REAL CORP 007:
TO PLAN IS NOT ENOUGH
PLANEN IST NICHT GENUG

12. Internationale Konferenz zu Stadtplanung und Regionalentwicklung in der Informationsgesellschaft
12th International Conference on Urban Planning and Spatial Development in the Information Society

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Strategien, Konzepte, Pläne, Projekte und ihre erfolgreiche Umsetzung in Stadt-, Regional- und Immobilienentwicklung
Strategies, Concepts, Plans, Projects and their Successful Implementation in Urban, Regional and Real Estate Development

TAGUNGSBAND
PROCEEDINGS

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(Editors / Herausgeber)

PREFACE

"To Plan Is Not Enough!" is the motto of **REAL CORP 007**, Strategies, Plans, Concepts, Projects and their Successful Implementation in Urban- and Regional Planning and Real Estate Development are in the focus.

There was a discussion here amongst experts if "To plan is not enough!" has to be understood as fundamental criticism on planning disciplines, as finally it has been understood that other branches contribute much more to the urban development of 21st century.

The opposite is true: REAL CORP organizers are still convinced that (urban) planning always was and still is the precondition of sustainable urban development. As there is a rapid development as well in goals, framework and available methods and tools there is the need for a permanent interdisciplinary dialogue. This is not only true for planning, but for all fields, so one could also say "To build is not enough!" or "Politics is not enough!" or "Marketing is not enough!" …

REAL CORP 007 intends to intensify the dialogue between **Urban Planning, Real Estate Development and IT business**, and also to overcome the communication barriers between **business, science, politics and public administration**.

"To plan is not enough!" does not mean at all that generally there is too much planning going on: there is still an amazing number of projects with enourmous investments taken and resources spent that are realized without professional state-of-the-art planning; on the other hand there are a lot of examples where extensive planning is done by highly qualified specialists, but there is hardly a thought on how to realize the plans in a "real world environment".

Still in many cases planners and architects on the one hand and real estate developers and investors on the other hand look at each other with astonishment, distrust, sometimes even animosity, although both are working on shaping the future.

So **REAL CORP 007** is to stimulate the fruitful communication between planning and real estate business – and maybe planning can even gain importance if the argumentation and methods are better understood by others.

It is crucial for this concept that the dialogue is not one-sided from planning towards real estate business – the co-organizers **Sissi DELLA LUCIA** (Immobilienmagazin) and **Andreas SCHILLER** (Publisher Immobilienmanager and Editor of Europe Real Estate) who at the moment also work on common "real-estate-information-strategies" guarantee good information flow also in the real estate sector. Last but not least **TECH GATE VIENNA**, strategically situated in "Vienna Danube City" or "Vienna DC", the biggest and most important new business district of Vienna, is a fantastic venue for REAL CORP 007 – many thanks to **Thomas**

VORWORT

„Planen ist nicht genug!" lautet das Motto der REAL CORP 007, Strategien, Pläne, Konzepte, Projekte und ihre erfolgreiche Umsetzung in Stadt- & Regionalplanung sowie Immobilienentwicklung stehen im Mittelpunkt des Interesses.

Im Vorfeld wurde von einigen Kollegen/-innen die Frage gestellt, ob denn „Planen ist nicht genug!" als fundamentale Kritik an den Planungsdisziplinen zu interpretieren sei, als Erkenntnis, dass andere Branchen wesentlich wichtigere Beiträge zur modernen Stadtentwicklung des 21. Jahrhunderts leisten.

Das Gegenteil ist der Fall: Die REAL-CORP-Organisatoren halten gute (Stadt-)Planung nach wie vor für eine unverzichtbare Basis der nachhaltigen städtischen Entwicklung! Nachdem sich aber sowohl die Rahmenbedingungen, Zielsetzungen als auch die verfügbaren Instrumente höchst dynamisch entwickeln, ist es notwendig, permanent den interdisziplinären Dialog zu suchen.

Dies trifft nicht nur für die Planungsdisziplinen zu, natürlich könnte man auch sagen „Bauen ist nicht genug!" oder „Politik ist nicht genug!" oder „Marketing ist nicht genug!" ...

Im Rahmen der REAL CORP 007 geht es schwerpunktmäßig um den Dialog zwischen **Stadtplanung, Immobilienentwicklung und Informationswirtschaft** und um den Austausch über die „Systemgrenzen" von **Wirtschaft, Wissenschaft, Politik und Verwaltung** hinweg.

„Planen ist nicht genug!" bedeutet keinesfalls, dass generell zu viel geplant wird: Erschreckend viele Projekte werden umgesetzt, Investitionen werden getätigt und Ressourcen verbraucht, ohne dass adäquate Planungsprozesse vorangegangen sind; andererseits wird nach wie vor in vielen Fällen mehr oder weniger aufwändig geplant, ohne an die Umsetzung in der realen Welt zu denken – viel zu oft landen Pläne gleich in der Schublade oder werden anlassbedingt so modifiziert, dass von der Intention kaum etwas übrig bleibt.

Nach wie vor ist es in vielen Fällen so, dass Raum- und Stadtplanung einerseits und Immobilienbranche und Investoren andererseits einander staunend, befremdet, misstrauisch und teilweise sogar feindlich gegenüber stehen, wo doch beide mit der Zukunftsgestaltung befasst sind.

Es geht bei der **REAL CORP 007** also unter anderem darum, den Dialog zwischen Planungs- und Immobilienbranche zu forcieren – durchaus in der Hoffnung, die Planung sowie ihre Denkweisen und Methoden aufzuwerten, weil wichtige Akteure erkennen, was gute Planung leisten kann.

Dafür, dass der Dialog nicht nur einseitig seitens der Planung gesucht wird, sondern auch die Immobilienbranche höchst kompetent vertreten ist, sorgen die Kooperationspartner **Sissi DELLA LUCIA** (Immobilienmagazin) und **Andreas SCHILLER** (Immobilienmanager), die derzeit – soviel sei hier verraten – auch an gemeinsamen Informationsprojekten für die Immobilienbranche arbeiten.

Nicht zuletzt soll der Veranstaltungsort, das **TECH GATE VIENNA** als Teil der Donaucity inmitten eines der wichtigsten Stadtentwicklungsprojekte Wiens angesiedelt, mit seiner hervorragenden Infrastruktur zum Gelingen der Veranstaltung beitragen – **DI Thomas JAKOUBEK** und seinem Team herzlichen Dank für die fantastische Unterstützung bei der Konferenzorganisation!

Über den Themenschwerpunkt hinaus werden im Rahmen der REAL CORP zahlreiche weitere Themen behandelt,

JAKOUBEK and his team for their fantastic support in conference organization.

There are many more topics that are dealt with during REAL CORP 007, for example there will be a 2 very important special Workshops:

Spatial Development Forum “Planning Infrastructure for Regional Development” is organized by CEI – Central European Initiative (http://www.ceinet.org/) in the context of the project ADRIATIC-BALTIC LANDBRIDGE and is a high-level event on European Planning policies, and “FLAIR”, organized by Dr. Dirk ENGELKE fromPAKORA.NET (www.pakora.net) deals with sustainable land use management.

More than 150 presentations have been accepted for REAL CORP 007, principal speakers include:

- Dr. Alfonso VEGARA, President Fundación Metrópoli (Madrid/Spain) and past president ISOCARP
- Dr. Kurt PUCHINGER, director of planning of the City of Vienna
- Prof. Dr. Vassily POPOVICH, Russian Academy of Sciences, St. Petersburg/Russia
- Federico CASALEGNO, Head of Mobile Experience Lab, MIT/Cambridge/USA

This volume of proceedings contains more then 1,000 pages of successful examples, theories and future-oriented concepts – and they raise a lot of questions, so there should be enough topics to discuss during REAL CORP 007.

For more than 10 years CORP has been serving as a platform for international, multidisciplinary discussion on various topics on spatial planning. Challenges are manifold when you provide means to understand and to develop society and space. This year contributions on applied issues, innovative products and theoretical disputes are presented alike at the conference. Contributors work in various fields, all of them working constructive on spatial development issues. Like every year, topics at CORP reflect internationalism of urban phenomena and rapid movements within assisting media technology to develop new forms of work-, housing- and living spaces.

Social phenomena play an increasing role in the design of living spaces in a society of “Digital Cities”. Due to lack of conceivability, lack of description and, in addition, increasing complexity these phenomena often have been neglected but now are attracting attention through IT product development. Working on spatial technologies of the future we begin to understand changing levels of participation and visualization in a spatial planning process. Statistical and juridical terms as well as seemingly precise concepts like “demographic development”, “aging”, “crime”, “public parks” and “streets” suddenly turn out to be variables in a spatial planning context which are barely calculable. Complex, multi-dimensional data structures do make it even more difficult to grasp concepts like “spatial structures”.

besonders herausgehoben seien zwei wichtige Kooperationen:

Unter dem Titel **"Planning Infrastructure for Regional Development** (Infrastrukturplanung für die Regionalentwicklung" wird von **CEI – Central European Initiative (http://www.ceinet.org/**) im Rahmen des Projektes **ADRIATIC-BALTIC LANDBRIDGE** ein sehr hochrangig besetzter internationaler Workshop organisiert. Der Workshop **„FLAIR – Flächenmanagement durch innovative Regionalplanung“** beschäftigt sich mit dem sparsamen Umgang mit der Ressource Grund und Boden, insbesondere mit der Wiederverwendung von freiwerdenden Flächen. FLAIR wird von Dr. Dirk ENGELKE (PAKORA.NET) im Rahmen des Förderschwerpunktes "Reduzierung der Flächeninanspruchnahme und nachhaltiges Flächenmanagement (REFINA)" vom Deutschen Bundesministerium für Bildung und Forschung (BMBF) gefördert. Nähere Informationen unter http://flair.pakora.net

Mehr als 150 Vorträge wurden für das Hauptprogramm der REAL CORP 007 akzeptiert, hier seien nur nur einige der Haupt-Vortragenden genannt:

- Dr. Alfonso VEGARA, President Fundación Metrópoli (Madrid/Spanien) und Ex-Präsident ISOCARP – Internationale Gesellschaft der Stadt- und Regionalplaner
- Dr. Kurt PUCHINGER, Planungsdirektor der Stadt Wien
- Federico CASALEGNO, Leiter des "Mobile Experience Lab" am MIT – Massachusetts Institute of Technology/Cambridge/USA
- Prof. Dr. Vassily POPOVICH, Russische Akademie der Wissenschaften, St. Petersburg/Russland

Die in diesem Tagungsband auf mehr als 1.000 Seiten zusammengefassten Beiträge liefern wichtige grundlegende Überlegungen und zeigen zahlreiche Beispiele für erfolgreiches planerisches Handeln. Sie werfen aber auch neue Fragen auf, sodass sichergestellt ist, dass ausreichend Diskussionsstoff für die REAL CORP 007 vorhanden ist.

Die CORP-Konferenzen sind seit über 10 Jahren eine Plattform für internationale und multidisziplinäre Auseinandersetzung zu vielen Themen rund um die Raumplanung oder raumbezogene Planung. Zum Verstehen und zur Entwicklung von Gesellschaft und Raum beizutragen ist eine facettenreiche Herausforderung Auch dieses Jahr finden sich deshalb praxisorientierte Beiträge und innovative Produktpräsentationen neben theoretischen Auseinandersetzungen aus all jenen Berufssparten, die konstruktiv an der Raumentwicklung teilnehmen. Dabei spiegeln sich in den Themen die Internationalisierung urbaner Phänomene und der rasche Wandel der Informationstechnologie zur Entwicklung neuer Arbeits-, Wohn- und Lebensräume wider.

Auch Überlegungen zu sozialen Phänomenen bei der Gestaltung von Lebensräumen spielen in einer Gesellschaft der „Digital Cities“ ein zunehmend wichtigere Rolle. Diese Phänomene urbaner Entwicklungen waren mangels Fassbarkeit, Komplexität und/oder Beschreibbarkeit oft ausgeklammert, werden aber zunehmend durch IT-Produkte wieder entdeckt. Mitarbeiter/-innen an der Zukunft raumbezogener Technologien beginnen zu verstehen, dass sich die Beteiligungsebenen sowie deren Darstellung am und im Planungsprozess verändern. Statistische, rechtliche Begriffe und scheinbar klare Konzepte wie Demographieentwicklung, Alter, Verbrechen oder öffentliche Parks und

Information technologies serve as “problem-identifier” and “problem-solver” at the same time. Technologies, which appear to be ubiquitous in magazines and media, like Web 2.0, Second Life, Google Earth and so on provoke, limit, create enthusiasm and – at the same time – provide (technical only, so far) advice and ideas on how to deal with and how to develop new and alternate looks at spaces. The way of dealing with data, information and spaces is a great challenge, particularly when looking into “social spaces”. Issues in “new” cities, like they are pictured in “Digital cities”, must be supported by innovative and participative technologies. Knowledge on spatial phenomena has to be increased and used as best as possible in a modern urban society. It will be of crucial importance to the quality of scenario development of urban spaces for planers, architects, geotechnicians, social scientists and other actors to meet these challenges and to learn how to work with those phenomena.

CORP offers a unique possibility to present theoretical concepts, discuss practical experiences and learn about new IT alike in an environment driven by the exchange of ideas and knowledge. The plurality of contributions and variety of topics promise a rewarding event in Vienna.

As immediately after REAL CORP 007, from May 23-25, **Real Vienna – The CEE-focused real estate and investment fair** is going to take place, there is the good opportunity to stay a little longer in Vienna and combine the participations – detailed information on REAL VIENNA at http://www.realvienna.com/

We wish you a successful and interesting participation in REAL CORP 007!

Enjoy your participation and the days in Vienna!

Manfred Schrenk, Vasily V. Popovich, Josef Benedikt

May 2007

Straßen werden plötzlich zu schwer kalkulierbaren Variablen der Raumentwicklung. Komplexe, mehrdimensionale Daten erschweren zusätzlich das Verstehen räumlicher Strukturen.

Informationstechnologien können dabei in der Planung sowohl „Aus-Löser“ als auch „Ein-Löser“ offener Fragen sein. Medial stark präsente Labels und/oder Anwendungen wie Web 2.0, Second Life, Google Earth und andere provozieren, machen süchtig, limitieren, begeistern und geben gleichzeitig – zur Zeit vor allem technische – Anregungen und Hinweise zum Umgang mit und zur Entwicklung von neuen Räumen und neuen Ansichten. Der Umgang mit Daten, Informationen und Räumen im Allgemeinen wird vor den Perspektiven „sozialer Räume“ zur Herausforderung technologischer Entwicklungen. Die Aspekte „neuer“ Städte, wie sie z. B. in „Digital Cities“ konzipiert werden, gilt es, mit innovativen und partizipativen Technologien zu unterstützen, um das Wissen zu Stadtentwicklungen einer modernen urbanen Gesellschaft bestmöglich aufzubauen und zu nutzen. In wie weit Planer/-innen, Architekten/-innen, Geotechnologen/-innen, Sozialwissenschaftler/-innen und Beteiligte anderer Fachdisziplinen diesen Ansätzen begegnen und damit umgehen lernen, wird die Qualität der Szenarien urbaner Lebensräume entscheidend mit beeinflussen.

Im Rahmen der REAL CORP 007 bietet sich die Möglichkeit, grundsätzliche Überlegungen, praxisorientierte Ansätze und neue IT-Entwicklungen in einem gemeinsamen Event kennenzulernen und mit Spezialisten/-innen verschiedenster Planungsbranchen zu diskutieren. Die Vielfalt der Beiträge und die fachliche Buntheit der Teilnehmer/-innen versprechen jedenfalls spannende Tage in Wien.

Nachdem unmittelbar im Anschluss an die REAL CORP 007 die Immobilienmesse **Real Vienna** stattfindet, bietet sich der kombinierte Besuch beider Veranstaltungen an – seitens REAL CORP wird am Mittwoch, 23. 05. 2007 nachmittags eine Exkursion zur REAL VIENNA angeboten (siehe http://www.realvienna.com/)

Wir wünschen Ihnen eine interessante und erfolgreiche REAL CORP 007!

Genießen Sie die Teilnahme!

Manfred Schrenk, Vasily V. Popovich, Josef Benedikt

im Mai 2007

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Einleitendes Statement zur internationalen Konferenz REAL CORP 007, Mai 2007

Kurt PUCHINGER

Dipl.-Ing. Dr. Kurt Puchinger, Planungsdirektor der Stadt Wien

1. Es gibt so etwas wie einen natürlichen Widerspruch zwischen Partialinteressen und denjenigen Personen und Konzepten, die für das Gesamtinteresse einer Gebietskörperschaft, einer Region, einer Agglomeration, einer Stadt verantwortlich gemacht werden. In der Regel ist es so, dass Vertreter von Partialinteressen, seien es Bürgerinitiativen, Developer, Interessensvertretungen oder Lobbyisten von der Stadt bzw. von der Stadtplanung etwas wollen. Und zumeist ist dieses Wollen nicht darauf gerichtet die Balance zwischen verschiedenartigsten Partialinteressen gut auszutarieren, im Gegenteil, in der Regel ist es darauf gerichtet eine bestimmte bestehende Balance in Richtung auf den oder die Wollenden begünstigend zu korrigieren; kurz gesagt, ein solches Wollen erzeugt Unruhe.

2. Wo kommt aber nun solches, Unruhe deutlich machendes, Wollen her? Mit Sicherheit nicht aus der Stadtplanung, die hätte es lieber gerne ruhig, also kann es nur aus der Gesellschaft kommen, aus deren realen Widersprüchen, aus deren sozialen Konflikten und aus deren marktwirtschaftlichen Verhältnissen. In der Regel antizipiert Stadtentwicklungsplanung notwendigerweise diese Verhältnisse und Dynamiken in ihren Konzepten, in ihren Planungen. Die Frage, die aber oftmals sehr diffus nur beantwortet wird, ist die Frage nach den Rollen, nach den Aufgaben, nach den konkreten Aktivitäten, die seitens der Gebietskörperschaft im Zuge des Umsetzungsprozesses von Planung gesetzt werden sollen und nach den Rollen, nach den Aufgaben nach den konkreten Aktivitäten die seitens der Wollenden, der Bürgerinitiativen, der Developer, der Interessensvertreter oder Lobbyisten gesetzt werden sollen. Und ein großer Fehler, den Stadtplanung machen kann, ist zuviel zu versprechen, so zu tun als wäre Stadtplanung ein börsennotierter multinationaler Konzern, als wäre Stadtplanung ein Investmentfonds, der über jede Menge an Risikokapital verfügt, so zu tun, als wäre Stadtplanung eigentlich mit den Kompetenzen einer Bundesregierung ausgestattet und hätte dazu noch das Sagen bei ÖBB und ASFINAG. Das wäre nicht nur ein großer Fehler der Stadtplanung, das wäre ein schwerer Fehler, was nicht heißt dass er nicht schon da oder dort einmal passiert wäre.

3. Development ist eine Sache des Marktes, nicht der Stadtplanung und das müssen beide Seiten immer besser begreifen, Development hat auch und immer mehr Verantwortung für den öffentlichen Raum zu übernehmen, an dem es maßgeblich partizipiert, das begreifen auch die Developer immer besser und Stadtentwicklungsplanung muss endgültig die Herrschaftsattitüde hinter sich lassen und sich als zentrale Dienstleistung im Öffentlichen Interesse im Markt positionieren. Und deshalb ist natürlich Planen nicht genug, sondern, wenn es um die Attraktivität eines Standorts geht, um seine Zukunft und um die Entwicklungschancen seiner Einwohner und um deren Lebensqualität, dann sind Handlungen notwendig, dann ist ein bargaining notwendig zwischen den Partikularinteressen und den Öffentlichen Interessen, die von der Stadtplanung wahrgenommen werden, wobei es aber grundsätzlich im Öffentlichen Interesse liegt, dass Entwicklung stattfindet.

4. Damit sich Wachstums- und Innovationsprozesse also abspielen können und damit das Ambiente stimmt ist eine besondere Dienstleistung für sämtliche daran beteiligte Akteure und für die Bevölkerung notwendig, ist Stadtentwicklungsplanung notwendig, die für wesentliche räumliche Rahmenbedingungen verantwortlich ist. Die Rolle der Stadtentwicklungsplanung ist nicht immer so gesehen worden und das trifft gleichermaßen auf den Blick von Außen als auch auf den von Innen zu. Ungeachtet dessen schafft aber die Stadtplanung langfristigen qualitativen und monetarisierbaren Mehrwert für den Standort, der sich rentiert in der Zufriedenheit und im Wohlbefinden der

Einwohner und der sich rentiert in ausgelösten Innovationen und in Wirtschaftswachstum, der sich insgesamt rentiert in der gesteigerten Attraktivität eines Standorts, einer Stadt.

5. Woraus besteht nun diese Attraktivität eines Standorts, die Attraktivität einer Stadt? Wenn man z.B. vergleicht die Attraktivität von Pompeji, Knossos, Karthago und Carnuntum mit der Attraktivität von München, Prag, Budapest und Wien dann wird man doch sehr rasch zu der Einsicht kommen, dass diese Attraktivität von der wir heute im Zusammenhang mit Standorten und Städten sprechen, irgendetwas mit den Menschen in diesen Städten zu tun hat, mit dem was dort gemacht wird, was dort entwickelt wird, was dort gestaltet und umgestaltet wird, kurz dass diese Attraktivität etwas mit dem Leben in diesen Städten zu tun hat und die gebaute Umwelt eben das ist was sie ist, eine günstige oder weniger günstige Rahmenbedingung für das Leben. Heute setzt sich Attraktivität zusammen aus
    - Lebensqualität,
    - innovative Atmosphäre,
    - kulturelle Vielfalt,
    - solide Ausbildungsniveaus,
    - Netzwerkkompetenz und
    - strategische Kapazitäten.

   Und wenn es gelingt diese paar Eigenschaften auf der Grundlage eines Stadtentwicklungsplanes in ihrer Entwicklung bzw. in ihrer Weiterentwicklung zu fördern und nicht zu behindern, dann ist einiges erreicht.

6. Im STEP 05 sind gegenüber früheren Stadtentwicklungsplänen zwei wesentliche Neuerungen enthalten:
    - Die Festlegung von Zielgebieten der Stadtentwicklung, die – unabhängig von Bezirksgrenzen - auf bestimmte Themen und Chancen ausgelegt sind und
    - Die regionale Betrachtung des Standorts Wien in einer größeren Region, um sich gemeinsam mit den regionalen Partnern im neuen Europa zu positionieren.

   Beiden Neuerungen gemeinsam ist, dass sie die Basis dafür legen, sowohl innerhalb der Stadtgrenzen, als auch darüber hinaus wesentliche Fragen der Entwicklung des Standorts Wien in Form von **Projektorganisationen** weiter zu verfolgen, was insbesondere auf eine horizontale Kooperation zwischen Abteilungen, Geschäftsgruppen und externen Partnern abzielt.

   Beiden Neuerungen gemeinsam ist aber ebenso, dass sie den **funktionellen Blickwinkel** auf die Stadt- und Agglomerationsentwicklung stärken gegenüber der an administrativen Grenzen orientierten Sichtweise gebietlicher Planung.

   Projektorganisation und funktionelle Betrachtung der Agglomeration eröffnen für die Zukunft die Chance Wachstumsprozesse effizienter begleiten zu können und Standortentwicklungen dort zu forcieren wo die stadtwirtschaftliche Rentabilität von entweder bereits vorhandener oder neu investierter öffentlicher Infrastruktur ein hohes Maß erreichen kann. Die Kalkulation der Rentabilität von Investitionen ist ein alltägliches Thema in allen Wirtschaftsbereichen, also warum nicht auch ein Thema im Zusammenhang mit öffentlichen Investitionen?

   Dieser Aspekt der stadtwirtschaftlichen „Verzinsung“ öffentlichen Realkapitals einerseits in Form von wachsender Zufriedenheit der Bewohner mit ihrer Stadt, andrerseits in Form von arbeitsmarktwirksamen, privaten Investitionen wird in Zukunft sicher stärker als bisher gegenüber reinen Kostenkalkülen in den Vordergrund treten. Das ermöglicht auch den privaten Sektor und seine Freiheit der Nutzung marktwirtschaftlicher Instrumente, über die ja eine Öffentliche Gebietskörperschaft nicht verfügt, zielgerichtet in den Prozess der Stadtentwicklung einzubinden und

- auch in seinem eigenen Interesse an längerfristiger Werthaltigkeit von Investitionen - für die Bereitstellung sozialer und technischer Infrastrukturen sowie von Freiräumen zu gewinnen.

Andrerseits erfordert eine solche Orientierung

- eine gewisse Flexibilität der öffentlichen Planung in Bezug auf die Anwendung und Interpretation räumlicher Siedlungs- und Stadtmodelle, insbesondere dort wo die Ästhetik des Planes den funktionellen und budgetären Realitäten nicht mehr gerecht wird und
- Überlegungen bezüglich eines effektiven Modernisierungsprozesses der Planungsorganisation, im Zuge dessen Stadtwirtschaftsangelegenheiten einen expliziten Stellenwert im Rahmen der Stadtplanung zugesprochen bekommen sollten.

7. Im regionalen Kontext wird es darum gehen das Verhältnis zwischen städtischer Agglomeration und ländlichen Raum in ihrem wechselseitigen Nutzen besser zu verstehen. Das Konzept der „Grünen Mitte“ zwischen Wien und Bratislava, das im STEP 05 aufgegriffen wird, sowie das Wien-Niederösterreich Projekt des Biosphärenparks im Bereich des Wienerwaldes ermöglicht erstmals das Thema und das quantitative Verhältnis zwischen bebauter und nicht bebauter Umwelt in einem für die wachsende Agglomeration adäquaten Maßstab, unabhängig von Landesgrenzen zu diskutieren. Wir wissen aus einer Reihe von Untersuchungen sehr gut bescheid über die positive Korrelation zwischen urbaner Dichte und privatem Transport-Energie-Einsparungspotential und werden deshalb nicht nur aus infrastrukturbezogenen Rentabilitätskalkülen sondern auch aus Umweltkalkülen und wegen der abnehmenden Verfügbarkeit von Flächen innerhalb der Stadtgrenzen diesem empirisch abgesicherten Zusammenhang erhöhte Aufmerksamkeit schenken.

   Die Bedienung der Nachfrage nach spezifischen Erreichbarkeiten innerhalb der Agglomeration ist in einer Netzwerkgesellschaft das „Um und Auf“ einer modernen Standortpolitik. Forschungseinrichtungen, Unternehmenszentralen, produzierende Betriebe, konsumentenorientierte Unternehmen, hochrangige Dienstleistungsbetriebe fragen teilweise sehr unterschiedliche Interaktionsmuster in der Stadt und in der Region nach. Für Forschungseinrichtungen z.B. ist die Erreichbarkeit von anderen Forschungseinrichtungen und internationalen Verkehrssystemen besonders wichtig, für höherrangige Dienstleistungsunternehmen ist die raum-zeitliche Nähe zu Regierungs- und Verwaltungsstellen sowie den Hauptquartieren der Unternehmungen von Bedeutung, für konsumentenorientierte Unternehmungen wiederum ist das Kundenpotential ein entscheidender Parameter für die Standortwahl. Um hier adäquate Angebote sowohl seitens des Öffentlichen Verkehrs als auch des Individualverkehrs formulieren zu können ist in erster Linie wichtig zu wissen, wie denn diese Typen von Interaktionsmustern in der Agglomeration Wien tatsächlich ausschauen und in zweiter Linie wichtig Entscheidungen im Rahmen der übergeordneten Verkehrsplanung in den Dienst der Standort- und Zentrenentwicklung zu stellen.

   Die Verkehrsinfrastruktur spielt eine wesentliche Rolle im Prozess der nachfrageorientierten Standortproduktion, wobei insbesondere die Logik der Entwicklung des ÖV- Systems neben der Bevölkerungsorientierung aus entwicklungspolitischen Erwägungsgründen künftig auch Parameter der langfristigen Zentrenentwicklung zu berücksichtigen haben wird. Das bedeutet, dass den Tangentialverbindungen zwischen künftigen spezifischen Zentren linksseits der Donau sowie deren Einbindung in die Zentrenstruktur rechtsseits der Donau erhöhte Aufmerksamkeit zukommt.

   Wir können heute nicht mehr über **ein** Zentrum sprechen und damit die City meinen, wir müssen über ein **System von Zentren** und die sie verknüpfenden Infrastrukturnetze sprechen. Die City ist, trotz höchster Erreichbarkeit im ÖV, in ihrer Entwicklung sehr eingeschränkt. Die neuen Zentren haben sich in den City-Erweiterungsgebieten, in der Donaucity bereits entwickelt und werden sich im Bereich des Hauptbahnhofs, St.Marx, Aspangbahnhof und in spezifischer Form im Bereich von Siemens/Allissen und am Flugfeld Aspern künftig entwickeln. In dem Zusammenhang attraktive Standortpotentiale liegen auch heute noch in den durch die vor knapp 150 Jahren erfolgte Donauregulierung gewonnen Flächen des 20. und 2. Bezirks und insbesondere auch an der „Waterfront“ des Rechten Donauufers.

8. Die Entwicklung solcher Potentiale ist aufgrund der Vielfalt der „Stakeholder – Interessen“ nicht immer ganz einfach, aber jedes erfolgreiche Development startet mit einem „Mission Statement“, einer überzeugenden **Entwicklungsidee**, einer überzeugenden Vision von Entwicklung, die geeignet ist sämtliche Interessenten „ins Boot“ zu holen. Ohne eine solche Idee wird die Bewältigung von komplexen Entwicklungsaufgaben noch schwieriger als sie ohnehin ist und führen selten zum gewünschten Erfolg oder auch zu stadtwirtschaftlich suboptimalen Lösungen.

   Auch wenn vom STEP 05 keine rechtliche Bindung ausgeht, so zählt doch der in diesem Plan zusammengefasste politische Wille fast mehr. In diesem Sinn ist jedenfalls davon auszugehen, dass seine Inhalte auch als Orientierungsrahmen für ausgelagerte Firmen und Unternehmungen der Stadt Wien gilt. Aus Sicht der Stadt Wien stellen diese Firmen und Unternehmungen (um die wir international oftmals beneidet werden) Instrumente zur Umsetzung stadtentwicklungspolitischer Ziele im Markt dar. Darin besteht ihr Hauptzweck, auch wenn sie klarerweise auch betriebswirtschaftliche Ziele zu verfolgen haben.

   Der Flächenwidmungs- und Bebauungsplanung kommt dann die Rolle zu diese Konzepte der Umsetzung zu begleiten und die Rechtsgrundlagen zu nutzen, um die Projekte rechtlich sauber abzuwickeln und erfolgreich finalisierbar zu machen. Insofern stellt die Anwendung der Wiener Bauordnung keinen Selbstzweck dar, sondern ein Mittel zur Ermöglichung von Entwicklung im Sinne des Gesetzgebers. So gesehen steht weniger ihre Novellierung auf der Tagesordnung sondern mit Sicherheit die Durchforstung ihrer Anwendungspraxis .

   Stadtentwicklung ist nicht nur der pragmatische Blick auf Flächenwidmungs- und Bebauungsplanung, Stadtentwicklung besteht wesentlich aus dem Verkauf von „Bildern der Zukunft“ und auf der breiten Diskussion dieser Bilder in der Öffentlichkeit. Auch das geht nicht immer gut, aber jedenfalls steigert es die Chance auf breite Akzeptanz von Entwicklungsvorhaben. Und insbesondere dann, wenn wir die Möglichkeiten von öffentlich – privaten Kooperationen, auch selbst ein „Bild der Zukunft“, optimal ausschöpfen wollen, dann bedarf es einer unprätentiösen Effektivität auf beiden Seiten, nach dem Motto meines Vortrags: Möglichst wenig vergeuden, möglichst viel erreichen!

🏆 *reviewed paper*

Event based simulations: enabling improved development planning and partnerships

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1 ABSTRACT

Even though conomic appraisal in the real estate field is currently based on the assumption that the built environment is static, buildings and its management represent a dynamic “system” whit a “behavior” we are able to design and develop. The fitness of this system, its ability to react to changing user demands, demographic development, etc. is imperative for sustainable environmental, economic and social urban development. Due to missing methods and technology the flexibility of property and the facility management behavior are either not considered or play a very minor role in the practice of the real estate development.

In the research and development project “discreteFD” at the Swiss Federal Institute of Technology Zurich (ETH Zurich) discrete event simulations were developed in cooperation with the Swiss industry partners SUVA and redKG and the German BASF AG, which map “system behaviour” of facilities and facilities management across the life cycle of a property. As a consequence, urban real estate development concepts can be optimized for sustainable use over a single day and the entire life cycle. The consequences of development plans and their sensitivity concerning possible events can be simulated over time. Alternative concepts become much more transparent for investors as well as for urban planners. New avenues of communication are opened and new partnerships are formed.

Empirical tests of the new simulation models and the software tools proved that the complex dynamic system of Real Estate and Facilities Management can be evaluated more precisely via discrete event simulations, thus achieving an enormous optimisation potential for Real Estate Development (RED) and Facilities Management. The congress contribution focuses on possible applications of the event based simulations in urban development projects and public private partnerships.

2 INTRODUCTION

Due to the increasing pace in which both individual lifestyles and the general economic situations of companies change, properties that are inflexible, poorly interpretable, badly managed and/or have high operating costs no longer meet the changing needs of users or tenants. The results of this development can be observed in many cities. Properties are vacant, renovated for alternative use at high costs or demolished for redevelopment at an early stage of their life cycle. As a consequence, neither the targeted return on capital nor a sustainable use is achieved.

Research at the ETH Zurich showed that institutional investors, as well as users, are increasingly developing buildings that are flexible in their use over time. Within in the framework of the research and development project “discreteFD”, funded by the Kommission für Technologie und Innovation (KTI), the ETH Zurich in cooperation with its partners SUVA und redKG , developed new concepts of real estate development where the layout of the building is developed simultaneously with the respective facilities management concepts. As a result, these concepts ensure successful long-term investments. Even though improved risk management and the tapping of the market for service-enhanced properties represent current research objectives in real estate, adequate methods and tools to evaluate and estimate the risks of these new types of facilities are lacking. Additionally, there are no methods and tools for the optimization of building, use, financing and operation concepts. The task to prepare facilities for a dynamic and complex future remains.

The objective of the project “discreteFD“ was to understand current and future business models within real estate development, to find adequate abstractions for the application of simulations in life cycle oriented real

estate development, to develop simulation tools enabling a transparent win-win situation for all partners and to optimize various layers of real estate concepts.

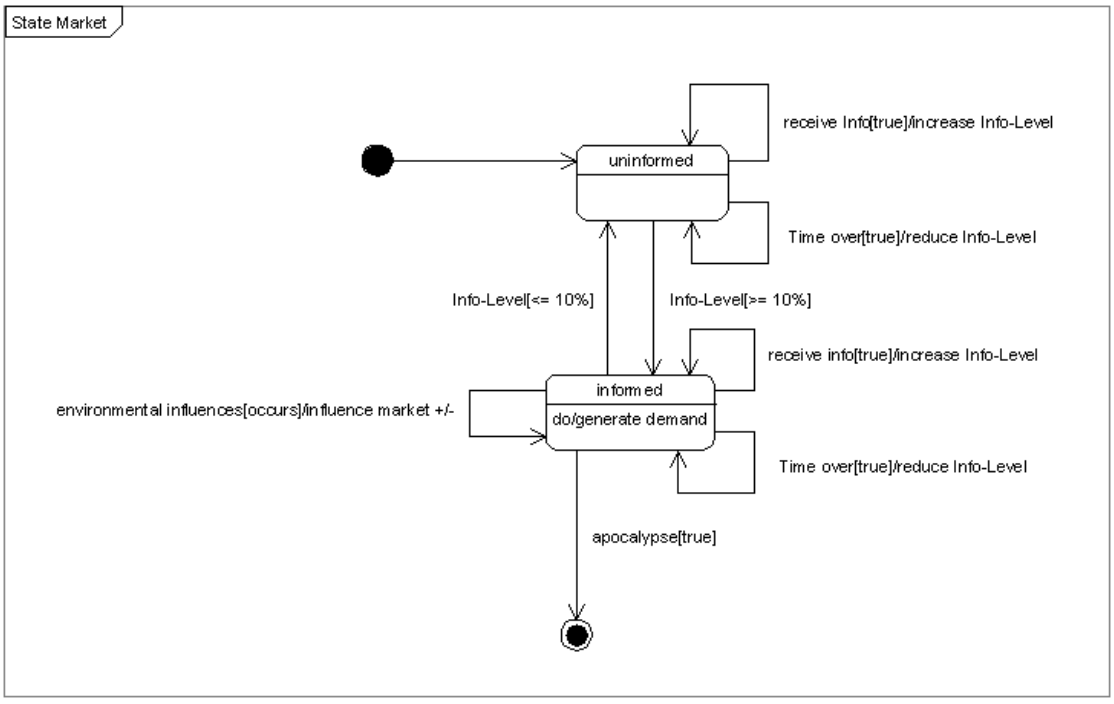
3 RESEARCH- AND DEVELOPMENT APPROACH

Research at the ETH Zurich regarding Discrete Event Simulations (DES) relates to facility developments defined as the phase prior to the actual building planning and to projects where building, use, financing and operation is developed in an integrative way. It is based on the thesis that the adaptability of a building, its interpretation potential, i.e. fitness; the types of management within the operating phase and the property-related services are all critical for sustainable property value and use. In the preliminary studies, the concepts of facilities management are to be optimized in relation to possible future events on which the developer or operator have no bearing. Such an approach is evident for owner-occupied properties (CREM) and public real estate (PREM) and is becoming increasingly important for the letting and sales of properties to third parties: The more customers regard the aspects of performance and adaptability of properties and services as significant and the legislator requires transparency, e.g. in the form of a "building pass", the more relevant this approach will become.

"discreteFD" pursues business simulation and information technology related objectives. Methods and tools from business analysis and business modeling on the basis of software development were applied. Via the narrative forms of story telling from eXtreme Programming , the business processes of facilities development, the requirements of the business field and the expectations of the end-user were collected and defined.

In addition, business data of the project partners and their customers were evaluated empirically in order to find influencing factors, which decide success or failure of facilities development (FD). From this, a Meta model for FD was deducted representing the basis for test implementations and simulation software. Based on the methodology of eXtreme Programming, potential modeling types, technical solutions and software architecture were evaluated with various test implementations and Architecture-Spikes . These test implementations perform single features (user stories) in order to answer the simulation questions, for example, the question of the optimal room mix of a hotel (single and double rooms) for an assumed demand.

For the translation of the simulation Meta model, in which the business processes were abstracted into software, transition diagrams and state charts were used; specifications of Unified Modeling Language (UML) .



Graph 1: State chart of the marketing of facilities

The validation of the simulation Meta model and tests of the software through practical cases represented the last step of the project.

4 STATE OF THE ART SIMULATIONS AND RISK MANAGEMENT IN THE CONSTRUCTION SECTOR AND FM

In some areas of civil engineering sporadically dynamic simulations were applied. Chahrour and Franz (Chahrour and Franz, 2004) specifically applied simulations from Logistics and Business Engineering in construction site organization in order to determine the utilization of specific equipment and their waiting time. At the 16th International Conference on the Application of Computer Science and Mathematics in Architecture and Civil Engineering in Weimar in 2003 Eichenauer, B. (IBE Simulation Engineering GmbH) and Scherer, K. (Fraunhofer-IMS and inHaus-Zentrum Duisburg) made a presentation on "Modeling and Simulations of Intelligent Building Systems with attributed Petri-Nets ." Literature research showed that whilst event simulations are in some areas of civil engineering, the application of simulations in real estate development represent a new phenomenon.

For a current assessment of the profitability of an investment, methods of dynamic investment analysis, also known as Discounted Cash Flow or Net Present Value method, are applied. With the help of spreadsheet analysis (Excel) the future progression of the net present value and of the interest rate is projected. These methods are often referred to as dynamic calculations (Schulte und Allendorf, 2005; Ropeter, 1998; Schelkle, 2005) through their inclusion of the interest payment for equity and dept capital over time. Strictly speaking, these methods represent merely static simulations as they do not include a simulation clock and in the instance of conditions and event, no changes in the system status occur. To our knowledge, dynamic event simulations in real estate development and FM have yet to be applied.

Because real estate development represents the business with the highest risks involved in the sector, the appropriate handling of risk is of vital importance. In real estate development, at the time of investment, reliable information is not available on the expected costs or on the prospective return. In addition, real estate development is confronted with unpredictable events, which are not within the influence radius of the developer. Consequently, a higher risk involved, on the one hand, generates extremely high returns, but on the other hand, the cooperation may get into financial disorder in the case of the poor development of a project. However, decisions on investments are generally still taken subjectively rather than analytically.

Only two publications on risk management in real estate development (Wiedenmann (2005) and Schelkle (2005)) are known. Real estate development as an academic discipline was first described in Bone-Winkel (1994) at the European Business School. Isenhöfer expanded this approach in 1999 in his publication on the strategic management of real estate development companies.

Several authors have dealt with general risk management in the real estate industry and specifically which risks are typically involved in real estate development (et al. Brauer, 2003; Diederichs, 2006; Hellerforth, 2001; Vogler, 1998; Wüstefeld, 2000; Schulte, 2005; Maier, 2004; Ropeter, 1998). The options to manage those risks, though, have not been examined or covered.

5 RESEARCH RESULTS

5.1 Analysis and Evaluation of Alternative Modeling Types and Simulation Tools

The first milestone of the project "discreteFD" was to examine whether the event based simulation is more suitable than other methods, like, continuous simulations for mapping reality, for example, the life cycles of facilities from a facilities development perspective. For this reason, utilising various modeling methods and tools, existent real estate development and properties in operation were analysed and test implementations of life cycle mappings of respective properties were developed and evaluated.

For the various test implementations, different simulation methods and tools were used:

- Monte Carlo Method (MC)
- System Dynamics
- Petri-Nets
- Discrete Event Simulations (especially eM-Plant)
- Simulation package SimPy and the programming language Python as Excel-AddIn

The Monte Carlo simulation represents one of the most used simulation methods and got its name from the world-famous casino. The method is particularly appropriate for the analysis of static problems with known probabilities. The Monte Carlo simulation represents a static simulation and does not cover dynamic situational or status changes.

System Dynamics represents a systems theory, based on the paradigm of information feedback as the behavior-determining structural component. System Dynamics has its roots in the findings of cybernetics and applies continuous simulations in order to examine behavior of non-linear models over time. This theory does not map results.

Petri Nets represent a modeling type, which is very neutral in terms of application. It is able to model and analyse dynamic system behavior. An event-based simulation may be applied with a time-related Petri Net model. Various simulation tools are based on Petri Net theory e.g. PACE, Umberto, etc. For practical use higher-level Petri Nets are required for which no constituent notion exists. Higher-level Petri Nets are complex to develop and analyse.

The simulation software eM-Plant represents an integrated simulation system. The advantage of eM-Plant is the complex support of simulation projects. The user concentrates on mapping the relevant system components and not on programming. The efficiency of modeling with eM-Plant is generally higher as with other simulation languages, but the high costs of purchase and operation of the software represent a disadvantage. In addition, there is a risk the results may be misinterpreted by inexperienced users. The simulation software partially includes its own programming language, which must be acquired for efficient and professional use.

According to expert interviews, facilities development is always based on assumptions of events for which probabilities concerning their certainty-to-happen are assumed. The empirical analysis of life cycles demonstrated that the events or conditions which are considered to be certain-to-happen generate a system behavior, which contributes significantly to success or failure of a project: Customer behavior, behavior of FM, etc. The modification of properties tends to be volatile. The exact process between events is of minor interest, that is, discrete event based simulations, which jump over time from event to event and simulate discrete modification of the system status in relation to the event, are highly suitable to map the life cycle of facilities appropriately.

In the project „discreteFD“, not only the question of which tools are the most appropriate for the simulation was raised, but also the question of how the simulation tool developed was to be applied. The project partners, e.g., the future users of the tool decided against a component simulator, which would have enabled them to develop individual models, but instead, decided in favour of a proprietary development of a parameter-based model where parameters are changeable.

5.2 Integration of System Behavior in Economic Appraisal

As a result of the findings, outlined distribution probabilities and system behavior of simulations of life cycle related real estate development were included in the development of “discreteFD”. Discrete event simulations (DES) were developed to provide a tool for new forms of real estate development and risk management for the industry project partners. The simulations implemented primarily generic features, which are applicable within a wide range of projects.

The performance of facilities over the life cycle, that is, the profitability for investors, operators and users, and also the eco-efficiency depend on a multitude of factors. The project “discreteFD” modeled and simulated those factors in a variable and flexible form including the factor time, which were defined as relevant on the basis of data analysis and expert interviews and which have not been mapped before.

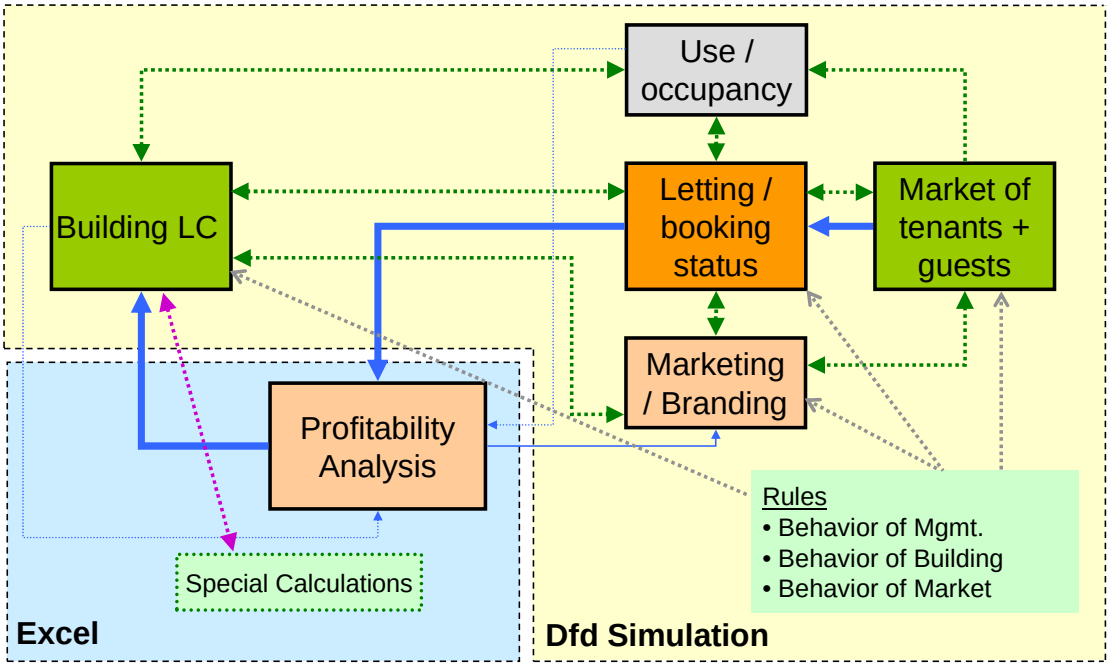
The life or durability of properties and building components, which has an important impact on the performance of facilities in connection with time, is not included in the simulation. “discreteFD” simulates on the level of building concepts.

5.3 Conceptual Model for Discrete Event Simulations of Facilities Development

The questions, which are to be answered by the simulation tools, were defined by the project partners as follows:

- Optimization of the building layout, e.g.: What is the best room mix for a hotel or how many conference rooms are necessary in a building?
- Management optimization in development, e.g.: What is the best point in time to inform the market, what are the letting terms?
- Optimization of rooms and accommodation management of school buildings, e.g.: What room mix in connection with which accommodation management is required for the most efficient use of the building during teaching hours?

On the basis of the questions defined, a life cycle of facilities was modeled from the perspective of facilities management and continuously evaluated by the project partners. Thus, the system structure was developed and mapped in a conceptual model including the system processes, the individual components, as well as their interrelations and impacts.



Graph 2: Conceptual facilities development simulation model

The conceptual model is divided into modules and classes respectively, which communicate via information (blue) and cash flows (green). The facilities in this model are presented in four categories and are able to adopt various statuses within those categories, mapping reality closely:

- Building LC: the status of a building over the life cycle of a property (from planning to use)
- Letting / booking status
- Marketing of the facilities
- Use / occupancy level: balance of the actual activities happening in the building

The cash desk (the profitability analysis) is required in order to determine the value of real estate development. Here the relevant key figures such as net present value are evaluated. Through the inclusion of existing valuation models in Excel, the users of the simulation are able to change the calculation modes in Excel.

Changes in the status of one entity class may cause status changes in others. Occupancy may inform life cycle that the occupancy level has reached a defined threshold and consequently the property is to be used alternatively. In the case of an insufficient occupancy level, the type of use of a building can be changed. If there is no more demand for hotel rooms, part of the building can be converted to offices or apartments. In the case of a high occupancy rate, an extension of the building or an alternative use of other parts of the building can be considered.

The modular structure supports the flexibility of the model. The fact that the life cycle of a building needed to be implemented only once facilitated the transformation into a flexible model.

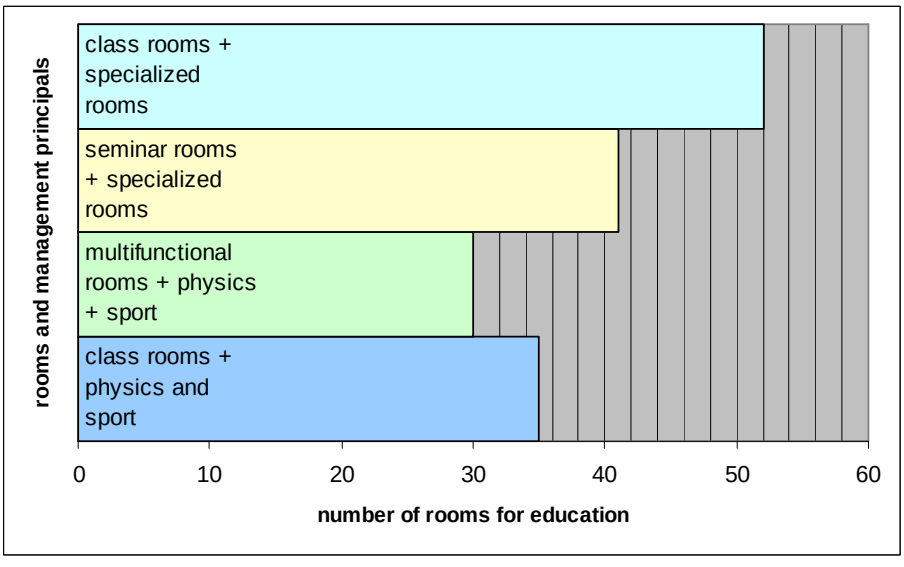
5.4 Implementation and Testing

In order to answer the questions outlined, flexible models were developed from component simulators (eM-Plant) and open source modules (SimPy/Python), which then were validated and tested through existing projects from the hotel, retirement and nursing home and schooling sectors. For illustration purposes, the empirical findings are demonstrated using the example of school buildings.

The questions determined, which were to be answered by the simulation concerning this sector are related to optimal room number, room quality and strategic accommodation management. First, rooms were distinguished into rooms for general use and rooms for use for specific subjects such as Biology, Arts, etc. The room demand was assumed as identified i.e., a specific number of teaching hours for a specific number of classes must be catered for with accommodation. The accommodation principles varied as follows:

- Classroom and subject specific classroom principle: Physics, Chemistry, Art, Music, Information Technology and Sports are taught in special rooms assigned for these purposes. Classes are exclusively assigned to a specific classroom for general teaching.
- Classroom principles apart from the subjects Chemistry and Sports: Chemistry and Sports are taught in specially equipped class rooms, all other subjects are taught in an exclusively assigned class room.
- Teachers' room principle: Teachers are assigned to specific room either via desk sharing or hoteling solutions. Student/pupils change rooms when teachers vary within the schedule.
- Specific classroom and course room principle: Corresponds to option 1. Classroom principle is substituted by course room principle.
- Course room principle for all subjects apart from Chemistry and Sports: Subjects apart from Chemistry and Sports teaching hours and classes can be assigned freely to rooms

At Bildungszentrum SeeCampus Niederlausitz an event based simulation was conducted for the classes 7 to 13. The results of the simulation show that when the classroom and subject specific classroom principle is no longer applied which usually represents general practice, 50% of the room capacity could be saved or made available other uses. Considering the fact that school buildings represent the largest segment within the public real estate portfolio, the economic and ecological potential of event based simulations in facilities management becomes evident.



Graph 3: Accommodation management principles and accommodation need/demand illustrated by the example of a German school (Forms 7-13)

The development of an independent simulation software for life cycle oriented facilities development framed the completion of the project "discreteFD". The software is, through focused user guidance at the time of data entry, extremely easy to use. It allows for once defined simulation models to be modified and used

again. With each simulation project, the amount of input effort is reduced for the application of discrete event simulations in new real estate development projects.

6 CONCLUSION

Discrete event based simulation tests of flexible facilities in the retirement, educational and hotel sector showed that with the help of simulations, optimized building layouts and management concepts can be developed. An idea, which due to the complexity and the dynamic of the business field, could not be developed without these tools. The imputed operating costs per teaching unit at the SeeCampus Niederlausitz could be reduced by 40% through the application of a simulation of the life cycle costs and benefits as well as the resulting optimization of the building and operation concept.

As outlined, the optimization of facilities development concepts and the evaluation of risks can be improved significantly and designed more realistically with the methods and tools developed within the project "discreteFD". Event based simulations enable transparency concerning the economic, ecological and social effects of real estate development over time, thus, enabling enhanced Public Private Partnerships. Even though the project "discreteFD" represents a generic approach to facilities development, not all problems are solved as real estate developments. For example, the questions raised in connection with development projects vary significantly especially in comparison to production and logistics. The expenses for modeling, development and implementation can be determined via the resulting increase in efficiency of facilities development projects. For the application of discrete event based simulations on a broader scale i.e., mass production, it is a prerequisite that real estate developers and investors are prepared to increase their investment during the planning phase in view of future benefits. The ETH Zurich plans to transfer and expand the outlined project to questions of eco-efficiency as well as to provide tools supporting the efficient operation of facilities and the decision making process during the various operating phases respectively.

7 REFERENCES

BRAUER, K.-U.: Grundlagen der Immobilienwirtschaft Recht - Steuern - Marketing - Finanzierung - Bestandsmanagement – Projektentwicklung; Gabler Verlag, Wiesbaden 2003

BONE-WINKEL, S.: Das strategische Management von offenen Immobilienfonds - unter besonderer Berücksichtigung der Projektentwicklung von Gewerbeimmobilien; Verlag Rudolf Müller, Köln 1994

CHAHROUR, R. und FRANZ, V.: Computersimulation im Baubetrieb, Forschungsstand und innovative Einsatzmöglichkeite; Tagungsband 11. ASIM-Fachtagung Simulation in Produktion und Logistik, „Experiences from the Future", Fraunhofer IRB-Verlag, Stuttgart 2004

DIEDERICHS, C. J.: Immobilienmanagement im Lebenszyklus; Springer Verlag, Berlin 2006

HELLERFORTH, M.: Der Weg zu erfolgreichen Immobilienprojekten durch Risikobegrenzung und Risikomanagement; RKW-Verlag, Eschborn 2001

ISENHÖFER, B.: Strategisches Management von Projektentwicklungsunternehmen; Rudolf Müller Verlag, Köln 1999

KOSTURIAK J. und GREGOR M.: Simulation von Produktionssystemen; Springer-Verlag Wien 1995

LAW A. M. und KELTON W. D.: Simulation Modeling and Analysis; 3. Auflage, McGraw-Hill, Boston 2000

MAIER, K.: Risikomanagement im Immobilien- und Finanzwesen ein Leitfaden für Theorie und Praxis; Verlag Fritz Knapp, Frankfurt am Main 2004

ROPETER, S.-E.: Investitionsanalyse für Gewerbeimmobilien; Müller, Köln 1998

SAUERBIER T.: Theorie und Praxis von Simulationssystemen; Vieweg Verlag 1999

SCHULTE, K.-W. und ALLENDORF, G. J.: Betriebswirtschaftliche Grundlagen; Oldenbourg Verlag, München 2005

SCHULTE, K.-W.: Handbuch Immobilien-Investition; 2. Auflage, Müller, Köln 2005

SCHELKLE, H. P.: Phasenorientierte Wirtschaftlichkeitsanalyse für die Projektentwicklung von Büroimmobilien; Dissertation, Institut für Baubetriebslehre der Universität Stuttgart 2005

SIEGERT H. J.: Simulation zeitdiskreter Systeme; Oldenbourg Verlag 1991

VOGLER, J.: Handbuch Immobilien-Investition. Müller; Köln 1998

WIEDENMANN, M.: Risikomanagement bei der Immobilien-Projektentwicklung; Dissertation, Institut für Standentwicklung und Bauwirtschaft der Universität Leipzig 2005

WÜSTEFELD, H.: Risiko und Rendite von Immobilieninvestments; Verlag Fritz Knapp, Frankfurt am Main 2000

🏆 *reviewed paper*

PPP Fruit and Vegetable Terminal Yekaterinburg: From micro-economic investment to macro-economic development.

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1 THE OVERALL SITUATION

During communism in Central- and Eastern Europe the production and distribution started top-down, beginning in the centralized "political/administrative" bodies. After the fall of the communist regimes we have to realize:

- for at least two to three generations there is no trading experience/culture in the way we organize wholesale and retail in the Western part of the world
- of course there is a big lack of money "to copy Western style"
- quite often in the last decade there was a certain unwillingness now from the
- atomistic trade partners – after just having gained entrepreneurial freedom - to gather
- again under one umbrella especially in cooperation with government authorities.

These historical and psychological developments/patterns have not been seen within Western governments or money-providing banks. The same business-plan offered by somebody who is just a newcomer with a cultural background from the East or another one whose company has grown experience makes a lot of difference in the success of the market.

A PhD-study has followed in its research the micro-segment of Food-Terminals for which in Central Europe the World Bank, the East European Bank, the EU or the German KfW-Bank had provided money – and where after a short to medium-period the buildings had been quite often transformed for other purposes! This is not only a waste of money concerning the building –project but also a missed opportunity to give a boost to the region, because Food-Logistic Terminals are an excellent tool to mirror the level of developments in distribution. They are not focused for example on one retailer, but have to serve a lot of retailers as well as suppliers and insofar work on the local/national average. With an increase of technical or agrotechnical demands of the Logistic Terminal suppliers and retailers are confronted to educate their people – that might be in "good agricultural produce", HACCP, IT-technologies. The micro-economic investment into a benchmarking Food Terminal might have a lot of macro-economic effects, if the concept is complex enough and not just fixed on the building-sector.

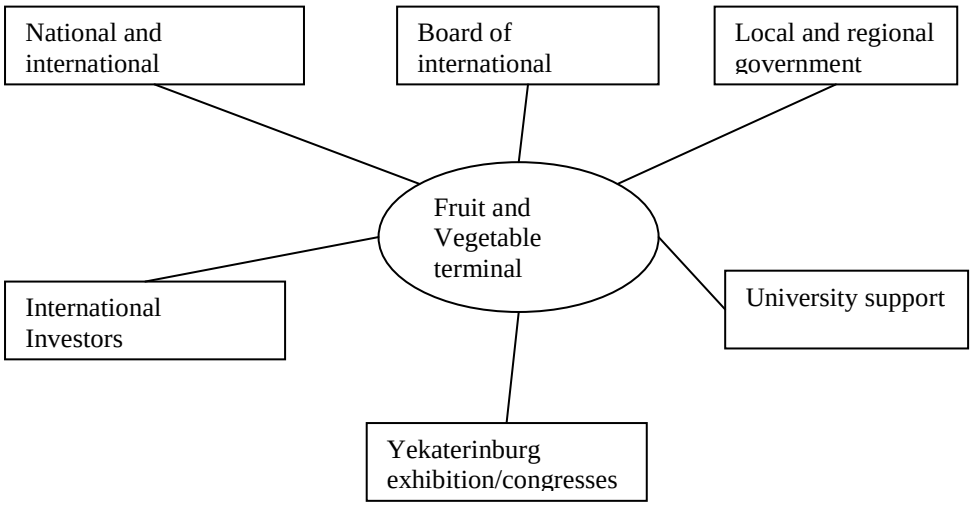
2 PILOT PROJECT YEKATERINBURG

Learning from the mistakes in other areas-now for Russia a pilot-project has been started in Yekaterinburg. Yekaterinburg has one of the highest turnover in Trade in Russia. It is the airport hub between Europe and Asia and should play a major role therefore in serving not only the city but also the Russian regions. The Trans-Siberian Railway is passing the city as well as the major motorways from West to East. In the beginning of December 2006 a site of 62 hectares was reserved for the purpose to start the project. The site is:

- near the airport
- only some hundred away from the railroad-system
- accessible from the major ring connecting Yekaterinburg and the major cities of the Ural-district.

Geographically the site is ideal placed. From the entrepreneurship point of view the city-management offers a great opportunity: the Fruit and Vegetable Terminal is planned as an international joint-venture public private partnership-model. By Western investors modern thinking will be transferred to local government as well as to Russian investors. To reflect all input of all stakeholders an international supervisory board will be established. Stakeholders will be represented directly or indirectly in that Board!

Already from the beginning the project will be defined in the broad sense of a Total Supply Chain starting from agriculture to wholesale, to processing uptil convenience-products, to packaging, to tracking and tracing systems, to electronic order picking and RFID-technologies, to HACCP-standards down the line to the retailers. Due to the good relations between local government and Ural Universities they will be integrated part for translations; BA-, MA- and PhD-students; the organization of round tables; penetration of the idea by the Yekaterinburg exhibition and congresses.



2.1 Technical and Operational steps

All buildings are planned modular to give the chance to enlarge the fruit and vegetable area step by step within the 62 hectares total area. The scope does not only see the handling of im-and export or of local production in the terminal, but also the processing – for example of convenience products, which could be supported by new packaging lines etc. All investors will participate from the initial investors, because a "know how pool" will be built up and the penetration of the educational learning will be pushed by the universities as well as by the Yekaterinburg exhibition and congress center. Within 5 to 10 years it is thought to establish satellite terminals in other Russian cities as well as in some of the neighboring countries.

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The perception of children for the limits of neighborhood

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1 INTRODUCTION

The localisation of neighbourhood limits of a city and consequently of its territorial size takes place in a different way depending on who and why performs this action. Intellectual maps through which routes, roads, the segmentation of the city in sub-areas with natural or artificial limits such as bridges, walls or buildings are recognized, act upon this process in multiple ways. The age of the individual is a factor that plays an essential role in recognition as it is connected to time, one of the dimensions of "being". The acquaintance with and consequently the learning of space is acquired through action within specified time. That is, the limits of neighbourhood as a material and intellectual unit of structured space entail the rhetoric and the matter, the history that requires apprenticeship, the familiarization that has need of the effective movement. The children, as a separate age group, conceive the sizes of their neighbourhood in relation to their psychosomatic scale. The present essay makes an effort to detect the limits and the size of neighbourhood in an intensely urbanised environment as conceived by children aged 11-12, in the city of Athens.

Tuan1 names as neighbourhood the place where the individual has the sense that he is at home while Holahan and Wandersman2 define it as the intermediary level between home and city, within the limits of which the residents have the awareness that they belong to the same community. The word neighbourhood refers directly to the word adjacency explaining the basic criterion of classification of place in this category. Most definitions of neighbourhood are based on the concept of proximity stressing that neighbourhood is the people who live next door3.

The quantitative and social data of the area play an important role in the discrimination of neighbourhood from the other forms of man-made space. A. Lagopoylos4 gives his own version by saying that: "In urbanised or non-urbanised settlements, the concurrence of their social and territorial units leads to the unitary elements of place of residence called neighbourhoods". The existence of neighbourhood is greatly attributed to the social isolation of certain groups and their low mobility within its limits. The resident of the neighbourhood has the following characteristics:

- It is closely connected to its residents
- It uses - exclusively or not - the services of its urban infrastructures
- It conceives the neighbourhood as having limits defined by the total of people that reside there
- It is sentimentally connected with the area of the neighbourhood, creating a sense of vital space that he owes, is named and identified after and provides safety.

The limits that determine the inner "being" from the outer "other" can be geographic limits, hills, rivers, swamps etc, cultural and national, functional like commercial, educational or recreational and finally psychological which arise from the feeling of members that there is a mental bond between them. The personal limits of neighbourhood often do not coincide with the geographic ones and with those that one would normally understand while the four constitutive elements of that were previously reported are rarely found all together in the neighbourhoods of the modern cities of the western world.

The people in their everyday routine move with easy from one region to another or much further from the place of residence. Thus the limits of neighbourhood are easily confused giving the sense of an interminable urban landscape especially in the demographically sensitive categories as old people and children. Fellin P. and Litwak E5 claim that the increased mobility in the neighbourhood disrupts and destroys the cohesion of neighbourhood. The degree to which the individuals incorporate in the environment of the neighbourhood depends on personal and community characteristics that most likely decrease due to their mobility. When these characteristics are lost because of the urbanisation then the previous cohesion with space breaks down and the limits become vague for the individuals. In the work of Glass6 only in 5 out of the 26 neighbourhoods is the identification between the natural and symbolic limits obvious. This shows that the operation of shops, schools and every local organisation do not always constitute a neighbourhood. The fundamental relation that forms that, in every case study, is the personal relationship between the residents

which however refers to a small scale area of the city. However, while conducting the already mentioned researches, the people asked determined the neighbourhood as a wider area. Taub[7] recorded also the importance of the name by which the region is known to its residents but also to the rest of the world. In the process of defining the area of the neighbourhood, the natural factors of the place acquire importance when they are included along with the social data of the groups that reside there. The natural elements minimize their force as limits of the neighbourhood while at the definition of the area the sociological characteristics of each street stand out. In order to define the limits of the neighbourhood, four factors are taken into consideration:

- neighbourhood as a place or unit of urban space
- as a set of social relationships
- neighbourhood that is defined from the institutions located there
- neighbourhood as a symbolic unit, with a name and an acknowledgeable identity[8]

In terms of the four dimensions reported, the individual determines the size of the neighbourhood.

Hancey and Knowles[9] confirmed that the residents of urban regions tend to define smaller regions as their neighbourhood, while as one moves away from the urban core to the suburbs and the regional communities, the area becomes bigger in size. Also women, the long-lasting residents of place, the parents of young children, tend to define neighbourhood as a small area. What is more, there is a significant group of residents that when asked about the limits of their neighbourhood, they give vague answers and mainly refer to the wider area using some geographic orientation such as "my neighbourhood is at the east of the river and the north of the avenue". The name of the neighbourhood is also of decisive importance to the identification of the limits of the region as the change of name beyond a point in the area signals in a symbolic way the beginning of another territorial unit. The name as a verbal symbol that corresponds to the aesthetic reality composes and it to a large extent supports the perception of limits and the intellectual outline of the neighbourhood in the intellectual map of the individuals. Relevant studies show that the residents with high income use more often the name of their neighbourhood compared to the low income ones[10]. The residents of the city are members of many groups at the same time, living inside the hierarchical structure of spaces. The activity of an adult resident coincides with and penetrates locality in many levels[11]. That is why at certain times a place is identified as neighbourhood with more than one name.

The limits of neighbourhoods are even set by organisations and institutions that have their headquarters in an urban area. It could be shops, construction companies, banks, hospitals, educational institutions etc. In this case we have the subjective intellectual mapping of "internal" people who live there but also "exterior" users that understand the area of operation of the organisations as the limits of a neighbourhood. The organisations For action and existence planning reasons, the organisations proceed to their own mapping of the neighbourhood. The limits of two different sources seldom coincide.

The localisation of neighbourhood limits happens differently depending on who and why does it. It is presented in a subjective way regarding the individuals - internal and external residents - as well as the official way of organisations and institutions that offer their services and develop their action in the particular area. Respectively, it is possible to make reference to the existence of two categories of neighbourhood in relation to the source of determination of limits: The subjective neighbourhood and the institutional or official neighbourhood.

The individuals subjectively determine a total of neighbourhood limits as identified by their movements. The intellectual maps act upon this process which guides the choices and directs movement and social contacts12. With the maps they are identify, as Kevin Lynch proved, the routes, the roads, the routes of means of transport, the pedestrians crossings, the segmentation of city in sub-areas which are realised with natural or artificial limits such as bridges, walls, rivers[13]. Also the social, functional and official limits are identified, including demographic elements, important institutions and the way safety in the region is perceived. Due to the development in the geographic technology of information systems (GIS), it is now possible to make neighbourhood maps based on data given by the residents. Another approach is the identification of crossroads which the pedestrians cross in the neighbourhood and are considered as area of social interaction. Grannis[14] suggested using the crossroads where the social interaction is less as limits of the neighbourhood. Using the GIS, he examined territorial and social organisation assumptions in order to

define the limits. With GIS the geographic characteristics, the economic and social elements relate with the local beliefs producing results of satisfactory clarity.

2 METHOD

The research was carried out with the help of a questionnaire. The individuals were students of the fifth and sixth grade of the 19th municipal school of Ionia (48 students) examining the sense of space with the density of structure and common appearance of urban landscape with the blocks of flats that is so typical in the neighbourhoods of Athens. The children answer the question "Where do you live? What are the limits of your neighbourhood?" They were asked to define the outline of their neighbourhood in a descriptive way. From each individual description a neighbourhood outline would emerge with subjective criteria. Through the answers it was attempted to show the current perception for the neighbourhood limits in the densely-populated and over-populated surroundings of the city where two to five storey buildings play a dominant role. The urban space having as its centre and starting point the family house extends to the limits that the children place. Expecting the projection of the effect that the children's psychosomatic scale has on the perception of neighbourhood sizes when family houses have been structured vertically in blocks of flats changing the relation of inside with outside, private and public space as also and the sense of ground possession. The processing of elements and maps with GIS (Geographic Information System) which develops geographic information systems with aerial photos as a background, making possible the direct recording of distances between specific points as well as the estimation of surface covered.

3 DISCUSSION

After identifying the limits of each neighbourhood as described by the student, it is spotted on the map with the elliptic form that represents the ground that it actually occupies. Within the outline, a number is written which has been given in each individual since the beginning of the research. On the map all the neighbourhoods appear with the exception of the 6th one which is located in a different area and the child for some reasons has to move to the school unit that is under examination. Additionally, the 10th is at a distance but is still present.

Through children reports it appears that the elements of structured space that serve as landmarks and limits of their neighbourhood are churches, schools, streets, shops and means of transport terminals. They are reference points in an area where a great number of people gather throughout the day or at certain times for the local society. From the 17 neighbourhoods near the school, the neighbouring church of St. Anastasia is mentioned as a limit in ten of them. In three cases, the school where the individuals of the research study is the limit while in one case another school of the area is the limit. Streets are reported in two cases and the metro terminal that forms the physiognomy of this part of urban space is reported once.

The children set the limits of their neighbourhood way beyond the end of street that goes past their house. The calculation of distance of the furthest neighbourhood is approximate based on the limits that each student reports. The average distance from 18 reports – with the exception of the 6th which is not included in the map – is roughly 355 metres from one end to the other, with 796 m being the longest (1st distance) and 115 m being the shortest (10th distance) (map 1)

The relatively big surface of structured space that children identify as their neighbourhood includes the relationship with the material elements as well as the relationship with people that live in that place. That is to say, a familiar area where children of age we study move, having the feeling of possessing of the area and belong to an area they own.

The area of city that the 19th municipal school of Ionia serves covers roughly 769.000 sq.m. of structured space while the greatest distance between the most distanced limits of this region is 1204 metres. These sizes refer to the territorial scale of the town or the prosperous demographic village. The wider frame is composed by their individual areas of neighbourhoods as identified by means of their limits by children. It is a quite familiar to the students area as it is approachable in a daily base due to the route to school, playing, shopping and the social contact with peers with who they meet on the common ground of school. (map 2)

4 RESULTS

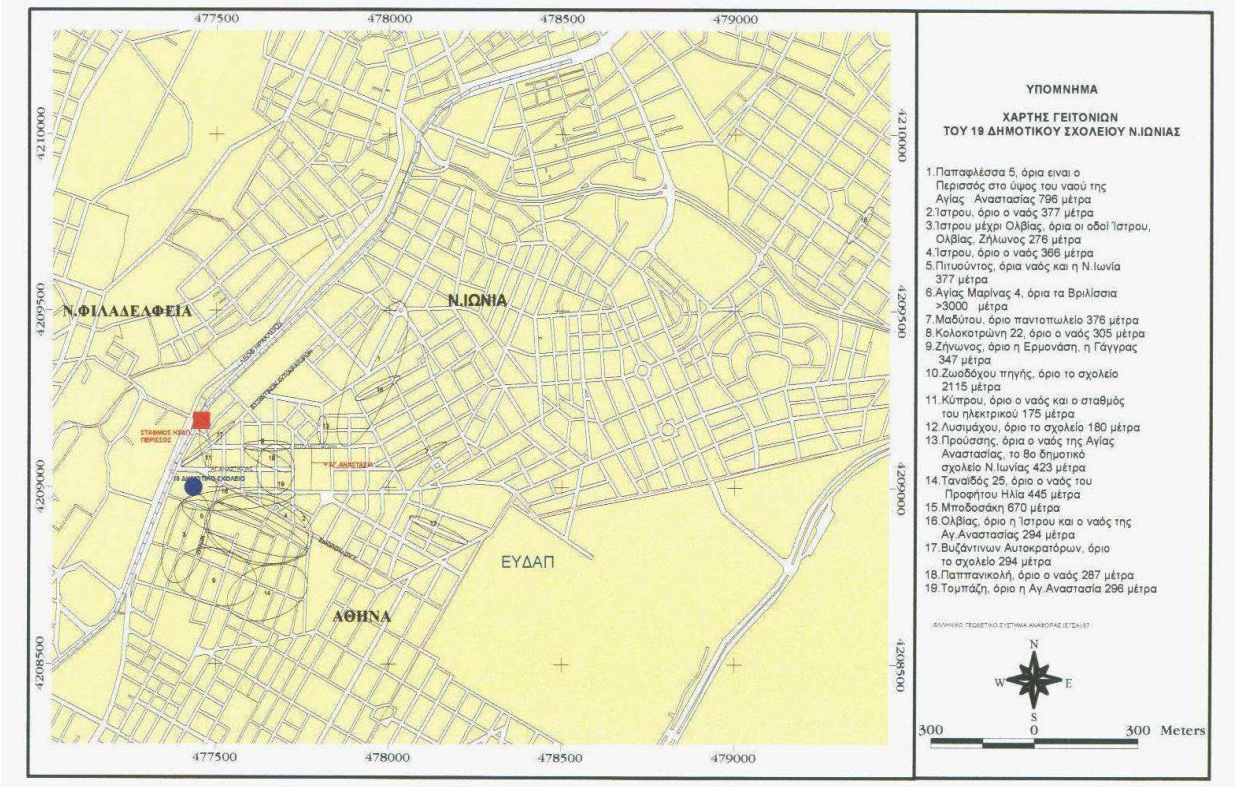
The children of the region of Athens consider a wide area of structured space as their neighbourhood. Its limits extend to a considerable distance from the family house, which shows that children in a city are prepared for equivalent movement in a rich in stimuli framework during the later stages of their growth. The cultural factors that compose the significance of neighbourhood make a catalytic appearance in the reports of the individuals of the research, with the church naming and defining the identity of the area. In recently developed and structured surroundings – during the last hundred and fifty years – where the residents are immigrants from various other regions of the same country, the school along with the church are points of reference and identification of the limits of neighbourhood.

In relation to the scale of the neighbourhood, the school and the schoolyard both occupy a small space in the neighbourhood. In the densely-populated areas of Athens there is a problem regarding finding appropriate establishments for a school, since school units are of a small scale and also they serve a lot of neighbourhoods with a large population, so they face the problem of overpopulation.

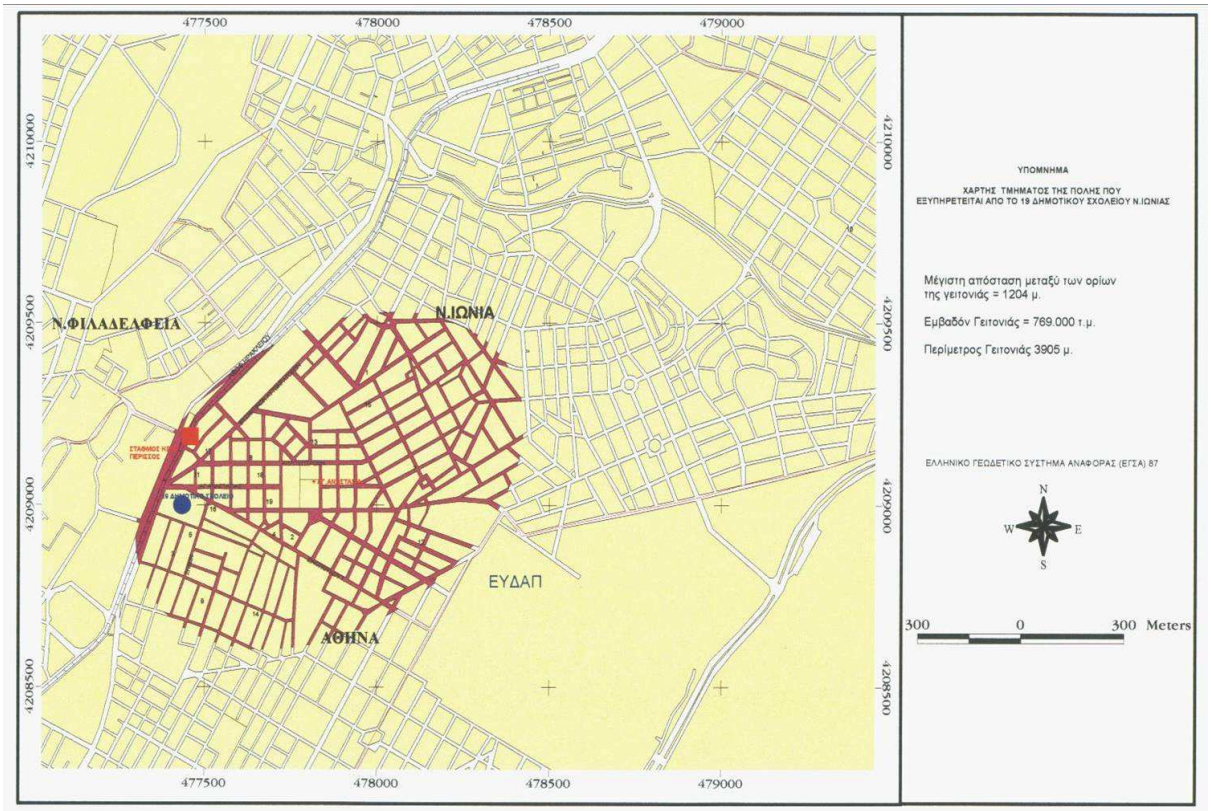
5 REFERENCES

1 Tuan Y., "Topophilia: A study of environmental perception, attitude, and values", ed:Englewod Cliffs, NJ:Prentice-Hall 1974
2 Holahan C. J., & Wandesman A., "The community psychology perspective in environmental psychology", In Stokols D. & Altman I., ed: Handbook of environmental psychology, ed: John Wiley and Sons, V.1, New York, 1987
3 Heller K., Price H., Reinharz S., Riger S., Wandersman A., "Psychology and community change" 2nd ed., Homewood, IL: The Dorsey Press 1984
4 Λαγόπουλος Α., «Εγχειρίδιο πολεοδομίας, μέρος Α: θεωρία πολεοδομίας», εκδ: ΑΠΘ, τόμος 1, Θεσσαλονίκη 1977, σελ. 85
5 Fellin, P., & Litwak, E., "Neighbourhood cohesion under conditions of mobility" American Sociological Review, 28, 3, 1963, p.p.364–376
6 Mann p., "An approach to Urban Sociology", ed: Routledge & Kegan Paul, New York: The Humanities Press, 1979, p.p. 151-160
7 Taub, R.P., "Urban voluntary associations, locality based and externally induced", American Journal of Sociology 83, 2, 1977, p.p. 425-442
8 Haeberle S. H., "People or place:Variations in community leader's subjective definitions of neighborhood" Urban Affair Quarterly, 23, 4, 1998, p.p. 616-634
9 Haney, W. G., & Knowles E. C., "Perception of neighborhoods by city and suburban Residents", Human Ecology 6, 2, 1978, 201-214
10 Anderson, E. "Streetwise: Race, Class, and Change in an Urban Community", ed: University of Chicago Press, Chicago 1990
11 Suttles, G.D., " The Social Construction of Communities" ed: University of Chicago Press, Chicago 1972
12 Downs, R.M., and D. Stea. 1973. "Cognitive Maps and Spatial Behavior: Process and Products", In Image and Environment, ed: Publishing Company, Chicago: Aldine 1973, p.p. 8-26
13 Lynch, K., "Image of the City" ed: The Technology Press—Harvard University Press, Cambridge 1960
14 Grannis R. C., "The importance of trivial streets and residential segregation", American Journal of Sociology, 103, 6, 1998, p.p. 1530-1564

6 MAPS



Map 1: Mitoulas N. “The child’s scale, the school building and the neighbourhood”, Doctorial thesis, N.T.U. Athens 2005



Map 2. Mitoulas N. “The child’s scale, the school building and the neighbourhood”, Doctorial thesis, N.T.U. Athens 2005

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Simulation model for urban development sustainability appraisal

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ABSTRACT

The attainment of sustainable development of urban areas is a major issue for urban planning in these days. However, so far no clear criteria have been established for planning agencies to evaluate the impact of planning regulations and public investment into infrastructure on the sustainability of urban development. Therefore, the goal of the research presented was to create the tool that could help to define and assess ex-antem sustainability of plans for development of an urban territory. The tool can assist the assessment of the development of urban areas based on land-use plans, regulatory plans.

The tool uses model representation of urban environment that reflects the externalities that stem out from various types of land uses and relative accessibility of each site in the represented area. The dynamics of the model is above all influenced by positive and negative externalities from uses in immediate neighbourhood, spatial accessibility of the site, spatial accessibility of the infrastructure, spatial and functional constraints of spatial development declared as by-law regulatives, and transformation cost connected to change from one function to another.

Cellular automata was selected as the best way to represent the spatial influences of various land-uses. Space is represented by two-dimensional grid of cells. Each cell has a certain number of neighbours depending on the defined size of neighbourhood. In the model, each cell represents one type of land-use. The change from one land-use type to another is determined by the transition rule.

1 INTRODUCTION

The assessment of sustainability development has become the common part of urban planning practice. So far there are not explicit and operational criteria that would help the public as well as planning offices to assess ex antem the benefits and costs that the planning concepts brings to the territorial and community development.

The goal of the reseach was to create a model that would enable in advance evaluation of the impact of the planning concepts that are operationalized in the forms of planning documents, prescriptions and regulations on the future quality of the environment. Several requirements result from this goal, the tool should:

- present alternative scenarios of future development in long term horizon;
- enable a user to evaluate the effectiveness of the investment into public infrastructure and the impact of the land-use control;
- adaptible to locally available data and it should be accessible to experts as well as to the public without requiring exessive technical equipment on the part of the user.

The development of the model is currently in the phase of testing but even now it has certain values in understanding the relation and mechanisms that act in urban development.

It appears to be valuable for the conceptualizing of the priciple of sustainable development in individual cases of cities and its practical application in urban planning and decision making of planning offices.

1.1 Background, concepts and functional structure of model

Model is based on the following assumptions:

- Number of active agents acts in territory who, by following own “selfish” aims, change the use of territory. The strategic goal of the individual free agents is to maximise their own utility (“satisfaction”).
- The development value can be menaced by negative impact mutual incompatibility of neighbouring land-use activities, inconvenient or nonexistent access to infrastrucure and unconvenient scale of functional zones and urban tissue.
- Planning has considerable impact on the development of the territory by imposing limits and regulations.

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- The territorial development is influenced by the investment in infrastructure: transport, utilities, facilities and by provision of services.
- Any change of use is conditioned by spending transition costs – demolition, construction, new infrastructures, releasing limits on regulations.

The model intentionally abstracts from the non-spatial economic principles and it focuses explicitly on the effects resulting from the spatial location and functional compatibilities of the cells. Therefore the model cannot be considered a classical economic model that derives the value from the yield from particular use of land.

1.2 Assumptions on the agents

- Activities of an agents are related to concrete areas in the territory represented by units that are called "cells". The satisfaction of agent comes from the particular use of all the cell ant external factors: access to public infrastructures, the character of the surrounding and the number of inhabitants.
- The model assumes that the decision-making of the individual agents is not influenced by the concurrent decisions of other agents, but it is influenced only by their past decisions. In this sense the coordination of the decisions on the level of individual agents does not exist. The mechanisms of the coordination of the individual agents activities are external to them: the land-use spatial limits and regulations resulting from the territorial plan.
- The model follows very simplified assumptions on the homogenous value structure of all agents in the territory. The user of the model can change the values attributted to each factor, but the attributed values will be valid for all cells in the territory.
- Model assumes the logical sequence of the land-use changes. Any new urbanization is contingent on the access to the public infrastructure: technical utilities, transportation and public facilities. When the factors are favourable, the new, more satisfactory land-use will emerge, provided land-use fits the limits and land-use regulations are respected. When the number of inhabitants in newly developed/transformed emmerged areas overpasses a critical level, new commercial facilities serving the inhabitants are supplied.

2 FACTOR OF DEVELOPMENT IN THE MODEL

Localization of uses is determined by the following factors:

- the functional compatibility of adjacent land-uses;
- treshold density factors;
- accessibility of infrastructure;
- limits and land-use and regulations resulting from the territorial plan;
- transition costs from one land-use to another one.

2.1 Factors of the functional compatibility of land-uses

Mutual effects of neighbourhooding cells are modeled by using the "cellular automata". The cellular automata is based on the grid of cells where each cell can have finit number of discreet states. In the case of the model, each cell represents 75 x 75 meters square. Each cell can have one of 37 states that represent particular uses.

The use of each cell is determined by the uses of the neighbourding cells. The 9x9 Moore neighbourhood is used, and each cell has 8 neighbours. Mutual effects of neighbours can be either possitive or negative; the effects can be symmetric or assymetric. For example the negative effect of the industrial use on the residential use is not the same in the opposite direction.

The testing the model so far has demonstrated that the dynamics of the territorial development that is not coordinated up by basic zoning rules tends to form large monofunctional zones of maximum mutual compatibility.

The mutual effects (interactions) of various combinations of neighbouring uses are declared in the form of matrix. The value of each interaction includes all known factors: physical activities, logic relations between the uses, the psychological and social impacts of the uses.

The relation between the land-uses in the model follows the following principles:

- The concentration of mixed uses in central district that is pulled by the agglomeration economy and other effects of spatial economy (for example the advantages of multi-purpose trips).
- Basic services and shops are distributed to provide the inhabitants with a reasonably comfortable access.
- Residential uses benefit from adjacency to green areas and open landscape.
- Mixed uses of central districts are ambivalent to the green areas. On one hand the green areas make the public space attractive, on the other hand green areas occupy valuable space. The model classify them as neutral.
- Various types of green areas in the open landscape are mutually neutral.
- Inside built-up areas, the green areas have clearly defined purpose. For example the green buffers are functionally linked to the transportation infrastructure, industrial areas and areas of utilities. On the other hand, park areas relate to residential zones.
- Spatially separated monofunctional areals diminish the quality of residential zones in their vicinity mainly because they diminish the accessibility and the penetrability of the surrounding area and cause the inconvenient contrast of the grain of uses.
- Monofunctional areals in central districts are pushed out by the zones of mixed uses that benefit from the mutual compatibility and attractivity for the customers;
- Hotel services and offices concentrate a large number of people who in turn generate demand for higher-order services located in the central district. This is not the case of monofunctional hotel and office areals as well as industrial areals.
- Mixed and residential uses are not compatible with the technical utility areas. The reasons are: risk of pollution, degradation of visual aspects of environment and high value of alternative uses.
- Areals, green areas, open public spaces and open landscape are neutral with regards to utility areas except for waste treatment. Forest areas are not compatible with any type of utilities. Industrial land-uses are neutral or positive depending on the type of technical infrastructure.

Other, unlisted interactions are considered to be mutually neutral.

2.2 Threshold density factors

Shops and services require a minimum density level of the customers.

In the case of basic services it is important to secure enough customers in walking distance. The basic services can be located in residential zones without any negative effects on the surroundings. Consequently the use of the cell will change from „pure residential use“ to „general residential“.

The services that service whole area are located in the centre of built-up area. Several services located next to each other form the mixed-use zones of the size that is derived from the total number of inhabitants in the whole territory.

2.3 Factors of infrastructure accessibility

The choice of the optimal use for each cell depends on the location of the cell with regards to public infrastructure:

- public transport hubs of regional importance;
- public transport stops of local importance;
- road network of regional importance;
- ports or airports;
- schools;

- public safety end emergency services;
- barriers, for example the railways, highways, motorways;

Each land-use has specific sensitivity to the accessibility of particular type of infrastructure, therefore the "satisfaction" from infrastructure accessibility depends on the use of the cell.

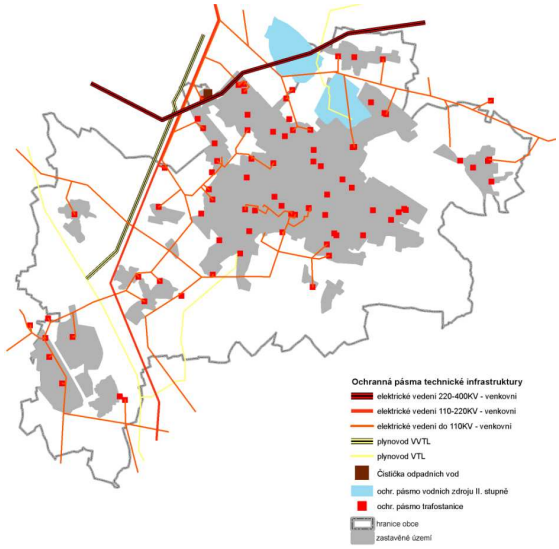
The sensitivities to particular types of infrastructure are modified by general agents' attitudes to the use of natural resourses. The general attitudes are valid for all agents equally regardless to their individual intentions and present activities represented by cell uses.

The attitudes influence the agents' decision-making when they are free to choose between several alternative types of the infrastructure. The model considers the accessibility of the infrastructure outside of the territory as constant for all agents (cells).

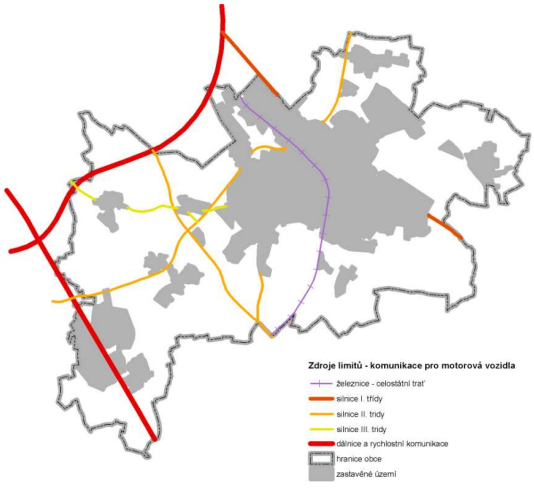
2.4 Factors of limits and plan regulations

Each cell independently decides on its transition from one use to another following the transition costs and agents' preferences. In this way it is possible to simulate the dynamics of changes in territory that is spontaneous, based on many concurrent decisions of independent agents. This kind of change would happen in a situation when there are no external limits or regulations. But the decision-making of individual agents is, as in real life, influenced by limits and regulations. The task of the limits and regulations is to protect the common values and public interest. The model uses 71 legaly binding

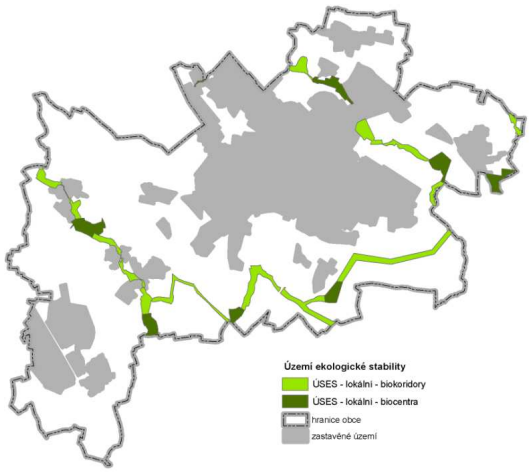
buffers of utilities



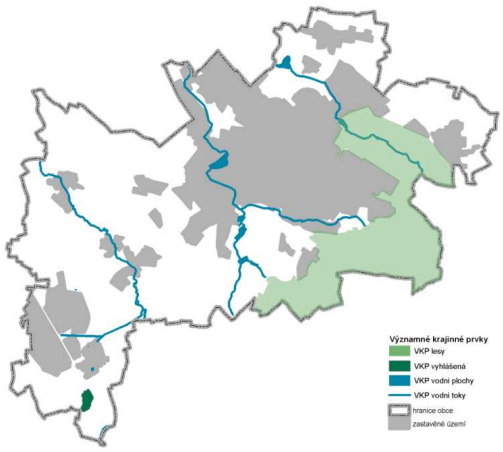
buffers of roads and railways



buffers of general nature protection
buffers of special nature protection

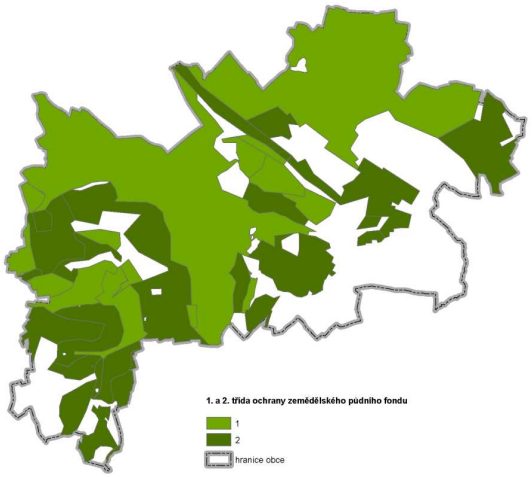


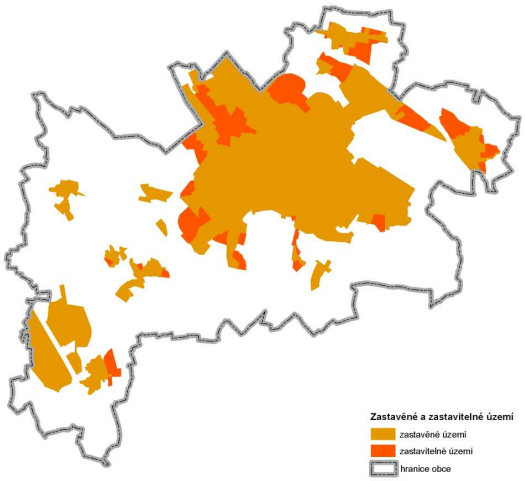
forest zones, protection of underground and surface water.



protection of agricultural land

existing built-up areas and development sites





mining, mineral resources and geology protective zones, natural heritage protection, buffers serving the waste treatment facilities

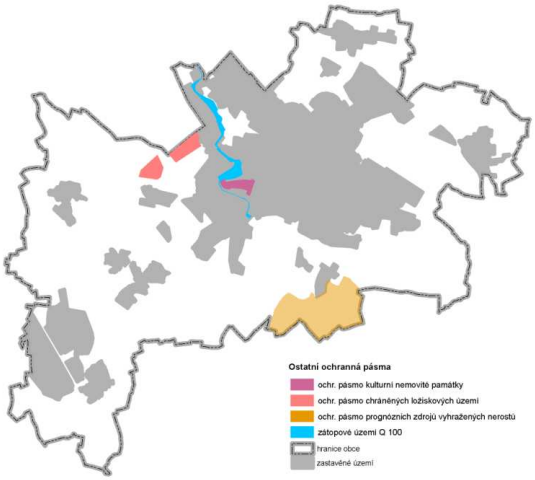


Figure 1: The hierarchical model of the attributes critical for evaluation and choice of living environment

Apart from the limits the model evaluates whether the intended use of the cell is conform to the regulations as they are declared by plan. Unlike the limits, the regulations cover all the territory. Their purpose is to implement the urban concept that fixes the principles of spatial arrangement and control the proportion of land-uses in the territory.

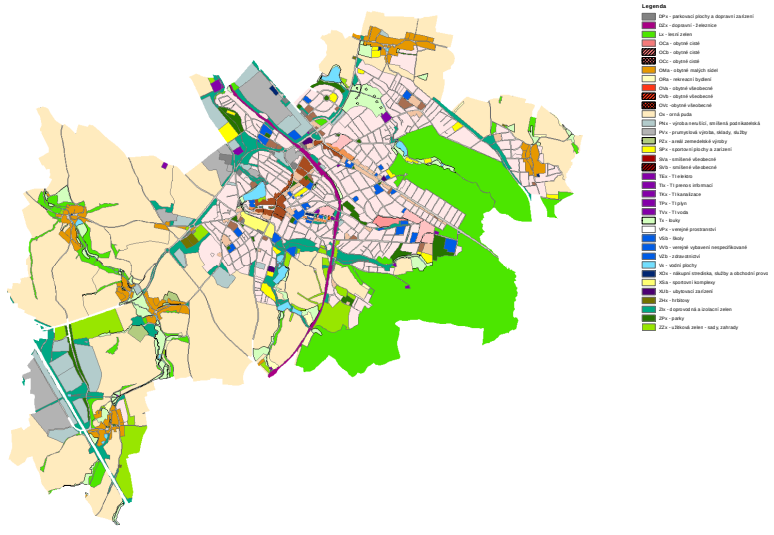


Figure 2: The land-use regulations prescribed by territorial plan

The limits and the planning regulations are the tools the model has to coordinate the spatial aspects of the territorial development from the point of view of public interest. The model enables to confront the decision-making of individual agents with the user-defined limits and regulations. User can by trial and error process of generating and evaluationg the alternative scenarios find the optimum degree of regulation.

2.5 Factors of transformation costs

The transformation costs reflect the original costs use of cells (disposal costs), new infrastructure provision, and new building constructions.

If the intended use of the cell violates one or more of limits or regulations, aditional costs are considered that reflect the risk of building ban or of the time delay caused by administrative procedures connected to limits or regulations change.

3 DECISION-MAKING PROCESS LEADING TO LAND-USE CHANGE IN THE MODEL

The decision on the change of land-use in the territory is performed on two levels: level of single cells and the city-wide level.

Each cell makes its own assessment of costs and benefits and decide on its best use. On the global level only some of cell decisions are going to be realized. On the city-wide level only selected cell decisions will be supported by appropriate infrastructure provision. The amount of the selected changes depends on the resources allocated to infrastructure investment and the flexibility of the planning regulations.

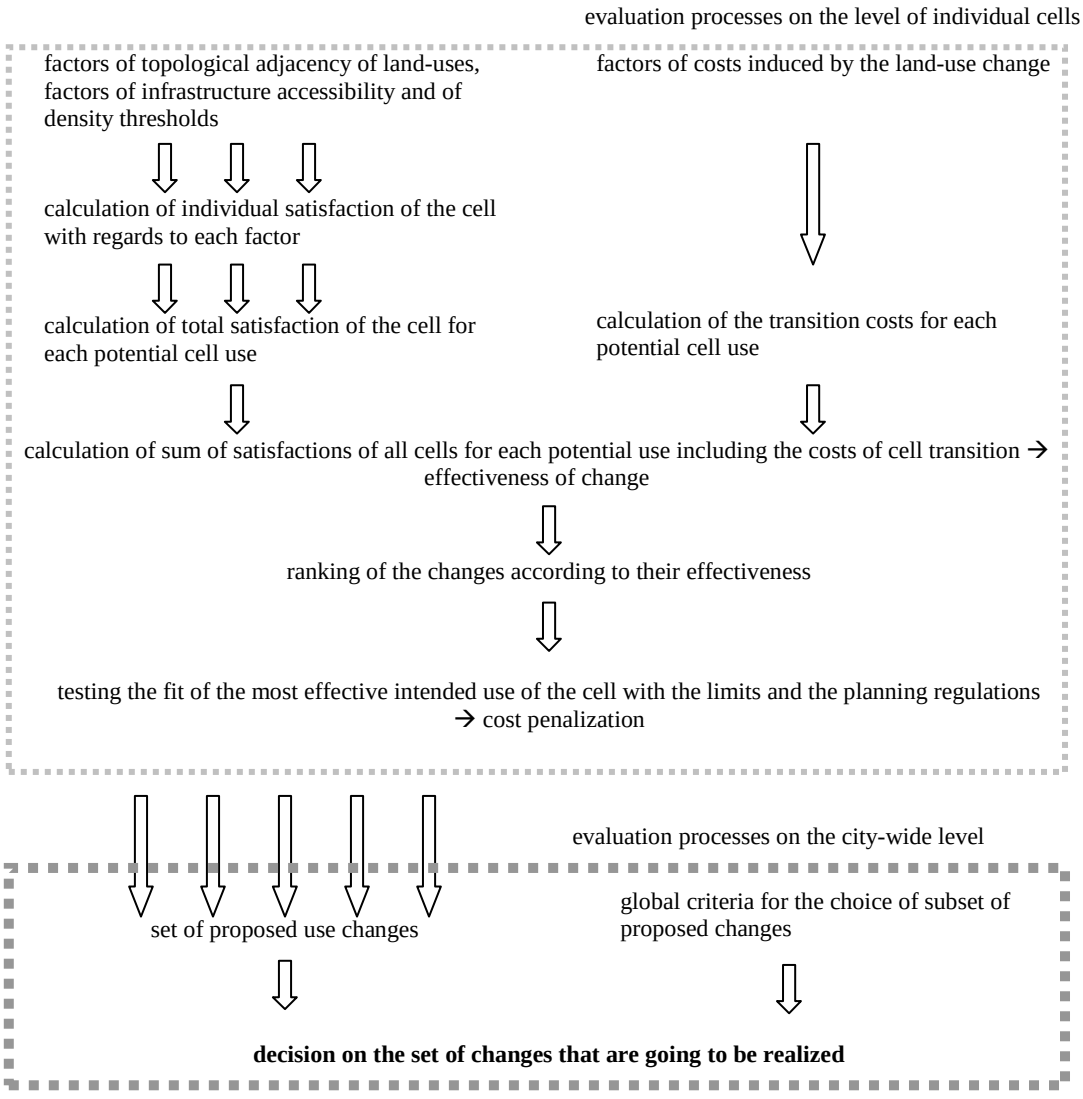


Figure 3: Mechanism of the decision process on the level of single cell and on the level of the whole urban territory

Decision-making on the level of individual cells is based on the assessment made for each potential use of the cell with the aim to identify the best possible use with respect to the maximum individual "satisfaction" and minimum transition cost. The decision-making on the level of individual cell ignores the factors of uncertainty coming from the time of transformation and it also neglects the risks of unexpected change of adjacent cells caused by uncoordinated decision-making on the level of individual cells. At the end of dicision proces on the level of individual cell, the partial evaluations of each factor are combined into over-all "satisfaction" of the cell by means of subjective values attributed to each partial evaluation by user.

On the city level, the proportion of permitted changes of cell uses per a period ("year") is decided by the user. Several criteria for the selection of cell use are possible:

- maximization of total "satisfaction" while ignoring the total costs of change;
- maximization of total "satisfaction" with certain limit of public investment into infrastructure;
- such set of use changes that brings certain minimum amount of "satisfaction" increase compared to all other sets of changes.

4 OUTPUT OF THE MODEL

The user of the model determines the initial state of territory and the factors that will influence the future development of land-use. The output of the model includes the set of scenarios that presents alternative ways of land-use allocation. The scenarios can be confronted with each other on the base of quantitative and qualitative criteria. Visualization makes it possible to judge the spatial configuration of funtional zones, built-up areas, the size and configuration of monofunctional clusters.

Quantitative judgement is posible based on numeric indicators:

- amount of total "satisfaction" change (functional fit);
- amount of "satisfaction" change coming out of total functional fit;
- amount of public expenditures and their impact on the total "satisfaction" (effectivity of public expenditures);
- cost of overcomming the development tresholds of future development;

Based on the outputs presented it is possible to make the assessment of how will the public investment in infrastructure, spatial land-use limits and regulations imapact the dynamics of land-use changes and overall configuration of built-up areas with regards to the open landscape.

5 MODEL VALIDITY LIMITS AND THE QUESTIONS OF MODEL CALIBRATION

The model validity is based on the correspondance of the modelled processes with the real world processes. The model, assuming that the complex processes can be decomposed on several partial processes, assess the validity of each partial process on its own. It is possible to decompose each process on single variables, their states and the transaction rules.

The model clearly separates the decision processes on the level of individual cells from the processes on the city level. Both the processes are based on different assumptions as mentioned above.

Apart from the objective description of the factors (land-uses, limits, planning regulations, transformation costs) the model uses also the subjective information inserted by the authors of the model or the model users. The model keeps the processes transparent and it distinguishes the transactions that are based on descriptive and normative knowledge.

The value criteria, that are implanted into the model correspond to the values of selected groups of experts (expert focus group): in this case the values express the consensus of model authors. It is intended to verify these inserted values by representative sample of respondents.

It is not possible to verify the correspondence of model outputs because the scenarios of future development are just hypothetical. Their realization is only probable as it is based on both known and unknown factors. At this moment it is hard to assess the predictive power of the model, in future the historical data can be used for the assessment of predictive power of the model.

The calibration method follows the division of the processes. The calibration is made on the level of partial processes first. It is much easier to verify the correspondence of the model performance to clearly defined characteristics of the environment than to analyse the reasons of discordance of the model behaviour including all factors at once. The partial processes are mostly calibrated by the authors of the model (for example the interactions among the adjacents cells), the synthesis of partial processes into complete model is left to the user of the model.

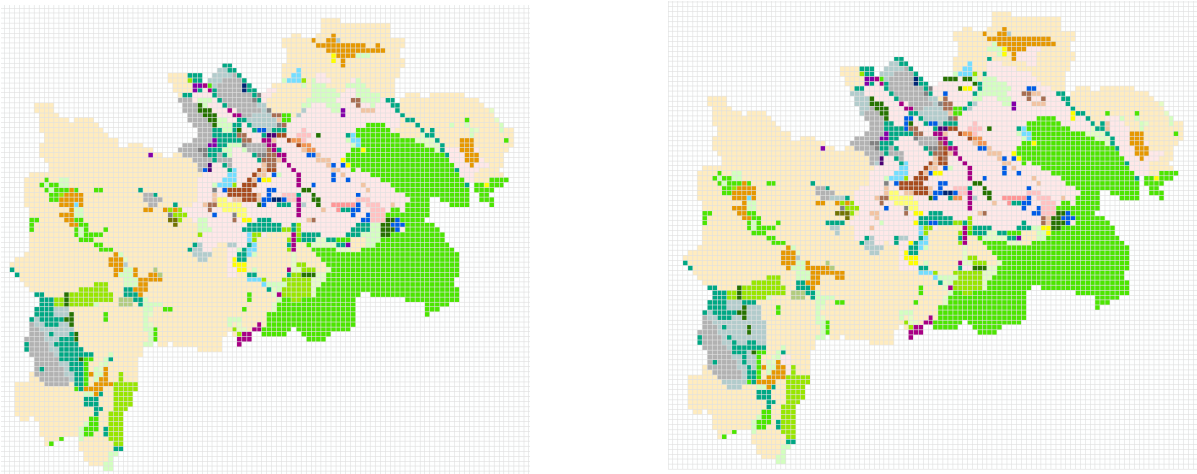


Figure 4: The example of the land-use development limited by planning regulations

6 THE USE OF THE MODEL

The simulation model can be used in the domains of education, research, urban planning and management.

In the case of education the model can illustrate the influence of each factor on the future use of territory.

In the field of research the model can serve as standard gauge for comparison of several territories to make general conclusions on the hypothesis validity. The model can be used for the inquiry of factors that are critical for the expansion of built-up areas, the verification of the effectivity of the planning regulations for the attainment of sustainable development of the territory or the effectivity of public investment into the infrastructure.

In practice of urban planning the simulation model offers the planners to test the impact of alternative urban concepts on the development of the territory. The software application of the model offers high accessibility and interactivity that is suitable for presenting of impacts of alternative urban concepts to public in public hearings.

A user can set the external factors at the start of the running of the model or in the course of the model performance. The user of the tool can control the rate of importance for each of the external factors.

The model was developed for simulation of urban development dynamics on local scale (urban municipality). To callibrate and demonstrate the model performance, the case of a suburban city Říčany next to Prague was used; other case studies are planned to be made.

7 TECHNICAL ASPECTS OF SIMULATION MODEL APPLICATION

From the technical point of view the model is web application. The processes are distributed between the server and clients. Majority of model functionalities are located on the server side so that the clients' side could be as simple as possible. The best reason for this arrangement is that the model will be continuously calibrated and upgraded by the authors. The advantage is that clients do not need any installations on their part.

The server and web application will be further developed and maintained by the teem of authors grouped in the Spatial Planning Lab (SPL) of the Faculty of Architecture ČVUT in Prague. The Lab will provide the users with technical and methodical support. Several web-based user interfaces will enable the distant access to the model. There will be special user interfaces created for authorities and other, simplier user interface for the public.

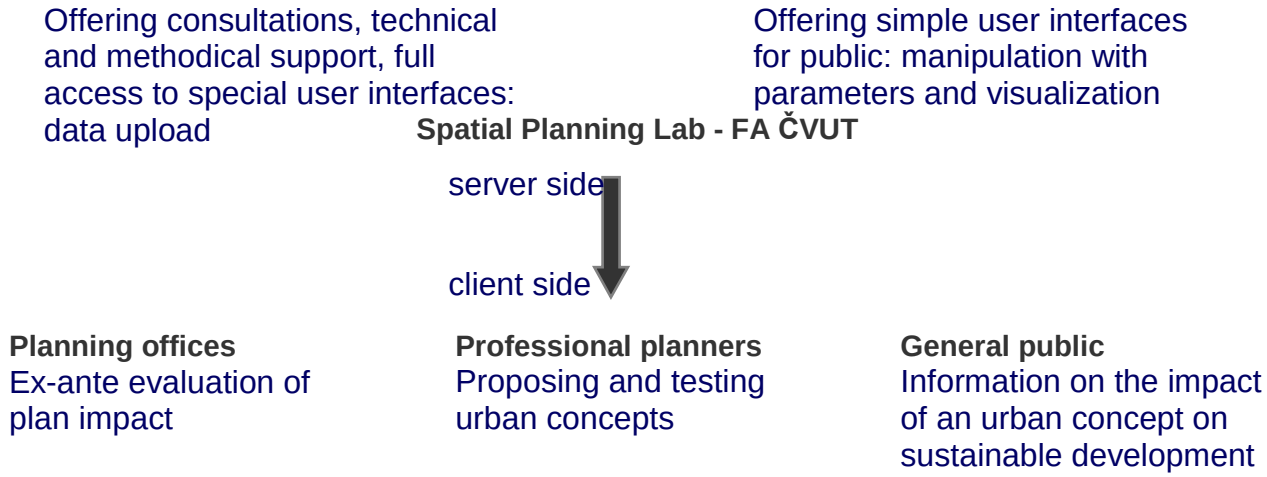


Figure 5: The functional arrangement of the application of the simulation model

8 REFERENCES

Maier K., Vorel J., Jankových V., Vorel O.: Využití informačních technologií pro hodnocení kvality prostředí a participaci uživatelů (Use of ICT for environmental quality assessment and users' participation) in "Proměny architektury a urbanismu": FA ČVUT v Praze: ISBN 80-01-03528X

Maier K., Čtyroký J., Vorel J., Drda F.: Udržitelný rozvoj měst a regionů (Sustainable development of cities and regions) in "Proměny architektury a urbanismu": FA ČVUT v Praze: ISBN 80-01-03528X

Vorel J.: Learning the public preferences for habitat environment: the use of Conjoint analysis. In: Advanced Engineering Design, June 2006, Prague: ISBN 80-86059-44-8

Beran V., Dlask P.: Management urdržitelného rozvoje regionů, sídel a obcí (Management of sustainable development of regions, cities and towns): Academia: ISBN 80-200-1201-X

Maier K.: Hospodaření a rozvoj českých měst (Management and development of Czech towns) Academia Praha, 2005: ISBN 80-200-1245-1

Local land use plan on web site or information about land use? Examples from Poland.

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1 ABSTRACT

Polish law lays local government under an obligation to publish land-use plan on the Internet.

In case of most municipalities, execution of this record boil down to place text plan only without map which is required by law. However, there is a problem of text part and graphic part integrity, which many municipalities solves publishing graphic appendix to plan in the form of graphic files

Face to expectations of investors and citizens, municipalities propose another publication start to offer different forms of publishing land-use plan on their website as well creating 'interactive services' on which they publish only land-use plans. The assumption of such services is maximum simplification of form of land-use plan presentation. Services, which don't make it possible

Services doesn't make it's possible to any composition of spatial information (eg, cadastral information, ortophoto, conservation areas) stops to perform an information function and often become an interpretation of land use plans making by authors of those services.

Can we say about local law in this situation or only about general information from the scope of land use? Authors answer the question: in which way local land-use plan in Poland should evolve so that new-created interactive services show full legal state that is in force in the field of land use.

2 LOCAL PUBLIC INFORMATION ON WEB SITE

Law about access to public information obliges municipalities to own their websites within the framework of Bulletin of Public Information (polish: Biuletyn Informacji Publicznej – BIP). BIP is the unified system of websites of public institutions created to improve common access to public information. Websites of particular public institutions are created according to defined schema with similar structure, what in assumption should lead to easiness of use such websites (both external users and administrators). According to decree of Minister of Interior and Administrator (18.01.2007) on the BIP websites of municipalities are published: entity information (address, phones, authorities, councilors etc.) and objective information (history, environment, land-use planning, tourism etc.) In the part destined to local law or land development should be published land-use plans. In practice BIP websites of many municipalities are maintain of necessity, because huge part of majority of information is available through much more attractive promotional-informational website of municipality. From user point of view obligation of possess BIP website in a high degree raises a availability of information and In case of many municipalities were a ovule of publishing any information in the Internet.

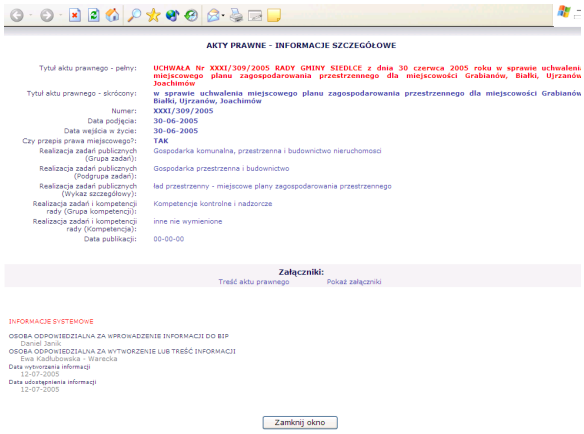
Podkowa Leśna example of BIP web site.

2.1 Land-use plans on the internet

Standardized form of BIP websites was one of the assumptions of BIP but as practice shows websites differs from each other in arrangement and information, which intuitively should be in one section is reality is in another. Typical example could be information about land development. Most often in this section we can find a guide "how to deal with issue" and who is the principal of department in municipality office whereas

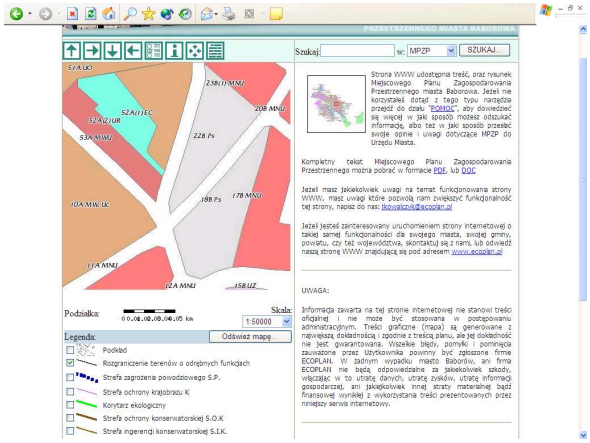
land-use plans are presented in following sections: “resolutions of municipality council”, “local law”, “architecture and housing”, “economy” and at last “land development”.

Most of municipalities (61%) realize their obligation of publishing land-use plans brings to insert on website only a text of resolution without graphical annex. The issue of integrity text part of land-use plan with graphical one many municipalities (18%) solve inserting a drawing of plan in form of PDF or JPEG files. Apart from legible, excellent-quality drawings we can find low-quality files (in low resolution, grey-scale) which do not have high usable value. In result of such a state of affairs it is almost impossible to use land use plan published in that way by a person who is seeking précised information. Particularly, when we consider difficulty with finding specific information on the websites.



Siedlce comunity a text of resolution without graphical annex.

Face to expectations of investors and citizens, much and much often municipalities starts to propose other forms of publication of land-use plans on their websites – they built so-called interactive services.



City of Baborów on-line spatial plan

The idea of publicize of land-use plans is right, particularly when it takes on an attractive graphic form, but content and function of such services is essential.

It is rarely possible to publish drawing of plan without a substantive waste form the document when land-use plans is presented in the Internet, in form different from static graphic file.

A decree of Minister of Infrastructure, that regulates a scope of land-use plan project, specify a content of this study (including a drawing). Drawing of land-use plan should contain:

- Outline from the study of local conditions affecting local planning and perspectives for spatial development with the boundary of area to cover with and-use plan.
- Scale of drawing in form of text and scale bar.
- Boundary of area to cover with land-use plan and administrative boundaries.
- Boundaries of closed areas and boundaries of their protective zones.

- Boundaries and signs of objects and areas, that are protect because of other regulations (including mining areas, flood and landslide areas).
- Lines which demarcate areas of different use or of different rules of development and their signs.
- Building lines and signs of components of land development
- When needed signs of information components, that are not arrangements of land-use plan project.

Law orders to make land-use plan on ground of base map. It is not only formal rule, because information included on the base map essentially affects on information content of land-use plan. Whereas municipalities intentionally resign from placing some information, because they want to simplify interactive service, what affects on its clarity.

Law about land-use planning and development, that at present regulates rules of spatial management in Poland was adopted by polish parliament in 2003. This law stirred up controversies (and stir up to now) because solutions, that was proposed significantly differed from practice. Controversies focuses on influence of this act of low on impedance of building development, what impresses on lower GDB growth rate.

According to earlier solutions in polish law, only local municipality can decide on way of land management by creating land-use plans. Land-use plans regulates land-use zoning category and settle a rules of development. It is a local law, which affects on value of real estate and investment activity on the area of municipality. Scope of land-use plan is similar to solutions applicable in other European countries, which one can call “Detailed spatial plan documents. Land-use planes, in conformity with spirit of law, are made for built-up areas or areas indicated to build in scale 1:1000. Text part of land-use plan must contain:

- Land use zoning category, including parameters and indicators of land development
- Rules of protection and formation of spatial order
- Rules of nature conservation and protection of cultural landscape
- Rules of protection of cultural heritage, listed sites and contemporary cultural assets
- Demands resulting from needs of public places creation
- Rules and conditions of integration and division of land properties
- Rules of transport and technical infrastructure modernization, development and construction

This is not always possible to visualize all of solutions on the land-use plan drawing because of a detailed approach to issues that are regulated by land-use plan. Text part of land-use plan constitutes a content of commune council resolution and a drawing is its inseparable part. The drawing is a annex to a resolution. A legislator does not let to function of digital form of land-use plan in administrative procedure in any shape (data base or graphic file). Simultaneously traditional (paper) forms of land-use plans causes that its structure is difficult or sometimes almost impossible to present in the Internet in the form of interactive service – service that present full information about an area identified on the map. As practice shows most land-use plans designations are dispersed in different chapters of document and the union of them in one place is impossible.

Problem of law-making by self governments In the field of spatial management, that was outlined above, faces barriers such as:

- Lack of base maps In scale 1:1000 for all developed and indicated to develop areas.
- Dispersed investment activity outside areas of big agglomerations.
- Creation substitute tools by law, witch enable to get building permission, with lack of land - use plan even against to spatial politics of municipality.
- Local government habits of having land – use plans on whole manage area.

Simultaneously insufficient system of spatial development monitoring doesn’t supply precision data about real cover and requirement on land – use plans analysis. Researches of different institutes estimate that nowadays 15-31% developed area and advisable for development have worked out land – use plans.

In spatial management system after 2003 run out abilities for local government to elaborate a document witch will be have character of land – use plan for whole administrative area witch will be decide in less detailed way about area destination and will have law power.

That document would dissolve all problems concerns spatial management on rural area and as frequently practice shows – in little towns. It's estimates that that character of land – use paln will be sufficient for 84-88% area of Poland.

2.2 Interactive system of presentation land – use plans of Lesznowola municipality (IS)

In 2006 Lesznowola municipality (Piaseczno district) makes accessible on it's web site an Interactive System Of Presentation Land – Use Plans. Inhabitants and investors using the web portal of commune office can acquaint oneself with contents of land – use plans in digital form – text and graphical part.

Lesznowola municipality is located in one of the most effective economical and social developed area. It puts directly into spatial planning. Nowadays 97% of municipality area in covered by land – use plans. In sum after 1994 adopted 50 plans. It is undertake successive resolutions about accession to work out land – use plans.

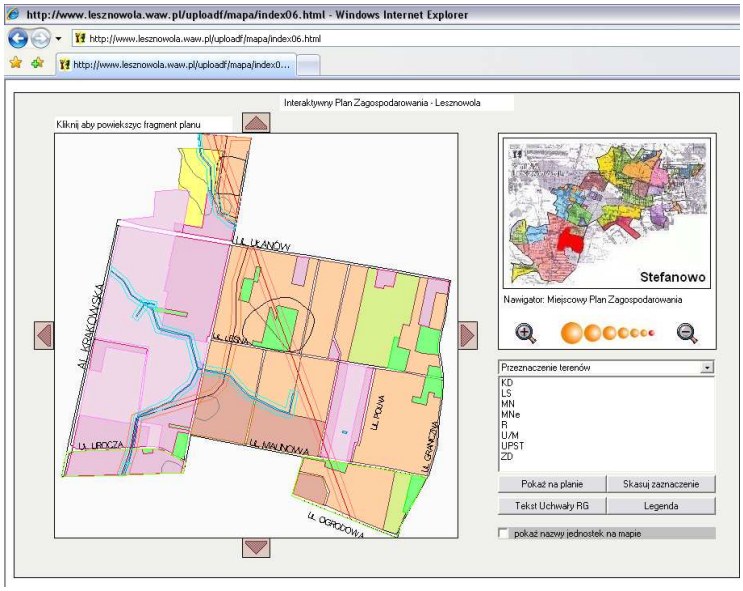
An Interactive system of presentation land – Use plans assume assistance for officials and inhabitants managing with complicated local government law in destination and use of area.

- Obligatory land – use plans of Lesznowola municipality:
- Adopted in 1999 – 2006 under previous law of spatial planning or present law.
- Makes up in scale 1:1000 or 1:2000
- It was worked out by different teams, so that's why for that same category of areas located close to each other but on different plans it is offen suggest to making different spatial solutions.
- Used different, of fen authorial signatures on land – use plan drawing.
- It takes into account directions for land – use plans with documents from different periods on regional and national level.

That system in it's assumption emphasize on graphical side of land – use plan – first of all user look at picture of the plan, then can acquaint oneself with text part. It is useful in addition to another manners of land – use plans representation on polish web sites – for finding a plan of concrete area it isn't necessary knowledge a number a resolution Commune Council, witch in practice it isn't essential.

In IS land – use plan drawing was deprived many, often essential for making decisions settlements or informations, which can very seriously reduce of land usage. There isn't marked e.g. water intakes security zones, conservator security zones, borders of areas under protection of Nature Protection Law, archeological positions and others. It also doesn't placed maps on witch was created land – use plans. Land – use plan drawing was bring to one information layer – land usage.

From point of user view the service has been simplified by elimination many functions. It has also influenced on speed of system functionality. However from law point of view it isn't a land – use drawing anymore, but just it's authorial conception. User isn't informed about it on the main web site of the service.



Example of land – use plans of Lesznowola municipality

Penetrating analyze presentating solutions show many errors:

- Topological errors, in a few examples land – use plans adjoined to each other have the same parts.
- Unproper land use symbols. In few land – use plans on the drawind (and in legend) there appers symbols of zones which aren't mentioned by right resolution. It means that they haven't got authorisation by law and what is the most important they confused users.
- Lack of possibilities in presentation few land – use plans, which doesn't makes easier to compare land usage in nearby areas located behind working out plan.
- Lack of tools for finding concrete informations.
- Lack of update. After some time, it will be completely unuseable. Validity of system of Lesznowola municipality is march 2006. From that moment there was adopted few land – use plans more. Quality of data of IS has been verificated, it turns out that data doesn't fulfils main standards, witch has to characterized by:

Using data without quality standards not only unable reuse it in other projects but also seriously limit functionality of service. For example, it isn't possible to simultaneity view two neighboring plans, to get area information or especially to make a spatial analysis eg. investment capacity.

High award of Minister of Interior and Administration for Implementation of Interactive System of Presentation of Land-use Plans shows that problem of spatial management through several dozen land-use plans in one municipality is extremely troublesome. The chaos is growing with every new adopted land-use plan or with change of land-use plan that is currently in force. Municipalities are in urgent necessity of order information about managed space. But, as described example shows solutions that are not georeferenced. In this case simplicity has dominated over union of visualization and high degree of professionalism of this interactive service. Professional interactive service should be based on proved standards of geodata.

3 CONCLUSION

The most often advanced webservices of land-use plan presentations are based on Geographical Information Systems (GIS), that combines map with database. Thanks to using GIS it is possible to introduce into service advanced functionality (like searching and query database etc.) that are available for end-user from a browser.

Taking needs of different user's group and issues connected with such services maintain into consideration it should be consider to use alternative products. These must involves amount of latour and costs.

Good 'interactive service' characterize flexibility and multi-purpose in supply information. It should be on solid ground in the form of data layers and relational database management systems. It make possible

management gathering resources will be much effectively but edition, update and topology control will be relatively easy.

It is important that data made to needs of publishing land-use plans could serve other purposes. Data should comply with conditions which decide about accuracy and resources. Law in force provide for such requirements e.g. to define metadata (data about data) through ISO 19115.

In the Word and also in Poland there is variety of solutions In the field of publishing information about land-use In the Internet. There is a tendency to publish 'interactive' local land use plans providing complete information about land use abilities. The most important is not only land use but also information about barrier in investment. These information are most often part of big service which gather any spatial data about city or municipal, which in any way can be compared. Local governments apply methods, which enable to simplify management of huge amount of information and using attractive form of presentation.

There isn't a website service giving information about land use plans which could substitute for visiting in township administration. It is mainly due to difficulty in creating such plan which would allow easy and full join contents of drawing to plan designations (general and detailed). It resulting from stiff and statutory regulation of form land use plan. Therefore, it is important to place a clause in a website service that constitute: "Information presented on this website is not a law in formal understood and it cannot be use in administrative procedure. Graphical contents (map) are generated according to land-use plan designations, but its accuracy is not guaranteed. On no account the municipality is not responsible for any harms, including loss of data, profits, economic information and any other material or financial loss, resulting from use of content, that is presented in this Internet service".

Is it consequently possible to work out a land use plan in such form that it could be published on website and there wouldn't be a risk resulting from incomplete and selective information about rules of development? In some municipal practice preparing land use plan in the form of 'terrain card' is optimal solution. Such form of textual component of a land use plan requires multiple repetitions of significant fragments of text. In result, land use plan for small area with complicated spatial structure can numbered 1000 pages.

4 BIBLIOGRAPHY

FOGEL, P., FISZCZUK WIKTOROWICZ, J.: Jak zamawiać opracowania i usługi planistyczne z uwzględnieniem technik komputerowych, Człowiek i Środowisko 1-2/2004, 2004

🏆 *reviewed paper*

Improve public participation in planning processes by using web-based 3D-models for communication platforms

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1 INTRODUCTION

Since people settle in cities, urban areas are always undergoing changes caused by redevelopment, refurbishment and new development. The diversification includes single buildings as well as whole districts. The changes of the urban pattern were growing in time and space over the last decades which means that the urban pattern is transformed often in short periods – considering the life-cycle of real estate. Those alterations of urban areas have great influences onto the people living and working in these areas. For not only the physical environment is changing but also social, ecological and economical alterations will often follow the transformation of urban areas. E.g. the market value will rise which causes diversification in the social composition of the residents, environmental influences will undergo changes like the dissemination of pollution will alter as well as fresh air systems, solar radiation etc.

Due to the multiple influences of urban development onto the residents, public participation (PP) should become an essential part of the planning process. Also, on this account the EU is strengthening public participation and e-democracy by pushing forward the offers in these sectors in its member states, just because “to plan is not enough”. Yet, public participation is not as easy as it sounds like. Effective participation is based on well informed public, whereas lots of non-professionals find it hard to understand the content of plans and therefore have difficulties to see which consequences might be caused by the offered planning alternatives. To improve communication, co-operation and particularly participation, new “planning” tools have to be developed and used in the planning process.

The paper discusses the use of 3D-visualisation to improve the understanding of planning contents and explains how web-based participation platforms might improve public participation in planning processes. The possible use of online participation tools will be explained by describing the EU VEPs project and the web-based 3D participation tool which has been developed for the case study urban redevelopment of the Rosensteinviertel in Stuttgart during the project, respectively which is still under development. Further the special function of a Web 3D Service (W3DS) is discussed regarding online participation systems using 3D-models.

2 HOW TO IMPROVE PUBLIC PARTICIPATION

In most countries of NWE (North West Europe) public participation already is an inherent part of the planning process. Yet, the currently used participation instruments do not at all tap the full potential of modern technologies to support innovative and effective participation methods. Considering the new media sector, a wide range of new possibilities are available to be used in variant ways. Further, most of the participation taking place because it is legally demanded. E.g. in Germany, participation is legally regulated by the “Baugesetzbuch” (German Building Law) and has to take place concerning so-called formal planning processes like Bauleitplanung (land use plans). However, in a lot of cases it makes more sense to participate the public in a very early stage of the planning (“informal planning process, e.g. urban development planning) to get best planning results and highest acceptance of the planning. For these kind of participation the common instruments like workshops, open councils etc. might well be supplemented by tools using the wide range of possibilities of the ICT (Information and Communication Technologies).

Yet, participation should not only be used for legitimisation of and improving the acceptance for the planning projects. Taking the expertise of the residents into account, planning and decision making processes will win quality as well as transparency (cf. Märker, O., 2006). In practice, a new procedure can be seen: online moderated actions. Online moderated actions try to use the variety of knowledge by enabling many

participants to speak out on a defined issue within a time stated. Moderators will coach the process supported by intuitive elements.

It is obvious that the meaning of e-participation is not only to digitalize existing planning and decision making processes but looks for innovative participation possibilities using internet-based information and communication technologies (ICT). E-participation for the public considers those aspects of public participation which enable an active attendance of discourse and decision processes via the internet. On one hand this asks for a broad information offer. Based on the information offerings, instruments on the other hand are necessary to enable active participation (e.g. web forms, fora, chats). Last but not least, the public will turn away from such offerings if the kind of influence of how the participation results are used in the development of the projects is not shown clearly and transparent (cf. Bräuer, M., Biewendt, T., 2005). The user must be able to see what happens with the results of the participation and how the online participation is integrated into the planning or development process.

2.1 ICT to improve information, communication and participation

Information, communication and co-operation are the basics of effective and transparent public participation. Strengthened by demands of the EU to enhance e-democracy and e-participation (cf. Öffentlichkeitsbeteiligungsrichtlinie [Richtlinie2003/35/EG], 2003 and Plan-UP-Richtlinie [2001/42/EG], 2001), new media offers a lot of possibilities to supplement the common participation instruments.

Using GIS and CAD data to generate 3D-urban-models, will utilize already existing planning data in a new way. 3D-visualistion of existing and planned structures will help non-professionals to better understand planning contents and the consequences caused by planning alternatives (improve information level of users). People might be able to evaluate and rate the planning much better as they were able to do by only having 2D maps and reports written by experts. Offering 3D-visualisation via internet, the range of residents achieved by participation measures might grow and also reach people who were not participating before (widen the group of approached people).

Using the internet enables the public to participate independently of time and space. Therefore, the information offered via websites has to be unambiguous, detailed and easy to understand. Reports and common 2D maps can be supplemented by 3D models, which may help to understand clearly the statement of planning proposals.

2.1.1 Potentials of ICT for public participation

The internet is no longer an exotic space. Close to 70 % of the German population is already“online” (cf.. (n)onliner Atlas, 2006), which means that the internet became an article of daily use. For “below thirties”, the internet is normality but also the number of onliners in age-group of 50+ is growing steadily:

Alter	2001	2002	2003	2004	2005	2006
14 – 29	63,4%	69,9%	77,2%	80,2%	82,8%	86,5%
30 – 49	48,0%	54,7%	66,3%	68,2%	71,2%	74,1%
50 +	15,6%	18,3%	25,0%	28,2%	30,5%	33,7%

Graph 1: use of the Internet according to age-groups (cf. (n)onliner Atlas 2006)

People use the internet for online banking, to search for job offers or a new partner, for information and communication (news, emails), to book holidays, to shop onlone, etc. The internet is not longer an alien instrument. To many, the use of the web is as naturally as reading newspapers or listening to the radio. Therefore, e-participation is timely and, considering the above listed circumstances, it is appropriate to allow residents to participate in planning processes online. (cf. Bräuer, M., Biewendt, T., 2005)

One of the biggest advantages offered by eParticipation is the independence of space and time: the user is free to choose, when and where he will join the project to get himself informed, and to participate in the process. This aspect could widen the range of people already participating in planning processes, because also those people can get involved who, until now, did not have the opportunity to, due to handicaps,

inconvenient working times, personal timidity, etc. The internet is available 24 hours a day, 365 days a year. Therefore, information can be offered, discussion can take place, and participation is possible, regardless of any office hours. It is also a chance to involve groups which may not be reached with traditional participation methods but are typical internet users, like e.g. young people. Get more resp. other people involved will also enhance the input of knowledge. Legal authorities will profit from getting input from different stakeholders and a wide variety of user groups. Planning will not longer be a process of making proposals and let them discuss by the public, but could benefit from the wide range of public knowledge, which could now easily be used to improve planning and decision making processes (cf. Bräuer, M., Biewendt, T. 2005).

Another point is the possibility of interactive communication, also, or even with high number of participation. Participants are able to link their comments interactively and time lapsed (asynchrony), different from face-to-face discussion (synchrony) where the comments are directly linked to the earlier statement.

The internet allows representing continuously profound information of all relevant planning data which is accessible to whoever is interested in. But not only common information, like textual and map based input, might be offered via internet. One of the big potentials of the web is the interactivity and the special visualisation possibilities. People can look at planning proposals in a 3- dimensional way, walk through 3D-urban-models and change the view-points as they prefer. Videos and panorama images are further features to make information and participation more interesting and understandable. New visualisation technologies (e.g. Google Earth) and discussion structures may help to improve participation and simplify understanding of development contents for non-professional people.

The internet as a networking instrument could help to improve the communication in participation processes: one-way-communication (download, newsletter, and mailing) is possible as well as two-way (e-mail, online forms, e-voting, chat) and multi-way-communication (collective city and residents' server, internet conference, online mediation, online working, discussion forum). This is a very important aspect by developing participation as co-operation between partners, not only as top-down involvement of local authorities.

Another important issue is the improvement of transparency in planning and participation processes which might come with ePlanning and eParticipation. But there is also the risk of anonymity and quasi-participation. Using the web for participation demands a careful handling of data and input of the participants. Contact persons have to be announced and fast feed-back provided. Also the use of the engagement and the influence of the planning process have to be defined clearly. Results have to be displayed and timelines have to be named. Anyway, if online participation is handled carefully and earnestly, the planning and participation process will become much more transparent. (cf. Märker 2007; Sinning, Selle, Pflüger 2003)

2.1.2 Potentials of online 3D-visualisation

As already mentioned in 2.1.1, the ICT offer a big potential regarding visualisation technologies. Information about space does not longer have to be 2-dimensional. With the upcoming possibilities of using 3D-data online, 3D-urban and terrestrial models could play an important issue in future online content. As Google Earth is demonstrating, 3D-urban-models improve the understanding of the space. Orientation is much easier because the user is able to identify landmarks in 3D – like he is used to do in reality, too.

Due to technical process in data capturing and computer graphics, more and more cities are interested in building up 3D-urban-models, in Germany and other European countries. But still most 3D-models are not available online, even if a lot of cities already possess 3D-data. Usually, the models are used for internal planning processes. With the upcoming popularity of Google Earth, the interest in using 3D-models online grew enourmesly and some cities already started to integrate their models into Google Earth to make them available for the public (e.g. Hamburg, Berlin and Bamberg). However, although the use of 3D-models for public participation offers an improvement of consulation, only very few models are used for this purpose.

Some of the currently existing 3D-urban-models are used in the Google Earth interface. At the beginning of VEPs, we did some test with Google Earth interface and 3D-visualisations. On of the restricitons we had to deal with, is that the buildings are not identifiable which means that a lot of interaction/information is not possible (such as GIS-requests, etc.). That was one of the reasons to decide to develop an own inerface for

the 3D participation tool we had in mind. Google SketchUp also offers a lot of possibilities to enable residents modelling their own buildings. On of the prototypes of VEPs (Master Planner, developed by University of the West of England) is dealing with some of those aspects and will offer a tool for online planning.

The fact of existing 3D-data as well as the missing use of 3D-models for participation have been key aspects for the development of OPPA 3D (Online Public Participation 3D) inside the VEPs project, which are presented below (see 2.2). The aim of the VEPs project is to fill this gap and provide a framework for creating internet-based public participation websites, combining 3D-urban and landscape models with Web 2.0 communication and discussion tools.

Using 3D data, public participation can become much more communicating and interesting: a lot of people still have difficulties to understand the content of planning proposals in 2D, even if they get all necessary information about the proposal. But using 3D to display the existing environment as well as the planning proposals will enable people really to understand the changes in the surrounding which might be caused by a distinguished development. The ability to move through the model interactively will allow the user to see all views of the design not only the preferred aspect of the planners/developers shown as a perspective rendering.

Another important issue for OPPA 3D was the linkage of spatial information to the commenting functionalities. The user will be allowed to set comments either in the commenting platform or directly in the 3D model. Statements of participants will become much clearer in their expression because they exist as visualisation and as written comment.

2.2 OPPA 3D – Online 3D Public Participation tool for Rosenstein area

2.2.1 The EU VEPs Project

The VEPs project aims to improve the knowledge base on the potential of Information and Communication Technologies (ICT) for territorial development in the North West European (NWE) region, specifically on the use of ICT for ePlanning, consultation and communication of citizens' views on planning issues.

The EU VEPs project is funded by InterReg IIIB and is an international project with participating members of UK, France and Germany. VEPs means Virtual Environmental Planning systems and develops a range of 3D visualisation tools used via internet to improve public consultation. VEPs will enable the user not only to download or view 2D-maps and images, but get a real impression of how the planning proposal will change the environment by having the opportunity to move around in the 3D model, to compare proposals and to comment on specific views.The integration of environmental simulations as noise and flooding should give citizens a better knowledge of the environmental impact of the proposed development. Simulations shall people help to view, comment on and understand the environmental issues associated to proposed planning developments, and help them to participate more fully in the planning process.

The state of the art in eParticipation is presently mostly limited on distributing static information to the citizens via the Internet, and sending and receiving (citizen's) comments online. VEPs aims to improve interactivity by trying to integrate interactive 3D-visualisation, to improve the understanding of planning decisions and consequences. Therefore, existing and already used tools, technologies and data shall be used (e.g. 3D city models, digital terrain models, etc.). VEPs will allow a two-way, resp. multi-way consultation process. The stage, at which citizens may view and respond to planned changes, can either be at the Master Plan stage or at a development proposal stage. If 3D-visualisation may (interactively) be used via internet, mutual understanding of planning contents may be improved by exploring what-if scenarios (cf. http://veps3d.org/site/54.asp).

VEPs, therefore, is a step towards an alternative approach to planning consultation. An interactive 3D-visualisation of planning contents allows the viewer to experience highly complex information without the need for training, because they can see the impacts of a planning development and visual as well as environmental consequences in an easily comprehensible format.

2.2.2 OPPA 3D (Online Public Participation 3D)

Stuttgart University of Applied Sciences is working on the 3D Public Participation Tool. This tool consists of a 3D-model, a participation platform and a 2D map, all communicating with each other. Ongoing from the

current prototype, further functions shall be implemented into OPPA 3D until the end of the project, such like comparing planning alternatives, requesting some kind of GIS data, gazetteer service, etc. The 3D public participation tool will be tested in further workshops to improve usability and functionality. For the testing, various user groups shall be addressed to use and rate the tool (professionals, semi-professionals, non-professionals).

Inside the VEPs project, different scenarios have been chosen by the partners. The Stuttgart scenario is the urban redevelopment of the Rosensteinviertel, an urban district located in the city center. In the event of a big urban development project (Stuttgart 21), new areas will be developed, new structures in the existing area will come into being and the transport system will be changed. The Rosenstein scenario was chosen to be the pilot project of VEPs. It was used to develop a common structure and guidelines of how to define user and system requirements.

OPPA 3D shall enable the residents to compare different planning scenarios and the related consequences and enable them to comment those scenarios – in text and map form. To explain difficult planning contents and the relation between different planning issues, as well as to demonstrate the consequences of the different planning alternatives, the illustration using 3D-models will ease the comprehension of the planning contents for all non-planners.

The 3D participation tool aims to improve access to information and public participation in the planning process by allowing anyone interested in planning issues to:

- View information about a planned development in 2D and 3D as part of a consultation process
- Improve their knowledge about the planned development by using 3D-views to help them understand the proposed designs and their environmental impacts
- Make comments on the development in either 2D or 3D
- Safe comments with spatial relation so the specific view to the comment can be seen by others

The participation model for VEPs to be used in this scenario consists of two parts: the scenario's website and the 3D participation tool. The website on one hand gives all necessary information concerning the district, the development plans, the existing data, etc. Also the functionality of the participation tool will be explained. On the other hand, there will be the linkage to the web-based 3D participation tool, consisting of a 3D-model with various visualisation features, a commenting and discussion platform and an optional 2D overview map. Beneath displaying and commenting/discussion functions, the 3D participation tool will offer a variety of optional functionalities which are described below.

The following functionalities of the 3D-viewer have been identified:

- dynamic flight through and turn-around features of 3D-model
- predefined flight-throughs, giving specific information about points of interests, the proposals back-ground, etc.
- predefined view-points in the 3D-model linked to the 2D-map
- display different planning alternatives as layers to allow users to compare proposals and consequences for the environment
- highlight buildings, select buildings to query specific data (GIS data like use, height, historical background, owner ship, etc.)
- set new comments in 3D-model, saving the specific view-point
- display existing comments in 3D-model
- display of environmental impacts, like noise simulation, changes of wind flows and fresh-air streams, flooding scenarios, etc.
- query any kind of GIS data, relevant for the planning area and planning content, e.g. land use, use of buildings, green and public spaces, environmental data (s.a.), height and density, property ownership, etc.
- use a gazetteer service (go to location, go to address, go to zip code)

- display additional data/information (e.g. parking lots, green spaces, public buildings, playgrounds, etc.)

The commenting tool enables all users (public as well as local authoritiy, planners, moderator, etc.) to set new comments, respond to existing comments, choose a topic or create a new one, view all existing topics and comments. The discussion forum is linked to the 3D-viewer and the 2D-map, navigation is possible in all three features. Most important is, to enable discourse oriented discussions – multi-way-communication, and to link the comments to the 3D-model, so that issues can be discussed and displayed in the same time.

The 2D-map will be an optional feature, basically used to give an overview about existing comments, the planning area, view-points, etc. Functions of the 2D-map are predefined view-points, which are linked to the 3D-model as well as displaying existing, spatial related comments, which are also linked to the 3D-model.

Main focus of OPPA 3D is the interaction between 3D-viewer and commenting tool as well as the discourse oriented communication. It allows interested users to query relevant planning data via a web-based system. By visualising the information in 3D, a lot of planning information and planning background can be conveyed in a realistic, clear and understandable manner. The communication platform, linked to the 3D-model, offers the possibility to link written comments to a visual display to explain more detailed the discussed issue. On one hand, the multi-way communication enables the user to view all listed topics and comments, to set new ones and to respond to already existing ones. Also, there is the possibility for every user to send comments or questions via email to a specific contact person. On the other hand, the moderator, resp. the contact person, has the possibility to answer to the comments in public (via the discussion platform) or private via email.

3 CITYMODEL ADMINISTRATION TOOLKIT (CAT3D)

In order to realize the major innovation, the integration of a rich 3D model that can be a part of the user interface, it is essential to have an efficient management of 3D geo-data on server side. It is recommended that the data is provided in different layers, which group objects thematically, so that the client can query the appropriate model for its specific needs. Typically, data for planning projects is provided by a variety of city administration departments, planners, architects or other institutions. All these parties have their own specialized software using different data formats. This implies, that the data for the different layers do not necessarily come from one data source. Therefore, the framework must be able to handle different data formats, database management systems (DBMS) and data schemas. It also has to have the capabilities to integrate this information into one database on the one hand, or if necessary, to merge the data “on-the-fly” to built an appropriate model on the other hand. It is also very important for the framework to support a set of output formats to support several platforms on which PP-Tools can be developed (e.g. GoogleEarth, VRML-Plug-Ins, etc.).

In the scope of VEPs, the CAT3D-framework is developed to handle the tasks defined above. The architecture is modular and can be easily extended. It is also possible to combine a subset of modules to solve specific tasks with a lightweight solution. The framework modules can be associated with one of the four groups: data connectors, data format creators, data mapping and utilities (fig.1).

The data connector modules are used to access different kind of data sources and to implement the “logic” of the data schema. For geo data, which is predominately handled by the framework, the use of database management systems (DBMS) with spatial extensions is quite common. These databases have an additional column type that stores the geometry of the object and is used to build a special index on which spatial search algorithms can be performed. All these additional capabilities can be encapsulated in the data connector, and the application developer neither have to know the detailed schema of the data nor the exact syntax of the involved queries.

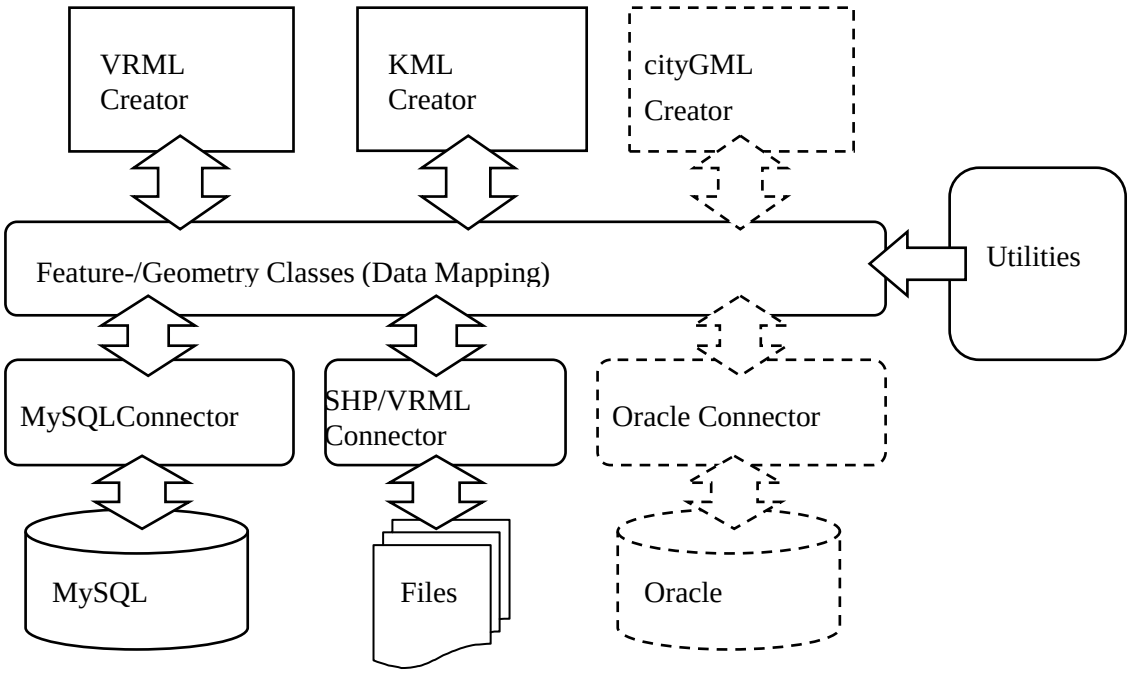

Figure 1: CAT3D architecture

Another advantage of hiding the data access in a module is that there is no direct connection to the data source, in that way the consistency of the data can be tested inside the connector before it is written to the database. In addition, with foreign key constraints within the database this is a very efficient way of avoiding corrupt datasets.

Data, that is read by the connector modules, is stored in memory to be processed by other components of the framework. In order to have a general format, which can be handled by all modules, the data mapping layer defines several classes to model features and geometries. These class definitions build a general structure for geo-spatial data that is used by all components in the framework. They also enable the exchange of modules due to special requirements and the extension of the framework with new components without interfering with existing parts of the framework. Utility modules can also process data that is stored in the data mapping layer. An example would be to read 2D building footprints and extrude them to build a LoD 1 (Level of Detail 1) block model. In addition, these building blocks can be intersected with the terrain model, so that they stand on the terrain surface. It is also possible to merge data from different sources in the mapping level in order to build a suitable model. For example, the terrain information can not only be used to give the buildings an elevation, it can also be integrated into the dataset, so that buildings and terrain surface build a 3D-model. All this processing is done in the mapping level, before the data is handed over to the appropriate format creator.

The format creators are modules to generate output formats. For the framework, it is quite important to support several external formats so that it can be used with many applications. Yet, for the online PP-Tools it is necessary too, to support different formats, because the front-ends can be implemented, using different technologies (e.g. X3D/VRML-Viewer, Google Earth, etc.). The format creator just provides the reverse transformation as the connector module. It translates the internal mapping format into the external format. In some cases, the external formats can be restricted compared to the internal, or features are modelled in a different way. These constraints and restrictions can be handled inside the format creator. And because of the mapping level between creator and connector, the modules for different formats can be exchanged quite easily and any combination of data connectors and format creators can be used to build a suitable dataset.

4 3D-MODEL TRANSMISSION

The CAT3D technology, described in the previous chapter, can access, manage and merge 3D data, but the data transmission and the interface for client requests is another part of the server side application that is built on top of this framework. Because we want to support different PP-Tool implementations and to be able to exchange client side modules, it is inevitable to use open standard interfaces and data exchange formats. As VEPs mainly handles geo-spatial objects, we also extended the definition of a textual comment by a

point-geometry, Open Geospatial Consortium (OGC) standards seem most appropriate. Besides an OGC Web Feature Service (WFS) for the transmission and management of comments, we decided to use the Web 3D Service (W3DS) interface to provide 3D city models over the internet. The W3DS is a discussion paper of the OGC and is currently in the standardization process. The interface is quite similar to the existing Web map Service (WMS) and the Web Terrain Service (WTS), though the type of the response is quite different. The W3DS returns a scene-graph, a tree-structured representation of a 3D scene. This structure cannot be displayed straight away; the client needs a viewer to render the information given in the scene graph. Supported formats, describing scene graphs, are the Virtual Reality Modelling Language (VRML), the Keyhole Mark-up Language (KML), X3D, and others. The VEPs implementation takes advantage of the CAT3D capabilities to access different data sources. A W3DS provides data in different layers, like CAD systems, to thematically group objects. By using a XML file, it is possible to link different data sources to specific 'W3DS layers', the connection to the data is realized by the different CAT3D connector modules. In that way the W3DS can provide different thematically organized object sets from different sources. This is extremely helpful when integrating the whole system into an existing geo-data infrastructure with distributed data stores. These distributed datasets are updated by the responsible department and it is impossible or not desired to transfer all the data to one central database. In that case, the W3DS, respectively the CAT3D framework has to build the 3D model on-the-fly.

5 CLIENT SIDE MODULE INTEGRATION

The PP-Tool client (OPPA 3D), as described in chapter 2.2.2, consists of a 3D viewer, a 2D map and a communication platform. All of these client side components are more or less individual applications, sharing one screen (fig 2). These applications are specialized in their field and provide a specific functionality that is useful and required in the PP-Tool. Yet, to show information about the same object or comment in all three modules, the applications have to be synchronized. In order to be flexible on client side in terms of exchanging modules, we mainly use standard interfaces (OGC) to communicate with the server, but there is also a need to have a flexible communication procedure among the client components.

The VEPs project team decided to implement a broadcast module that sends event messages to all registered listeners. This technique seemed to be more flexible and allows fast integration of existing components and applications. It also makes it unnecessary to update the broadcast module whenever new functionality is added to the system. In contrast to a fixed set of API methods that must be implemented by every module, the broadcast module only calls one function to transmit the event message. When integrating a new module, it only has to implement this single function and not a large set of functions. Instead, the 'API' on client side consists of a set of event messages. These messages can be analyzed by the receiver and the execution of the required action can be delegated to existing module methods. In that way the existing module interface does not have to be changed to fit the API, the message handling method is just put on top to read the message and trigger the appropriate action. Another advantage is, that not all other components have to be informed manually by a module with a separate function call. The module just passes the message to the broadcast that handles the message delivery to the involved components. This method is recommended when more and more modules are embedded into the system to provide additional functionality (e.g. web service front-ends), and more than the three basic modules are in use.

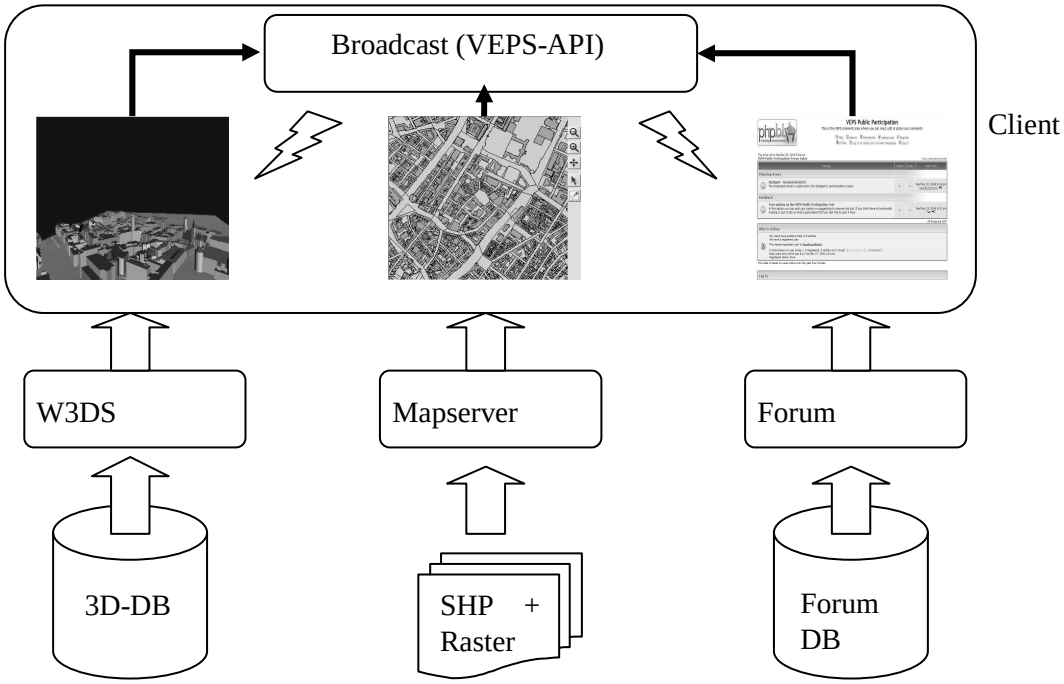

Figure 2: PP-Tool architecture

6 PROSPECTS

To evaluate the tools developed during the VEPs project, a new organisation joined the project team. Groundwork is a federation of Trusts in England, Wales and Northern Ireland, each working with their partners to improve the quality of the local environment, the lives of local people and the success of local businesses in areas in need of investment and support. Due to their work, Groundwork UK is very experienced in operating and evaluating all kind of public participation. For the evaluation of the VEPs tools, Groundwork will test them in a special scenario developing an evaluation concept to test the tools with different user groups (professionals, semi-professionals, public/non-professionals).

The statement of our paper, “improve public participation in planning processes by using web-based 3D-models for communication platforms”, is an assumption and consciously has been chosen kind of provocative. As there are still not enough research studies considering this issue, the main aims of the evaluation are firstly to test, if people could think of using this tool as part of a participation process (executional office as well as the applying users), and if they think this tool helpful to improve the participation process. Secondly, we will gain some indicators wether 3D-visualisation really will improve the understanding of planning contents in public participation.

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8 REFERENCES

Bogdahn, J., 2006. A Web 3D Service for Public Participation in Urban Planning, Thesis at the University of Applied Science Stuttgart (HfT Stuttgart).

Bräuer, M., Biewendt, T., 2005. Elektronische Bürgerbeteiligung in deutschen Großstädten 2005. Zweites Website-Ranking der Initiative ePartizipation. Berlin: www.initiative-eparticipation.de.

Coors, V., Huning, K., 2005. Compressed 3D urban models for internet-based e-planning, Paper on NextGeneration3DCityModels, Bonn.

Coors, V. et al. Appraisal of standards for 3D City Models. In: Proceedings of Information Visualization (iV05), IEEE Computer Society (P2397), July 2005, ISBN 0-7695-2397-8, pp. 157-162.

Curwell, S., Deakin, M., Cooper, I., Shapira, I., Ravetz, J., Babicki, D., 2005. Citizens' expectations of information cities: implications for urban planning and design, In: Building Research & Information. Volume 33, pp. 55-66

Haist, J. and Coors, V., 2005. The W3DS-Interface of CityServer3D. Gröger/Kolbe (Eds.), Proc of the 1st Intern. Workshop on Next Generation 3D City Models, Bonn 2005

Huning, K., Knapp S., 2005. Upcoming standards for 3D city models, Case study Rosensteinviertel and used technologies, Paper on EnVis 2005, London.

Knapp, S. and Chen, Y., 2005. VEPS: Design Process Discussion--- Scenario – urban (re-)development & Use-Case – Rosensteinviertel (pilot project) _Development of Profile and Process Guidelines based on the Pilot Project of Urban (Re)Development in the Urban District Rosenstein Available at: <http://www.veps3d.org/development10453/files/25-oct-2005/10-38-05/VEPS%20paris%20meeting_final%20from%20stuttgart.pdf>

Knapp, S. and Chen, Y., 2006. VEPs – Virtual Environmental Planning system: First steps towards a web-based 3D- planning and participation tool. Paper on CORP 2006, Wien.

Märker, O., 2006. Thesenpapier zum Workshop: Partizipation + E: Online-moderierte Verfahren in der Stadtplanung. Berlin: Zebralog e.V.

Open Geospatial Consortium, 2005. Web 3D Service, Discussion Paper.

Open Geospatial Consortium, 2005. Web Feature Service Implementation Specification, Adopted Specification.

Sinning, H., 2005. Virtuelle Planungskommunikation. Perspektiven für zielgruppengerechte Ansprache. Dortmund: Selbstverlag des IfR e.V.

Sinning, H., Selle, K., Pflüger, K., 2003. Neue Medien und Bürgerorientierung. Anforderungen, Strategien und Praxisbeispiele. Gütersloh: Bertlesmann Stiftung.

Stiftung Mitarbeit, Initiative e-Partizipation, 2007. E-Partizipation, Beteiligungsprojekte im Internet. Bonn: Verlag Stiftung Mitarbeit.

reviewed paper

Issues in use of computer visualisation of large-scale urban developments as planning support tools

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1 ABSTRACT

A focus on planning procedures at different stages helps to recognise some of the difficulties inherent in planning, particularly the outcome of changes to the built environment and the importance of people's involvement in the process. One of the areas that gives rise to significant public dissatisfaction and feelings of dis-empowerment is that of urban planning. The replication on the web of existing plans cartographic-based approaches tend to perpetuate the requirement for trained interpretations, thereby contributing to the exclusion of the general public from participation. Similarly, static computer generated representation of 3D models that aspire to simulate the real environment, described as "an incomparable tool"[1] for winning approval quickly or speeding the funding process, are often questioned for not providing a comprehensive understanding of the proposed developments. We argue that more effective tools are required to clearly display urban planning proposals, in particular large scale commercial developments. Planning support tools and representations were examined thorugh two projects, an ESRC funded investigation of perceived credibility of design representations and the Interreg funded VEPs project. In this paper we examine the expectations of the agencies involved, the primary purpose of the representations and tools that is served and whether they support exchange of views and discussion by providing an effective base for consensus. The feedback and responses to date have shown that various stages and purposes within the planning process require different level of information and that appropriate visualisation techniques are needed in order to reduce the requirement for trained interpretation and encourage the participation of the general public in planning process.

2 THE PLANNING PROCESS IN NORTH WEST EUROPE

The urban planning process can be broadly defined as: seeking advice; appraising the site; consulting the public and experts; briefing; developing technically acceptable proposals; negotiating; applying for and gaining legal consent and public acceptance. They all contribute to both "efficient process and an improved product"[2]. However, the process is costly and so at any late stage difficult to deflect. One of the areas that gives rise to significant public dissatisfaction and feelings of dis-empowerment is that of urban planning. While the mechanisms differ from state to state in Europe [3], the problems as perceived by the public, are often the same, including lack of meaningful consultation resulting in lack of influence over developments and changes, particularly those affecting the home and its immediate environment. These concerns have yet to be addressed by EC harmonisation initiatives, such as: E-Europe 2005; and INSPIRE.

2.1 Planning in the UK

In the UK, for example, guidance on planning policy and process can be found in various places in the Central Government Planning Policy Statements (PPS) to planning authorities. However these are at times conflicting thereby permitting latitude to developers and professionals, to the greater confusion of the public. PPS 1 on 'Delivering Sustainable Development' [4] emphasises the importance of proper presentation of planning applications and PPS12 on Local Development Frameworks [5] draws attention to the importance of local participation and the need for local authorities to prepare detailed plans and drawings which show the proposed development in its setting. Yet according to a statistical analysis, coverage of these issues was until recently still generally sporadic; and presentation of applications, environmental impact analysis and site analysis were only referred to in a fifth of the plans in the UK. [2]

The UK Central Government has now started actively to seek ways to improve both the planning process in general and public participation in that process, through its recent e-Planning Blueprint, published in August 2004 [6]. Initiatives since launched include the national PARSOL (Planning and Regulatory Services Online) project, a range of 'Pathfinder' projects and the Implementing e-Government (IeG) initiative. The main focus of these initiatives is to develop a set of toolkits, standards and 'demonstrator' projects with the aim of assisting planning authorities to implement e-Planning in forms that citizens will both comprehend and use in

their dealings with the councils. New online planning portals are aimed at introducing partnership working, bringing together planning, building control and licensing services.

2.2 Planning in Germany

In comparison to the flexible and discretionary planning system in the UK, German Städte und Gemeinden (cities and municipalities) have a constitutional right of self-government. Local land use planning in Germany is largely about zoning and a municipal responsibility, documented in preparatory and subsequently binding land use plans. The cornerstone of local land-use planning is the power to designate land for specific uses (for example residential and commercial use, public purposes), or to impose restrictions (for example maximum dimensions of development including number of storeys and roof structure). All municipalities are required to have a Flächennutzungsplan, a zoning plan that lays out in general terms the types of land use prevailing or envisaged for the whole of the municipal territory. Preparatory land-use plans are in most cases drawn to a scale of 1:10,000, or occasionally 1:20,000, and have to take into consideration the planning objectives and principles at higher level as set out in the respective Landesentwicklungsplan and Regional plans [7]. Thus, although local authorities are solely responsible for the preparation of their local land use plans, the legal framework provides mechanisms that ensure conformity between different levels of plans ('duty of compliance'). The second type of plan at local level is the Bebauungsplan (B-Plan), a plan which contains legally binding designations, drawn up to a scale of 1:5,000 or 1:1,000, regarding the proposed development and structure. [7].

A cartographic representation of the territory of the municipality forms the central part of both types of local land use plans in Germany. Public participation requirements on plans at local level and development proposals (which have to comply with the regulations set out in the Bebauungsplan) are clearly set out in the Baugesetzbuch. For development proposals, these usually only extend to third parties that would be directly affected by the development. The most recent revision of the Baugesetzbuch (2004) has made provision for public participation through the use of on the Internet, i.e. online plans and proposals. This is a major innovation for the German planning system, which until recently has had strict requirements for two-dimensional versions of local plans, and will allow local authorities to make better use of other online tools as well as three-dimensional models. [8].

3 THE ROLE OF VISUALISATION IN THE URBAN PLANNING PROCESS

Communication and visualisation are already at the heart of the planning system. The rationale for visualisation in urban planning and design, according to Langendorf [9] is based on three premises:

- To understand nearly any subject of consequence it is necessary to consider it from multiple viewpoints, using a variety of information;
- Understanding complex information about urban planning and design may be greatly extended if the information is visualised;
- Visualisation aids in communicating with others.

The importance of visualisation is being recognised as crucial for almost all design and planning professionals who need to represent, communicate and evaluate design ideas and planning proposals [10]. According to Sawczuk “the design and planning process revolves around client’s needs and therefore the client should be part of the team.” [11]. Recent research findings have revealed that while skilled participants appreciate traditional media, such as drawings, unskilled participants prefer photorealistic presentations. Similarly, it was reported that when lay-people were exposed to architects’ drawings “plans had little meaning as the people could not understand what was represented” [12].

Traditionally, there is a strong relationship between plans and cartographic representations, and the planning discipline. Maps, plans, sketches, images or other cartographic representations are (besides language) important communication media for planning. According to some researchers only these media are able to clearly demonstrate visually the complexity of different demands on space. [8] In architecture, visual representations are fundamental to the practice of architecture because they are graphical means of information visualisation about the design philosophy, appearance and the impact of the development upon the locality. [13] However, there has been little consideration given to these aspects of 'mapping' in the planning literature to date. Likewise, cartographic science has failed to connect theory and research to the

real-world tasks of spatial planning, and the question of how communication through 'planning maps' could be improved has been given little attention [8]. In architecture, as well, despite some effort, "this gap in our knowledge has persisted and it would appear that intuition, prior practice and trial-and-error approaches have guided the production of architectural representations of design proposals". [14]

Over the last thirty years, many perception and cognition studies have been undertaken and the effects of visual variables have been investigated systematically [15] [16]. However, there is growing recognition amongst cartographers worldwide that there will never be an all-embracing theory of map reading or, of cartographic communication in general. This is due to the fact that there are certain variables which are difficult to control or even to identify in the process, such as the map user's skills and capacities, and the purpose the map is used for in different circumstances. Rase for example stated that 'we are not sure what really attracts the attention of the reader, how the essence of the map is extracted, how the content is stored in memory, or what makes a specific map type superior to another one under certain conditions'[17][8]. As a result, empirical research and the theories proposed appear disjointed and unconnected. Cartography is thus often still applied as a craft discipline rather than a science, and knowledge of map acceptance and map perception is mostly based on intuition, assumptions and personal experience, and to a lesser extent on scientific evidence. There is little previous work that explicitly addresses the relationship between planning and cartography, and the role and function of cartographic representations in the planning process. [17][8] Thus, it remains difficult to see how the interpretation of plans and their cartographic symbols can be made adequately transparent to the untrained user.

In architecture, within the range of representations there is a rich repertoire of imaginative techniques such as perspective, axonometric drawings or artistic impressions, recently further enhanced through computer graphics and virtual reality representations. The theory [14] shows that it takes considerable experience and knowledge to read architectural drawings before one becomes skilled at interpreting them. For those professionals from other fields, outside architectural and urban design, involved in the process of decision-making and design review it is even more difficult to interpret information when presented visually. This can increase the danger of misinterpretation of the information and affect environmental decisions. Overall, current research shows that the major impediment in the design assessment area is the lack of systematic research to establish comprehensive patterns or to tease apart the differences between professionals' and non-professionals' perception through architectural representations.

4 COMPUTER VISUALISATION AS URBAN PLANNING SUPPORT TOOL

According to research literature recent moves towards computer generated visualisation models reflect the acknowledgement that traditional, hand made representation techniques fail to communicate design and planning information effectively and clearly [18]. In regard to computer-generated visualisation, architecture, for example, has been greatly influenced by computer technologies such as computer-aided design (CAD) software packages. In parallel, GIS have been extensively developed with urban planning as a major area of application in most European countries. The sheer diversity of computer technologies and the versatility of their application has encouraged an interest in their use for visualisation in planning. A UCLA (USA) group of researchers Ligget, Jepson and Friedman have pioneered exemplary information rich 3D modelling environments, while other researchers such as Day at Bath University have tested CAD generated computer visualisation of urban environments [19]. Findings by a research group at the Queensland University of Technology, Australia, led by Buccolo, tested computer visualisation on the design for the new town centre of Capalaba and the Brisbane Airport [20]. This research group identified certain advantages in the use of computer visualisation when compared to the traditional static tool, such as a better comprehension of the depicted scene, way-finding and evaluating physical change but they suggested that more systematic research would need to be carried out to prove the reliability and validity of new technologies and tools. Similarly, Mahmoud confirmed this conclusion and extended it by proposing more experimental research to be conducted to investigate the benefits of these methods for the potential users [21]. As Kalay [22] points out, while computer programs "made communication easier and more efficient, they have not, in and of themselves, improved shared understanding, which is fundamental for making joint decisions and for negotiating tradeoffs among competitive worldviews".

The use of the web for planning purposes is one area that is receiving a great deal of attention lately, in particular, the visualisation of urban forms and landscapes. As the Internet has become accessible and faster,

an increasing number of applications are being tested and developed in encouraging public participation in planning process. Research shows that these new tools have improved the communication process [18] and that 3D forms of representation “made the plan understandable”. [23] Daniel and Meitner cite several experimental studies that have demonstrated the power of visualisations “to affect attention, to alter interpretations of complex concepts and differentially to arouse positive and/or negative emotions”.[24] Although researchers' views vary on the appropriate use and place of visualisation in the planning process, all agree that communicating design can be more effective and improved if computer generated visualisation is used as the means. Pietch states that with “increasing participation of non-design professionals such as elected council members and members of the public, the demand is there for a better communication medium than conventional 2D drawings”.[25] However, Kalay [22] points out, while computer programs "made communication easier and more efficient, they have not, in and of themselves, improved shared understanding, which is fundamental for making joint decisions and for negotiating tradeoffs among competitive worldviews".

Some research suggests that three-dimensional and interactive computer visualisation (based on using 3D VRML in research into community based 'planning for real') is one of the “most important developments in visual communication for urban planning and urban design since the development plan”.[26] This is an area that needs more research to establish when it is appropriate to simplify, by how much to simplify while retaining verisimilitude, and how reliable are the consequent judgements. Kaplan and Kaplan argue that “a simplified model is more likely to parallel people’s cognitive structure. Hence the very simplicity of the model may encourage its use. A simplified model also encourages generality; details make things particular, thus narrowing their range of appropriateness. Finally, simplification reduces the total load to one’s processing”[27]. Other researchers as Santella state that “the basic goal of realistic rendering is to create images perceptually indistinguishable from real scenes. Since the human observer judges the fidelity and quality of the resulting images, the perceivable differences between the appearance of a computer graphics image and its real world counterpart should be minimised. Thus, visual perception issues are clearly involved.”[28]

5 THE ESRC PROJECT

The focus of this research study is on people’s perceptual responses to static visual representations that provide an understanding of the three-dimensionality of design schemes. In these cases one is unable to interrogate for information other than that which is shown in the view. By comparing traditional and computer generated architectural representations the study aims to establish whether some methods of architectural representation are regarded as more credible in communicating design than others and in what way and why.

To reduce extraneous influences, the selected cases for analysis were limited to some proposals for significant commercial developments with similar contextual attributes. The units of analysis were 'collections' i.e. sets of images, with a descriptive role. They were put together to allow concepts and ideas to become visible [29] and to be both representative and statistically significant and thus unit and choice of representation is regarded as "a reliable source of factual evidence". [30]

The preliminary results of the various group perceptions show that an important requirement from three-dimensional representations of the architectural design schemes is the apparent realism of the visual representation. This factor affects people’s perceptions of credibility in the way that it makes the images believable and possessing “no sense of fudge” according to an architect with over 20 years of experience. Computer generate photomontage was regarded by the majority of participants as representation that possesses the highest level of realism and thus, the one where the information presented leave the viewers with the impression that it is the most studied design which is both, technically and accurately presented.Architects and some other professionals still regard traditional forms of visual representation as both a useful and credible form of representation. Yet, these forms appear to be better as a means of communication that they use internally, among themselves for the discussion and analysis during the design development stage, than for the stage where the conceptual design is communicated to other parties involved in the process. Another form of representation that has not been investigated in the study was frequently mentioned during the group discussions: that of interactive three–dimensional visualisation. According to theory interactive computer visualisation is the form of visual representation, which is one of ”the most

important developments in visual communication for urban planning and urban design since the development plan".[31] Indeed, several participants from various groups mentioned the examples of three-dimensional interactive computer generated walkthroughs as the most credible form of visual representation.

6 THE VEPS PROJECT

VEPs, the Virtual Environmental Planning system is an Interreg IIIB funded European project focused on the North West Europe region. [32] The project brings together partners from the UK, Germany and France, with skills in geographic visualisation and spatial planning, led by the Environment Agency for England and Wales. VEPS has received additional support from the UK government as a potential contribution to its e-Planning programme.

The VEPs project is focused on what can be described as a 'person-centric' approach to evaluation of planning issues, based on a credible sense of presence in the scene to support effective judgement. This is perhaps a bottom up approach, contrasted with the usual top down approach to planning. Workshops have indicated that users are most likely to become engaged in the participative planning process when they are conscious of a particular impact on their own lives. One of the areas that gives rise to significant public dissatisfaction and feelings of dis-empowerment is that of local planning. "Not in my backyard" or 'NIMBYism' is now often quoted in the UK as the almost automatically cynical response to local planning proposals. It is then necessary to find mechanisms that create consensus beyond the person centred view, and to allow the cumulative impact of individual decisions to be appraised. The workshops held in the partner countries within the VEPs project have identified that the issues most likely to engage citizens in this way are for example changes to the neighbourhood of their home, or changes they wish to make to their home in the context of their neighbourhood.

The VEPs prototype tools created are aimed at bottom up use by Citizens, able to model their own explorations as well as viewing street level impacts in their immediate neighbourhoods. Other investigation during the VEPs project is examining how to facilitate the planning process and planners. In Stuttgart the Stuttgart University of Applied Sciences is working with the City Planners on a case study of the Rosensteinviertel area proposed for major air-rights extension to the city centre over undergrounded railway tracks and for urban regeneration. For regional appraisal "there are several planning support systems (PPS) available on the market today to ESRI users. PSS use indicators and alternative development scenarios … can measure and compare performances of different … indicators for land use, transportation, natural resources and employment…." There are a range of what are now termed Planning Support Systems under development such as Metroquest , and it is not intended to replicate these, but rather to identify what data needs to be passed from local and neighbourhood impact proposals in order for such systems to be pump-primed so that matching sites can be identified and the cumulative effects of similar development modelled forward over decades. Equally further constraints may be formulated using such simulations that will better inform decision making at the local level, so a two-way exchange needs to be established.

The VEPs project focuses on the master planning stage where visualisation can assist in avoiding delays in the planning process - here, the judgments required can be made before a specific proposal has been formulated and / or before an application for planning approval. The project is also developing means of enabling the public to 'what-if', to modify proposals and to examine the impact of their modifications, or to upload alternative proposals. An underpinning spatial database assists analysis of the potential impact. Such spatial databases are in effect a form of GIS when associated with spatial analytical tools. The benefits of GIS in this context is borne out by recent research in this field which states that "the potential for extensive and alternative use will be directly reflected where GIS will prove to be powerful" [26]. In the resulting VEP system an underpinning spatial database will be crucial throughout, from data acquisition to modelling process, to enable on-demand responses and for maintenance of the system.

In VEPS, the purpose of visualisation is to assist users to make decisions together about proposals for change, using a digital environment that represents the proposals. It is regarded as critical that they then endorse those early decisions when they are confronted by the final built outcome. Hence to start with, for this research, visualisations have been created and published using existing commercial and / or open standard file formats, such as VRML; to swiftly create a prototype web based virtual reality that users can freely explore. This is intended to lead to user engagement in the research process and to user driven optimisation of the final system. The final system would be expected to fall into the category of those

systems with 'full analytical features' [33]. It is hoped that this will indicate improvements in the way in which users participate in the planning process and decision-making.

6.1 The Web based visualisation tool

The VEPs project is focused on easing the task of creating and comparing 3D modelling of what does not exist, within an existing context. Because of this distinction tools are needed that allow modelling to be created in the context of the varying height of the DTM. While it is useful to be able to trace round existing aerial imagery and even to elevate modelling with bitmaps, this is not enough to meet the need. It is important to be able to freely if simply model in context using as referents the shape of the terrain and the form of adjacent buildings structure and landscape to be retained. These modelling tools should ideally be open source and deploy VRML, X3D and similar emerging open standards.

These standards require plug-ins or extensions to current web browsers to operate at present. In examining the available plug-ins those for VRML have been available the longest and are the most developed. Digitisation of new modelling in context requires a particular scripting behaviour of VRML, the touch sensor. This is now described in X3D as the "PointingDeviceSensor" component, of which the touch sensor is a particular 'node'. "Pointing-device sensors detect user pointing events such as the user clicking on a piece of geometry (i.e., TouchSensor).

This current 3D e-Planner prototype toolset is undergoing user evaluation following the EAR [34] methodology. At present it consists of a DTM with draped aerial imagery and vector mapping. It has the capacity to provide two zones, an inner neighbourhood where users can interact and model, and an outer contextual zone that is interactively navigable but 'locked'. Modelling created by one user can be shared with another across the web and viewed in context. The recipient can save the modelling of another and modify and then upload it. Within the interactive modelling zone (which can be an entire neighbourhood or scene) users can both digitise around the aerial imagery or digitise new buildings in context (see Image 2). Tools have been created to enable users to elect to share their modelling with others. Users, whether the originator or other members of the public with whom the originator has shared the modelling, can interactively modify the elevational height of a selected building and adjust the slope or form of its roof. They can also save the digitised building as a VRML (CAD) model then re-insert, move, scale, or rotate it (Image 3).

7 ISSUES IN USE OF COMPUTER VISUALISATION

In the ESRC study, the purpose of static representations was to communicate the final versions of design schemes. At this stage these representations are intended to deliver relevant information including a high level of detail and requisite specific information such as for example the use of materials. The participants therefore received highly complex information intended to support precise judgments.

In the VEPs project, the purpose of visualisation is to assist users to make decisions together about proposals for change, using a digital environment that represents the proposal. It is regarded as critical that they then endorse those early decisions when they are confronted by the final built outcome.

Both investigations consider how these tools for planning support deliver the relevant information and whether the information is delivered in an easily comprehensive form. The issue was also, how best to represent the proposed changes in the built environment so that they are perceived and understood as credible and the judgments that may be made are reliable.

The results to date show that an important requirement from the three-dimensional representations whether they are static or interactive is the apparent realism of visualisation. This factor affects people's perceptions and judgments in the way that it makes the visualisation believable and possessing 'no sense of fudge' according to an architect with over 20 years of experience. These representations appear to leave the viewers with the impression that it is the most studied design that is both technically and accurately represented. This is reinforced by the level of detail that these visualisations provide. However, architects and some professionals still regard traditional forms of visual representations as both a useful and credible form of representation. Yet, these forms appear to be better as a means of communication they use internally, among themselves for the discussion and analysis during the design development stage than for the stage where the conceptual design is communicated to other parties involved in the process. For the final stage of design they

all agreed that computer generated representations of design “sell better” design and are likely to have more persuasive power than traditional means of representation.

The preliminary analysis of these research projects suggests that there are three viable approaches to public consultation and engagement in the planning process.

- Firstly, the complex information in a planning consultation may be “dumbed down” to a level that can be understood by the average member of the public without a qualification in planning;
- Secondly, full information can be presented but the citizen might need to receive training in order to understand it, particularly because plans and maps require training to read and interpret correctly because for an 'untrained' user they often contain ambiguities;
- Thirdly, (the proposed VEPs project approach) an interactive three-dimensional (3D) virtual reality (VR) visualisation would allow the viewer to experience the highly complex information without the need for training, because they can see and experience what the visual impacts of the planned development will be in the associated model.

This approach is also supported by the existing literature which claims that the use of 3D visualisation is particularly powerful in visualising urban and built environments as it gives the option to deliver the relevant information in an intuitively comprehensable form [19]. In this respect newly available highly accurate three-dimensional LIDAR data is becoming more widely available. LIDAR stands for Light Detection and Ranging and is a (usually) airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. LIDAR is a range imaging data acquiring method, which is used, in conjunction with the Global Positioning System (GPS), to deliver high-resolution digital elevation models. A flash movie on the Environment Agency Website demonstrates these principles. This data can be sufficiently accurate for the precise judgments demanded in planning to be made, and, as image 1 shows, provides a digital context in which new proposals can be viewed. The issue that is then posed is how best to represent proposed changes in this environment, so that they are credible and the judgments that may be made by non-technical people are reliable - without making the proposals so photo-realistic that they are 'read' as certain.

Research studies have identified the demographic and professional bias of decision-makers to be the most significant factors in the process of communication of architectural ideas through visual representations [35]. Several studies also report differences in the evaluation of decision-tasks between experts and lay-.people. For example Barker [36] states “Differences between lay and expert appraisals can be anticipated because of variations in the decision context, experience, perceived role, and ability to cope with a highly complex and uncertain situation”. These differences have been confirmed by the initial analysis of groups’ perceptual responses in the ESRC study.

The issue of acceptable and useful levels of abstraction of visual representations was particularly difficult to acquire for the perceptions and understanding by the members of the public. Their responses relied very much on the colour schemes used, impressions of the atmosphere that the images created and ‘activity indicators’ such as people and car added to the representations. These findings underscore the need to fit the form of visual representations to the audience and type of decisions to be made. The results of some current research confirm [37] these findings, which revealed that skilled participants appreciate traditional representations while unskilled participants prefer photorealistic presentations.

8 CONCLUSIONS

The point of having interactive visualisation of urban planning and design developments is that it allows some useful tasks to be accomplished, and the meaning of the visualisation is determined by what exactly the task is. During the research studies described above we have addressed two hierachical sequences of responses to computer-based visualisation. The first element that has been studied through the VEPs project is ‘low-level’ detail. The interactive VRML environment offers low resolution images applied to objects as they are neared. In contrast, the ESRC study examined ‘high-level’ representations showing highly detailed objects in a scene, their spatial disposition and other elements of design.

We consider that there are possibly other hierarchical levels of detail. There is an ‘intermediate level’ of representation, which this research did not examine, that would be probably the equivalent of a black and white architectural drawing or the result of CAD software such as Sketch-up. There is also the perhaps

highest level of detail that would be achieved when the built environment visualisation includes the movement of traffic, plants (in the wind), and people, that would then offer a much higher resemblance to the real world. One may suggest that this has already been offered by some immersive VR technology, only currently accessible using expensive stand-alone technology. However given the pace of computer technological development, it is possible that this level of detail for planning support visualisation may be successfully introduced into future web based media.

While most of the research in this area is focused on metrics for comparing 'realism' against reality we are more concerned with the reliability of the planning appraisal judgments formed. If the non-experts are surprised when they see the built results of the planned proposals that they earlier evaluated, then there is a problem with the visualisation that provid the information. We argue that computer visualisation for planning and design decision making process should be a 'person-centric' visilaistion that is based on a credible sense of presence in the scene and supports effective decisions. Considerably more work is needed to establish clear guidance for when a particular form of representation is reliable in this respect. Web based technologies currently introduce further limitations in their support of interactive representation that may disappear in future.

9 REFERENCES

[1] SHEPPARD SRJ: 'Guidance for Crystal Ball Gazers: Developing a Code of Ethics for Landscape Visualization' online at http://survive.sli.unimelb.edu.au/~ianb/Public/ascona/Sheppard.doc 2000
[2] PUNTER J. CARMONA M.: The Design Dimension of Planning, E& FN Spon, London, 1997
[3] SEATON,K. NADIN,V. DUHR,S.: European Planning System Update.London;DETR, 2001
[4] ODPM: Office of the Deputy of Prime Minister, Planning Policy Statement 1; Delivering Sustainable Development, 2005 Available online http://www.odpm.gov.uk/stellent/groups/odpm_planning/documents/pdf/odpm-plan_pdf-035506.pdf
[5] ODPM: Office of the Deputy of Prime Minister, Planning Policy Statement 12: Local Development Frameworks, 2004, Available online: http://www.odpm.gov.uk/stellent/groups/odpm_planning/documents/pdf/odpm-plan_pdf_031155.pdf
[6] ODPM: Office of the Deputy of Prime Minister, E-Planning Programme Blueprint, 2004 Available online http://www.odpm.gov.uk/stellent/groups/odpm_planning/documents/downloadable/odpm-plan_o30468.pdf
[7] DUHR, S,: The form, style and use of cartographic visualisation in European spatial planning- exmaples from England and Germany, Environment and Planning A, Vol. 36, No 11, pp.1961-1989, 2004
[8] DUHR, S,: Exploring cartographic representations for spatial planning in Europe, Unpublished PhD thesis, University of the West of Engalnd, Bristol, 2005
[9] LANGENDORF, R:. The 1990's; information systems and computer visualisation for urban design, planning and management, Planning and Design (19) pp 723-738 1992
[10] MCKECHNIE, G. E. Simulation techniques in environmental psychology in Stokols, D.(ed.) Psychological perspectives in environment and behaviour, Plenum Publishing Corp. New York, 1997
[11] SAWCZUK, B The management of the design process, in Nicholson, M. (ed) Architectural management, E&FN Spon, London, pp 84-89, 1992
[12] HARRLICHACK M.A, The effect of rendering technologies on the evaluation of computer generated design simulation, Master thesis, College of Env. Science and Forestry, State University of New York, Syracuse, NY, 1993
[13] SMITH., A.H. et al. Visual communication in urban planning and urban design, Paper 2, Online Planning Journal , 1998 http://www.casa.ucl.ac.uk
[14] MAHDJOUBI, L AND WILTSHIRE, Towards a framework for evaluation of computer visual simulations in environmental design in Design Studies, 22, pp193-209, 2001
[15] MEDYCKYI-SCOTT, D., BOARD, C. Cognitive cartography: a new heart for a lost soul. Advances in cartography. Muller, J. C. (ed.), Essex: Elsevier Science Publishers Ltd, pp. 201-230, 1991
[16] GILL, G. A. (1988) Experiments in the ordered perception of coloured cartographic symbols. Cartographica, Vol. 25, No. 4, pp. 36-49, 1988
[17] RASE, W.D., Computer-assisted Map Design, in Muller, J.C. Advances in Cartography, Elsevier, Essex, pp181-200, 1991
[18] AL KODMANY, K. Supporting imageability on the World Wide Web: Lynch's five elements of the city in community planning, Environment and Planning B: Planning and Design, volume 28, pp805-832, 2001
[19] DAY, A. New Tools for Urban Design, Urban Design Quarterly: 51 1994
[20] BUCCOLO et al. Client Expectation of Virtual Environments for Urban Design, Proceedings of IIV2001 Information Visualisation International Conference, IEEE 2001, California, pp690-694 2001
[21] MAHMOUD A.H. Can Virtual Reality Simulation Techniques Reshape the Future of Environmental Simulations? in Online Planning Journal: 2001 accessed on line at http://www.casa.ucl.ac.uk/planning/articles41/vrsim.htm
[22] KALAY Y.E., Computational environment to support design collaboration, Automation in Construction 8, pp37-42, 1998
[23] APPLETON, K. and LOVETT, A. GIS-based visualisation of rural landscapes: defining 'sufficient' realism for environmental decision-making, Landscape and Urban Planning, v.65, issue 3, pp117-131, 2003
[24] DANIEL T. and MEITNER, M. Representational validity of landscape visualisations, Final report, USDA Forest Services, Forest Health Technology, Enterprise Team, 2000
[25] PIETCH S.M. Computer visualisation in the design control of urban environments: a literature review, Environment and Planning : Planning and Design, volume 21, pp 521-536, 2000
[26] SHIODE, N. 3D Urban models: recent developments in the digital modelling of urban environments in three dimensions, GeoJournal 52, pp263-269, 2001

[27] KAPLAN R. AND KAPLAN S. Cognition and the environment, Preager, New York, USA, 1983
[28] SANTELLA, A. The Art Of Seeing: Visual Perception In Design And Evaluation Of Non-Photorealistic Rendering. Doctoral Dissertation, Graduate School—New Brunswick Rutgers, The State University of New Jersey, 2005 http://www.research.rutgers.edu/~asantell/thesis.pdf
[29] APPLEYARD D. Understanding Professional Media, in Wohlwill, I.A.J.F. (EDS) Human behaviour and Environment: Advances in Theory and Research, New York, Plenum Press pp43-88, 1977
[30] COLLIER, in Van Leween T. and Jewitt, C., Handbook of Visual Analysis, Sage Publication, London, 2001
[31] SMITH., A.H. et al. Visual communication in urban planning and urban design, Paper 2, Online Planning Journal , http://www.casa.ucl.ac.uk 1998
[32] VEPS - Virtual Environmental Planning System funded Dec 2004 to 2007 by INTERREG IIIB NWE-ENO (a Community Initiative Programme funded by the European Regional Development Fund www.nweurope.org)
[33] HOLTIER S. STEADMAN, J.P. AND SMITH M.G. Three dimensional representation of urban built form in a GIS, Environment and Planning B:Planning and Design 27, pp51-72 2000
[34] ISTAG Report on Experience and Application Research "Involving Users in the Development of Ambient Intelligence" http://www.cordis.lu/ist/istag.htm
[35] BATES-BRKLJAC, N Visualisation of Architectural Design Schemes through Static Computer Generated and Traditional Visual Representations: An Investigation of Subjective Responses Tenth International Conference on Information Visualisation (IV'06) pp. 337-342 2006
[35] BARKER M. The Structure and Content of Environmental Cognitions. 1972
[37] BATES-BRKLJAC, N, Communicating urban development schemes through architectural representations: an investigation of perceptual responses,Communicating Space(s) 24th eCAADe 2007 Conference Proceedings, ISBN 0-954-1183-5-9, Volos, Greece available online http.cumicad.scix.net/cgi-bin/works.Show/2006-674

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Public and Private Spaces Under Changing Security Conditions. Can Technology Keep Us Safe?

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1 INTRODUCTION

Security systems using information and communication technology have the potential to avert security threats to public and private places in urban areas, minimize their impact or, at the very least, reinforce crime fighting efforts. However, many are concerned about the Orwellian nature of such technologies and the social exclusion they may cause. Despite a current lack of integrated urban security policies with dedicated security resources, new urban security regimes are developing to meet specific threats. Real estate development has to meet urban security requirements to an increasing degree. The paper will contribute to the debate by defining urban security as a public responsibility, describing promising ICT-supported security technologies and technological-organizational convergence in an urban setting, sketching the future of city life under new security regimes and specify urban security requirements for real estate development.

2 CHANGING SECURITY CONDITIONS

Urban safety ist a basic precondition for urban social and economic dveoppment. Following the terrorist attacks in the United States on 11 September 2001, the subsequent attacks in Madrid and London and the blighted attacks on trains in Germany, the public is more aware than ever that towns and cities, with their densely built-up areas and sophisticated infrastructures, are extremely vulnerable.

A quick glance around the world to Latin America, Asia or the Middle East shows that the terrorist threat to towns and cities is by no means a recent development. Urban Europe has itself long been subject to attacks from groups such as ETA and the IRA. Since the 1990s, however, terrorist attacks on urban areas have been on the increase (Savitch 2005) and will continue to be an issue in the future. Yet, whether real or suspected, threats to the urban fibre are not confined to mass attacks aimed at "global cities" and megalopolises; the worries commence with everyday crime.

Urban security is the subject of increasing public debate, which often leads to the assumption that towns and cities are unsafe per se. A number of myths must be dispelled. For example, "the fear of crime is influenced less by the 'objective' crime rate than by problematic social situations in residential areas." (Oberwittler 2003, p. 31). Nevertheless, around 40% of Germans fear a sharp rise in crime rates and are concerned by increased vandalism (around 30%), graffiti (20% of West Germans and 29% of East Germans) and begging (18% of west Germans and 21% of east Germans) (Opaschowski 2005, cited in Stegemann 2005). No one disputes the fact that in some urban areas security, once taken for granted "as a by-product" (e.g. platform staff at train stations, bus and train conductors etc.), has fallen victim to staff cuts and must now be painstakingly "repurchased". Thus, the increase in private security services cannot be attributed exclusively to declining safety levels in urban areas. "To at least some extent, this figure is due to a statistical manipulation related to increased outsourcing" (Siebel/Wehrheim 2003, p. 24) and to "security as a by-product" having been curtailed. Even the use of security technologies cannot automatically be interpreted as a reaction to growing urban insecurity. "Nor can any conclusions about surveillance in cities be drawn from [increased] sales of CCTV systems. […] Cameras are often simply used to regulate traffic flow" (ibid.).

Until now, academic debate has rarely explored the interplay of domestic security and urban development. The sparse discussions of the issue have focused on the historical perspective. Experts, the public and the media assess threats to security very differently. Even expertises are inconsistent. Tailoring precautionary measures requires precise, objective risk assessments.

Security plans – not just for terrorist threats – primarily focus on so-called critical infrastructures. These include "organizations and facilities of key importance to the urban community whose destruction or impairment would result in long-term supply bottlenecks, considerable disturbances to public safety or other dramatic consequences" (DStGB 2006, p. 6). Since these infrastructures are mutually dependent, damage to any one of them would significantly affect every aspect of urban life – power cuts amply illustrate this interconnection. Restructuring in recent years, including continuing internationalization of networks (e.g. energy and telecommunications), privatization and partition of state infrastructure (e.g. passenger and freight

systems) and increasing dependence on information technology, has necessitated inclusion of new players and a general overhaul of existing security plans.

Locally, security policy is seen "as a matter for higher government authorities and international defence alliances" (Lenk 2006, p. 1). Although risks and threats clearly affect people at a local level and, more importantly, are felt locally ("crime hotspots", "critical infrastructure", "no-go areas" are just three terms which highlight the local relevance of security issues), we still do not have a comprehensive local security policy. Currently, responsibility for local risk management "as a whole does not fall under overall municipal policy" and "is relegated to the various departments: emergency medicine, fire fighting, police" (ibid.). Even cautious analysts would say that local risk control, measured against the local fallout of global risks and threats, does not yet seem "particularly mobilized" (ibid.).

Dealing with threats demands realistic assessment, prevention – insofar as this is possible – and concerted action when damage occurs. Increasingly, this can only be achieved by cooperation among the departments. The wider the damage, the more apparent this need becomes. Even minor disasters require a considerable amount of coordination, and a collaborative approach to prevention makes sense.

3 URBAN SECURITY AS A PUBLIC RESPONSIBILITY

A key task of government is "protecting the public from dangers which cannot be averted individually" (Weber 2004, p. 1) and "guaranteeing security and public order" (DST 2004, p. 1). In Germany, the police are the principle guardians of law and order. They are supported by other enforcement agencies. Civil defence in Germany is structured hierarchically; the federal government and Länder work together. Civil defence is a national responsibility, while the states handle disaster control. Germany's civil defence relies largely on a safety and rescue system provided by honorary and voluntary organizations (volunteer fire brigades, the Deutsche Lebens-Rettungs-Gesellschaft e.V., German Red Cross, the Arbeiter-Samariter-Bund, etc.). In particular, local governments in Germany are entrusted with ensuring law and order. "When city walls became redundant, external security [...] ceased to be a municipal responsibility, and since the Munich police force, the last to be re-established after the Second World War, was nationalized in 1975 (Lange 1998, p. 83), internal security has also been a federal and Land obligation" (v. Kodolitsch 2003, p. 5). Municipal security focuses are:

- risk prevention (granting and withdrawing pub/restaurant/amusement arcade licences etc., establishing prohibited zones, monitoring immigrant organizations etc., sheltering the homeless, imposing curfews, protecting minors and restricting the right of assembly),
- urban development measures (establishing use criteria, preventing emergence of architectural no-go areas etc.) and
- designing social, youth, family, housing, education, culture, employment and other policies to support crime prevention.

Security and preventative measures as tasks in themselves are only slowly entering discussions in these areas. It was not until the early 1990s that municipalities recognized security as an interdepartmental responsibility and developed integrated approaches, generally grouped under the heading "local crime prevention" (cf. DST 2004, p. 2 ff.). New local security tools (ibid.) include:

- public order and security partnerships between police and the municipality: they aim to curb the tendency to "place responsibility for security exclusively with the police and public order with the city" (DST 2004, p. 2),
- crime prevention councils to integrate citizen involvement and contribute to developing neighbourhood solutions,
- municipal security services to assume security duties which, due to cutbacks in state budgets, can no longer be performed by the police or which are no longer provided by local departments (e.g. Inspection duties traditionally carried out by parking attendants, conductors etc.).

Urban areas are increasingly depicted as crime zones and debates are often fuelled by a growing fear of crime rather than being founded on actual crime rates. The security situation in Germany's conurbations is, however, "far less critical than in most other cities in Europe and the world" (DST 2004, p. 1). Yet within

metropolitan regions, there are "clear signs that our security systems must be refined and extended" (ibid.) to meet emerging demands. Concerns include:

- organized crime and corruption,
- new security issues in areas with negative demographic trends,
- growing citizen expectations in the sphere of public order and general risk protection (ibid.).

Additionally, debates on urban security are focusing more on terrorist threats. Metropolitan regions are at their most vulnerable when staging major events or developing existing infrastructures.

German federal security policy has been restructred considerably since 2001. The line between internal and external security has become blurred; risks and threats can no longer be unequivocally categorized as one or the other. Players active in the two fields rely increasingly on cooperation to solve new security problems. The German federal government and the Länder have formulated a joint New Strategy for Civil Protection in exceedingly threatening situations which emphasizes collaboration within the security community. It harmonizes the existing resources of the federal government, Länder, municipalities and relief organizations, and develops new coordination instruments.

The perceived deterioration of the security situation has made citizens more willing to accept restrictions to their personal freedom. For instance, 44% of Germans feel antiterrorist security precautions are insufficient, and more than 60% would like to see the German armed forces deployed for law enforcement and border protection duties (Allensbach survey, cf. BPB 2004, p. 2). In German cities internal security measures influence different spheres and constitute new security regimes. Measures include legislation (amending security and public order acts, threat protection regulations), organizational intervention (replacing informal arrangements with government agencies or private enterprise) and symbolic alterations to the cityscape (closing off certain areas, enhancing visibility, beautification) (Wehrheim 2004). Technology upgrades are essential to inner security in cities.

4 ICT SUPPORTED SECURITY TECHNOLOGIES

The security technology sector offers an array of solutions equal to the complex task which are being implemented in municipalities or may be introduced in the future. The advantages are weighed against misgivings regarding ubiquitous technological surveillance and social exclusion and scepticism towards security promises. Nonetheless, security authorities are willing to resort to technology, particularly when faced with imminent or suspected threats. In most cases this occurs before thorough analysis has been performed or integrated action plans synergizing technology, strategies, concepts and non-technological measures have been devised. Such solutions appear to appease technology users, or at least decision-makers, who are at least able to demonstrate the ability to react in critical situations, and technology providers who "portray an immature technological application as a panacea" (Lenk 2006, p. 2).

The security market is booming. The German federal government, Länder and municipalities spend approximately 30 billion euros annually on internal security. Private security service sales have risen from 1.9 billion euros in the early 1990s to 3.6 billion euros (v. Landenberg 2004). These figures clearly show that the employment of security technologies and urban security restructuring not only involve security considerations, but are also economically motivated.

This section expounds upon only a few examples of new security technology application in municipalities. The cases described below focus on "visible" front-end applications for public and private spaces. They illustrate how commonplace security technologies already are in spheres which do not incontestably fall under "internal security".

4.1 Video surveillance

The topic of video surveillance is not new to municipalities. It is considered "the most significant innovation for internal security in cities" (Wehrheim 2004, p. 23) in recent years. Video cameras are widely used to monitor traffic. Video surveillance systems have also become an established component of facility security (for government agencies, stadiums, public transport etc.). For years now video surveillance systems have been used to prevent crime on city streets and in public spaces, e.g. to police drug-related criminality. This development was spearheaded by British municipalities, some of which have proceeded to implement CCTV

systems extensively in shopping streets, busy public places and elsewhere so individuals can be traced throughout larger areas of cities.

Surveillance of this sort can be automated with the support of biometric and behavioural characteristics. One possible use would be "filtering out" people who are considered likely to do property damage (e.g. graffiti tagging) on the basis of route tracking.

Video surveillance was first allowed in Germany after 2000 as a result of Länder police law amendments. There has been no attempt to establish a nationwide surveillance scheme like the one in the UK. Cities argue that video surveillance activities should be restricted to crime hotspots. Surveillance can complement other crime prevention measures, but is not a substitute for them (DST 2004, p. 5). The number of permanently installed video cameras is estimated at 500,000. Video surveillance has only been used sporadically to monitor crime in German cities. For the most part crime-ridden areas were observed with two to three cameras (Wehrheim 2004, p. 23). The London terror attacks, the train bombs found in North Rhine-Westphalia and daily reports of vandalism and violence on public transport and in public spaces in general have spurred further debate on substantially broadening the scale of video surveillance.

Because constant surveillance of public places often leads to profound invasions of personal privacy (the right to one's own image, the right to informational self-determination) its implementation is limited; private monitoring of public spaces is restricted, time limits have been set for data storage, the use of hidden cameras is prohibited and notices of surveillance activities must be posted. Nonetheless, there continue to be grey areas, infringements and inconsistencies which have incited public debate on video surveillance. The use of surveillance data in borderline cases continues to be a hot topic.

Video surveillance data analysis has proven particularly effective in solving crimes. It is used more and more to identify offenders (e.g. following the attacks in the London Underground, in combatting ordinary crimes, vandalism etc.). A wide range of opinions have been expressed regarding how effectively video surveillance deters crime. Its preventive impact in high crime areas is commonly mentioned as a positive outcome along with its provision of evidence for criminal prosecution. Measurable crime reduction in areas monitored with CCTV is sometimes offset by increased crime rates in other areas, the so-called displacement effect.

The scale of surveillance has expanded significantly in recent years and will continue to grow in the mid-term. In addition to the proliferation of cameras in public spaces, various surveillance techniques are being networked, and private und public security measures are being coordinated, e.g. to create security alliances (cf. Hempel 2003).

4.2 Biometric access systems

Using biometric identification in counterterrorism has been discussed frequently in recent years. The debate centres on integrating biometric data in identification documents and using biometric traits for identification and access control. The number of operational biometric ID systems in Europe has skyrocketed from around 8,500 (1996) to over 150,000 (2004) (European Commission Joint Research Center – JRC, cf. Horvath 2005). The biometrics industry is expected to grow considerably. Unfortunately, no official revenue or employment statistics are kept for this sector. It is difficult to distinguish exactly what proportion of security technology implements biometrics, and the companies involved tend to have prohibitive information policies (cf. Petermann/Sauter 2002, p. 6). We must therefore rely on market studies conducted by interest groups and private institutions. In 2004 the entire biometrics market in Germany was estimated at 12 million euros. Large federal government contracts are expected to push market volume to 377 million euros by 2009 (SOREON 2004, cf. http://www.heise.de/newsticker/meldung/48560). Despite the stated reservations, the figures suggest that the market is indeed still maturing. As is often the case when new technologies are first introduced, revenue forecasts are very optimistic. It is also evident that large government contracts have been driving the market.

Biometric systems tested to date use facial recognition , fingerprinting and iris scans :Forensics identify people using DNA characteristics.

An array of unsolved problems remains. Some individuals cannot be detected with fingerprint and iris recognition because their traits cannot be recognized or are not sufficiently distinctive. With age, recognition methods become less reliable and some occupations (e.g. jobs in which finger injuries are common) hamper biometric recognition. Moreover, conditions at the time of recognition (e.g. lighting during facial scanning)

can interfere with the system. Lastly, these systems are feared to have too many security loopholes, e.g. fingerprint recognition (Bundesdatenschutzbeauftragter 2005, p. 47 f.). In addition, no bioethical frame of reference has been established for the development and use of biometric technologies. Discussions on the acceptability of biometric technologies have focused mainly on cost-benefit aspects and security issues (BITE 2005).

The notion that such access systems are only employed in high security areas and at border control points is erroneous, as the entry system for Hanover Zoo season ticket holders illustrates. People wishing to subscribe to the zoo must first supply personal information which is recorded in a ticketing system. A digital photo is taken and saved the first time the ticket holder visits the zoo. Digital photographs are taken before entry on every subsequent visit and are compared with the stored data. Visitors may only enter after they have been positively identified. With more than 71,000 visitors, this represents the largest application of biometric identification in Germany's service sector (DStGB 2003, Glitza 2004, Schiffhauer 2004). Municipalities could install biometric entry systems in places like museums and sports venues. Numerous other applications in the realm of security are conceivable.

4.3 RFID

Radio frequency identification (RFID) is microchip technology which enables contact-free data transfer. RFID systems include an antenna, a transceiver, a transponder and radio frequency technology. They can be employed to: recognize objects, authenticate documents and commercial goods, optimize processes, i.e. automate logistics, support access control and track vehicles and monitor the environment etc.

Transponder systems are not entirely new. They have been used to identify animals for around 20 years. Due to significant advances in silicon chip technology and radio transmission, and especially due to the improved integration of the two, RFID has become a focus of public debate. It is superior to other technologies employed for similar purposes:

- It offers a much broader range of features for access control technology than standard smart card and magnetic stripe systems. Non-contact data transmission is user-friendlier (no waiting periods, active registration process etc.).
- In the logistics field, bulk processing can replace the time and labour consuming individual registration of goods. This improves operational efficiency and increases resource utilization rates. RFID also has security advantages (e.g. asset tracking).
- Branches with high security requirements and extensive verification procedures benefit most from cost reduction (e.g. logistics and waste management companies).
- Businesses with self-contained supply chains (e.g. retailers) also expect to profit from this technology. In flow structures of this sort RFID transponders, which are still relatively costly, can be used repeatedly and continually (BSI 2004, p. 85 f.).

Cities are applying RFID technology to an ever greater degree. RFID applications already abound in public transport. Because about a fifth of ticket costs are spent to manage ticket sales, radio frequency identification is appealing to transit companies. Adopting this technology is expected to lower costs and improve transport operations. Germany's first project with contact-free cards was introduced in the mid-1990s (Cap 2005).

RFID applications in urbvan settings are now used in healthcare, facility managerment, waste management public libraries etc.

A major worry regarding RFID technology is that personal data may be manipulated because the processing stages lack transparency. Some systems allow data access from metres away. Both RFID and readers can be inconspicuously embedded in everyday objects. Data protection concerns are reinforced by awareness that "identifying individuals, including linking this technology with video cameras, […] has already been tested on the market" (Bundesdatenschutzbeauftragter 2005, p. 46). A number of everyday viability issues remain.

5 TECHNOLOGICAL-ORGANIZATIONAL CONVERGENCE IN AN URBAN SETTING

New security technologies can be utilized in a variety of ways in urban areas. The combination of a range of technologies, such as video surveillance, biometric profiling and non-contact data transfer is enabling the development of complex identification, entry and surveillance systems. These can control access to and use

of certain areas (city centres, local public transport, embassies, ministries, government agencies etc.) and larger parts of a city. Convergent technology systems like these are already in place.

Economic changes (e.g. the fall in the price of computer memory) and technological developments (e.g. higher capacity storage media) are making it easier to manage data. Storing information without specific justification or purpose is becoming an increasingly popular precautionary measure (particularly in security circles). It is also maintained that the public is more inclined to allow their personal data to be filed, possibly as a trade-off for heightened security. On the basis of this assumption, there have been efforts from some quarters to facilitate the process of gaining ex post access to data which was originally gathered for different purposes. The debate in Germany on using road toll data to combat crime and terrorism demonstrates the issues at hand. The gradual spread of the practice of using data retroactively for objectives other than those originally intended is one of the main reasons for public opposition to storing personal data in any form.

On the one hand, we must take full advantage of all technologies which can be employed to contain threats. On the other hand, the growing practice of collecting personal data and information that can be traced back to individuals within their particular urban setting and the possibility to link this data will take surveillance to a whole new level. Organizational as well as technical convergence has a particular role to play in this domain. The opportunity to link data, combined with factors such as the increased overlapping of internal and external security countermeasures and a desire to assess the situation comprehensively based on the available facts, will make it possible to develop ever more detailed profiles of individuals. Without wanting to dramatize the situation by conjuring an image of the "transparent citizen", technical-organizational convergence will make it easier than ever to obtain details on private citizens. Closer integration of technical and organizational resources will also increase the danger of data being misappropriated at a later date.

6 URBAN FUTURES UNDER NEW SECURITY REGIMES AND URBAN PLANNING

The use of information and communication security technologies involves dangers and potential benefits which must be considered and weighed up. Surveillance technology, for example, has preventative potential as it lowers the detection threshold (e.g. of minor violations and crimes) and of potentially dangerous situations. The subsequent growth in intelligence on particular security matters could theoretically enable early intervention. Empirical findings however , taking the situation as a whole into account, demonstrate that the potential of these technologies is not being exploited and cannot be exploited. On the other hand, there is a danger that surveillance which is focused too heavily on certain areas will lead to exclusion or crime displacement.

The implementation of ICT security technologies can improve a city's accessibility if, for example, permanent security measures such as fences, security margins and protection devices are replaced by technological control systems and temporary measures. However, these technologies can also reduce the accessibility of certain city areas if that is the purpose of the system or if its implementation targets certain social groups too heavily (cf. Graham 2005).

It is always difficult to assess the impact of a technology. Security technology, too, can only be properly judged once in a specific application. The growing use of security technologies must be considered in the context of real and perceived threats and the security regime which has been set up to counter them.

Safety matters are a challenge for urban planning. The changing nature of the threat, the increasing use of security technology in particular parts of the city and the growing significance of security issues for city life could have a variety of repercussions. These include a fundamental shift in the image of cities, the long-term transformation of urban architecture and space and adjustments in the use of urban sites.

6.1 Cities as unsafe places

The public may increasingly view cities as unsafe places, giving rise to a new type of "urban fear". Cities are comparatively "unmanageable areas" and are therefore suspected of harbouring every type of security threat: from "common criminals" to terrorists planning attacks. These fears are already being voiced in international urban studies literature . There is a very individual fear of crime. The objective crime rate is often low, while people may expect it to be at a high level.“ Perceived safety of a certain location seems to become a locational factor for the settlement of companies and citizens. To be reckoned a high crime area may lead to a downward spiral in economic and social development of a neigbourhood. Therefore urban planning has to

focus more and more on safety and security measures. It has the opportunity to create a picture of safe and secure places and contributes to make public and private spaces appear more manageable and to encourage people to use public spaces.

6.2 Fortification of cities

A growing or lasting threat could lead to public and private places becoming more heavily "armed" through the step-by-step introduction of security measures, security technologies and architectural features which promote safety. First, authorities, the public and investors begin to pay more attention to what is happening around them, thus creating a kind of informal surveillance system. Then security technology is upgraded and regulations controlling activities in public places are tightened. Fences, barricades and gates are constructed and an "architecture of fortification" begins to distort the face of the city. In security circles, this is referred to as "target hardening" (Oc/Tiesdell 2000). Urban planning has to assess the specific safety and security demands of different locations carefully in order to create lively and attractive public and private spaces. On the one hand a fundamental fortification of urban structures would dramatically constrain urban life. On the other hand appropriate implementation and use of security technologies may help to minimize interventions in the spatial structures of urban areas. Surveillance and access control technologies may substitute some structural measures (“intelligence instead of concrete”). In this way security technology offers the opportunity to minimize barriers..

Security considerations may strongly influence town planning - at least at vulnerable locations. This would significantly change the face of city centres where such sites are concentrated (e.g. Berlin or Frankfurt am Main). The solution could be designing and implementing a comprehensive security plan. By looking at London we can see where this development would take us. IRA attacks in the City at the beginning of the 1990s prompted construction of a "ring of steel", like Belfast's. The number of entry points to the financial district were reduced and road blocks were erected, making it possible to temporarily cordon off the area if necessary. Thousands of video cameras were installed, security plans were devised for financial institutions and they were advised to limit the number of entrance points to each building. Buildings were fitted with more security technology and back-up premises of the original sites were created for an emergency. Police patrols increased significantly (cf. Coaffee 2003). Urban planning has to think about what it means to mixed-use areas in the long run, when defined security demands lead to a higher concentration of specific buildings and structures (like office space) in certain “lockable” areas.

Changing security conditions also have implications for the organization of mass gatherings, which have become a favourite tool of modern urban planners in their endeavours to market public space. For example, growing security demands have led to the increasing use of personalized tickets, which can prove extremely inconvenient for the eventgoer. Extensive security measures (road blocks, flyover bans etc.) can also disable large parts of a city.

6.3 „Archipelagos of safety“

Supposed "archipelagos of safety" such as shopping malls, train stations, central squares, business improvement districts and gated communities could proliferate (cf. Wehrheim 2002), leading to the categorization of urban spaces according to their level of security. Polarization would result with areas viewed either as safe or unsafe. A further factor to be considered here is the existence of "undefined areas" which are becoming increasingly common as a result of demographic developments, gradual technological changes and economic restructuring. Due to their frequent recycling, these areas could also be labelled as unsafe. Urban planning has to set the stage for safe and secure spaces in all urban spaces. It has to prevent the emergence of architectural no-go areas.

"Control zones" or "security zones" could be constructed on boundaries of undesirable neighbourhoods. Large cities could develop an island system made up of overlapping milieus (localized poverty milieus, the working, leisure and residential areas of the various lifestyle groups and the milieu of cosmopolitan, highly skilled workers) who strive to control and minimize contact with each other (cf. Wehrheim 2004, p. 26). "Security zones" around "institutions under threat" may be expanded to residential buildings. Depending on the level of security required, temporary entrance restrictions may be imposed on particular parts of a city, combined with technological surveillance of these areas. Measures temporarily restricting access are already in use. These range from police orders (declaring an area off limits to certain individuals) and constructing

barricades at events to longer-term entry bans for specific areas. Technological surveillance will considerably extend the feasibility of such entry restrictions and it will individualize access regulations. Therefore it will depend on the specific implementation conditions of these technologies and the regulations of their use whether it gives leeway to city dwellers (e.g. by temporarily limiting access restrictions and substituting rigid barriers) or it cuts liberty of action by supporting software sorted urban geographies. Urban planning has to become aware of this possible new inner-urban polarization processes and has to deal with it.

The growing use of technological surveillance could transform the nature of public space, ultimately resulting in the loss of certain spaces and the merging of public and private spheres. Some fear, for example, that public spaces could become "elite consumer enclaves governed by private law" (cf. Hamedinger 2005). Urban planning has to ensure the “legibility” of spaces. In the context of public and private spaces this means that boundaries between public and private spaces and their different security regimes have to be marked clearly – by constructional or symbolic means. Public places need spatial management to improve their functions and to make sure that citizens get the impression that there is someone who cares.

6.4 Redesigning infrastructure

Urban security regimes could have an impact on infrastructure planning. It may be considered necessary, for example, to change the design of entrance areas to public transport (as has already been done to some extent in airports) and limit transfers between the different carriers. The development of screening corridors equipped with explosives detectors or sensors which can remotely recognize hidden explosives will revolutionize existing transport infrastructure. In the final analysis, we have to consider the possibility that the infrastructure of major airports and train stations with adjoining shopping centres and office complexes may simply be too vast to ensure security. For security reasons, it may make sense to decentralize facilities. This could entail the disintegration of shopping and transport facilities (e.g. at airports or train stations) and the introduction of size limitations or the concentration of these facilities (depending on what is more suitable for control measures). Eventually it might change urban spatial patterns extremely.

6.5 The virtual and the material city

The relationship between material and virtual space could change permanently. The "space of flows" (Castells 1989) could expand significantly. Partly unnoticed, data from everyday activities could be generated, selected and stored. Numerous new links between the expanded "space of flows" and material space could emerge. One example is the spread of data-based admission controls at events (with personalized tickets), for border crossing (with machine-readable ID which automatically detects biometric characteristics) and for security zones (in public and private buildings). The technological developments behind this trend range from individual and isolated applications to complete sustainable networks. The catchwords in this discussion are "augmented reality", "ubiquitous computing", "pervasive computing" and "ambient intelligence".

Finally, in view of their shrinking financial means, one must ask how cities will be able to respond to increase investment in security infrastructures. There is a danger that architectural, technological and regulatory security measures in cities will successfully combat the threat of attacks, but, in doing so, will impair urban living spaces and disrupt city life, thereby achieving one of the terrorists' objectives.

7 CONCLUSION

The public debate on using technology to improve urban security has provoked a very polarized response from decision-makers as well as city residents: security technology is either demonized or uncritically espoused as the solution to all the security challenges facing the city. Up until now, the potential benefits and risks of security technology have hardly ever been evaluated in specific contexts. Instead of deciding whether to implement security technology on the basis of vague speculation about its virtues, we should conduct more empirical research into the specific effects of individual security technologies and their collective impact. Conversely, to achieve this, we must refrain from automatically condemning every move to introduce security technology as an attempt to establish a "totalitarian State". We should continue to explore the risks associated with these technologies - assuming that this dialogue has indeed begun, a point which itself is open to debate - in order to obtain a more balanced assessment of the situation. Nobody disputes the fact that we are working towards a common goal: to make our cities safer. What must still be

debated is how much security we need and how best to achieve it. The crux is not the implementation of technology itself, but how to combine it with a security plan which addresses the social origins of crime.

In the future, security looms as a vital issue for cities and their residents. Urban security regimes are developing - more in response to events and ad hoc security demands than as well thought-out, integrative programmes. Urban impact analyses are also necessary to mould this blossoming security regime into an integrated local security policy in the medium term. These analyses should not only resolve urgent issues, i.e. how to manage dangerous and threatening situations and disasters, but must also assess the long-term impact of internal security measures on urban life. These issues must be addressed by town planning and technological impact researchers, as well as city residents, technology users and developers. Urban safety needs the cooperation of a variety of actors and it needs tailor-made safety policies not drag-and-drop copies. Urban planning is a fundamental part of urban safety policies.

8 BIBLIOGRAPHY

BITE – Biometric Information Technology Ethics (2005): Press Release, January.

BPB – Bundeszentrale für politische Bildung (2004): Aus Politik und Zeitgeschichte, Editorial.

BSI – Bundesamt für Sicherheit in der Informationstechnik (2004): Risiken und Chancen des Einsatzes von RFID-Systemen. Trends und Entwicklungen in Technologien, Anwendungen und Sicherheit, Bonn.

Cap, Clemens H. (o.J.): Anwendungen von RFID Identifikation, slides from the "Smart Cards, Smart Labels, Smart Devices" lecture, Chair for Information and Communication Services, University of Rostock, http://wwwiuk.informatik.uni-rostock.de/sites/lehre/lehrveranstaltungen/vl_smartx/rfid-applications.pdf, 09/05/05.

Castells, M. (1989): The Informational City. Information Technology, Information Restructuring and the Urban Regional Process, Oxford/Cambridge MA.

Coaffee, Jon (2003): Terrorism, Risk and the City: the making of a contemporary urban landscape, Aldershot.

DST – Deutscher Städtetag (2004): Positionspapier Sicherheit und Ordnung in der Stadt.

DStGB – Deutscher Städte- und Gemeindebund (2003): Kommune schafft Sicherheit. Trends und Konzepte kommunaler Sicherheitsvorsorge. Editorial supplement "Stadt und Gemeinde interaktiv", vol. 12.

DStGB – Deutscher Städte- und Gemeindebund (2006): Sichere Städte und Gemeinden. Unterstützungs- und Dienstleistungsangebote des Bundesamtes für Bevölkerungsschutz und Katastrophenhilfe für Kommunen, DStGB-Dokumentation 60, editorial supplement "Stadt und Gemeinde interaktiv", no. 5.

Floeting, Holger (2007): Can Technology Keep Us Safe? New Security Systems, Technological-Organizational Convergence, Developing Urban Security Regimes, Difu-Papers, Berlin 2007 (Difu-Paper)

Glitza, Klaus Henning (2004): Mundwasser gegen einen Hauch von Toll Collect, CD Sicherheitsmanagement 4, 125-129.

Graham, Stephen (2005): Software-sorted geographies, Progress in Human Geography, 29 October 2005, pp. 562-580.

Hamedinger, Alexander (2005): Privatisierung und soziale Kontrolle öffentlicher Räume in "sicheren Städten", in: Manfred Schrenk (ed.): CORP 2005 & Geomultimedia05, Proceedings, Wien, pp. 547-554.

Hempel, Leon (2003): Verdrängen statt Vorbeugen, in: Telepolis, 15/01/03, http://www.heise.de/tp/r4/artikel/13/13928/1.html, 09/05/05.

Horvath, John (2005): Prepare to be scanned, in: Telepolis, 02/08/05, http://www.heise.de/bin/tp/issue/r4/dl-artikel2.cgi?artikelnr=20635&mode=print, 13 November 2006.

v. Kodolitsch, Paul (2003): Einführung: Sicherheit in der Stadt, in: Deutsche Zeitschrift für Kommunalwissenschaften (DfK), no. I/2003, pp. 5-10.

v. Landenberg, Markus (2004): Mit Sicherheit mehr Jobs, in: Stern Spezial "Campus & Karriere", 1 October 2004, pp. 42-44.

Lange, Hans-Jürgen (1998): Sicherheitskooperationen und Sicherheitsnetzwerke in der eingreifenden Verwaltung – Zum Verhältnis von Polizei und Ordnungsverwaltung, in: Klaus Lenk und Rainer Prätorius (ed.): Eingriffsstaat und öffentliche Sicherheit, Beiträge zur Rückbesinnung auf hoheitliche Verwaltung, Baden-Baden, pp. 82-93.

Lenk, Klaus (2006): Öffentliche Risikovorsorge und gesellschaftliche Sicherheitsbedürfnisse als Gegenstand der Politik. Lecture given at the German Association of Towns and Cities and the Alcatel SEL Foundation symposium on "Municipal Security Communication Systems", 31 May 2006, Berlin.

Oberwittler, Dietrich (2003): Die Entwicklung von Kriminalität und Kriminalitätsfurcht in Deutschland – Konsequenzen für die Kriminalprävention, in: Deutsche Zeitschrift für Kommunalwissenschaften, no. I/2003, pp. 31-52.

Oc, Taner, and Steven Tiesdell (2000): Urban design approaches to safer city centers: the fortress, the panoptic, the regulatory and the animated, in: J.R. Gold and G. Revill (eds.): Landscapes of Defense, Upper Saddle River: Prentice Hall, pp. 188-208.

Petermann, Thomas, and Arnold Sauter (2002): Biometrische Identifikationssysteme. Sachstandsbericht, Büro für Technikfolgenabschätzung beim Deutschen Bundestag (TAB), Arbeitsbericht Nr. 76.

Savitch, H. V. (2005): An Anatomy of Urban Terror: Lessons from Jerusalem and Elsewhere, Urban Studies 42 (3), March, pp. 361-395.

Schiffhauer, Nils (2004): Hinter dem Spiegel geht's weiter, in: GIT Sicherheit + Management 12, pp. 12-13.

Siebel, Walter, and Jan Wehrheim (2003): Sicherheit und urbane Öffentlichkeit, in: Deutsche Zeitschrift für Kommunalwissenschaften (DfK), vol. I/2003, pp. 11-30.

SOREON Research (2004): The Biometrics Market in Germany 2004-2009.

Stegemann, Thorsten (2005): Auf der Suche nach der Stadt der Zukunft, in: Telepolis, 19 October 2005, http://www.heise.de/bin/tp/issue/r4/dl-artikel2.cgi?artikelnr=21143&mode=print, 4 November 2005.

Weber, Wolfgang (2004): Die neue Sicherheitsarchitektur Deutschlands – Neue Strategie von Bund und Ländern zum Schutz der Bevölkerung. Lecture given at the German Association of Towns and Cities symposium on "Improving security to make our municipalities better places to live in", 4 March 2004 in Mainz.

Wehrheim, Jan (2002): Die überwachte Stadt. Sicherheit, Segregation und Ausgrenzung, Opladen.
Wehrheim, Jan (2004): Städte im Blickpunkt Innerer Sicherheit, in: Aus Politik und Zeitgeschichte, no. B44, pp. 21-27.

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Geo-informatics in fighting crime and in strengthening public security

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1 INTRODUCTION

The police personnel must have the ability to examine information, therefore an information system showing data in the most visual and practical form becomes beneficent. Displaying information using the stated formula of the map (situation map/plan) not only confers naturalness but also opens the premises for correlation between the followed entities/events and the particularities of the area where they happen (the zone considered together with its anthropical and natural elements, in the modelling closest to reality).

The police activity often assumes cartographic organization, and transposing this geo-spatial management through the digital approach brings many advantages, as informatization has proved it in many domains.

The modern approach in fighting criminality is based on geo-information applications (GIS) able to:

- represent the digital map of the jurisdictional zone, with its specific interest topological elements;
- monitor the geo-spatial details of the crime-suspected persons;
- reveal the problematic areas (occurrences/risks);
- administrate information concerning the criminal events from the circumscription; etc.

Here are several geo-spatial locating methods applicable in the IT assistance designed for police activities and for managing the situations which endanger the public safety:

by interactive dialog – the localization vocally provided by the caller for the event/incident is recognized by the dispatcher operator and transposed in a position on the digital map;

- automatically – the information system knows the address from where the burglary sensor signals and cryptographically shows it on the screen;
- the automated theft-protection system of a vehicle queries its GPS receiver (which calculates its position by astronomical “triangulation”, respectively by a spherical back-intersection using signals from specialized satellites) and transmits the actual position to the security service where it is connected (LBS, AVL);
- the telephony operator can provide, in case of high necessity, the phone location (by certain LBS techniques – such as cell-ID, CGI+TA, TDOA or E-OTD – the mobile phone can be geo-located in the area of the cellular antenna network – fig.);
- radio-labeled entities (people, mobile equipments) can be dynamically located in the perimeter of a Wi-Fi site (e.g. a campus/building having a 802.11g standard wire-less network).

By intensely exploiting the visual capabilities of cartographic symbolization – respectively by using the powerful GIS symbology: thousands of colours, patterns/fills, transparency, contouring, point-formed of filar symbols, qualitatively and quantitatively parametrized symbols; and also any combinations of these to get typological differentiated representations of the crime events/incidents – the comparisons and relations are in the first place automatically and even involuntarily made by the human eyes/brain.

A long-term benefit of the police activity informatization consists in the potential of integrating video-conferencing and training technologies too.

2 DISPATCHING AND POLICE CALLING CENTERS

If an IT-assisted phone calling centre is implemented at the police unit (inspectorate, division, section), its cartographic subsystem can display a variety of information about the community (geo-spatially referenced), helping the dispatching-operators to process the incoming calls. In this manner the centre's personnel – usually constituting the first contact point between the public/community and the police – possess additional modern and trustful tools. By using the GIS application the operators locate the address of the caller and can transmit information (retrieved on the spot from the police's database) towards an emergency service from the caller’s neighbourhood.

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Sometimes the calls toward police do not require an immediate answer, and the resolving of the signalled problem is done by a local entity around the caller (proximity officer, collaborating institutions – such as those for social services, or other organizations), and for such situations the dispatcher can efficiently disseminate comprehensive information (possibly assembled as a portal built on the community map and published through Internet).

Graph 1: A geo-information assisted dispatcher

The cartographically displayed data reveal (especially when they are aggregated in strategical approaches) spatial points with high frequency of crime/troubling events (hot-spots), in such a way that, for subsequent incidents in these zones, a higher priority or a particular resolving modality can be assigned from the beginning.

From another point of view, the implementation of such geo-information systems in police departments causes the personnel's motivation to rise, as a consequence of technological and professional new challenges and also because of the feeling of being part of a modern organism which benefits from the interest of the administration.

Here are some generic requirements for the control application in a emergencies communication centre (using Computer-Aided Dispatch solutions):

- easy implementation and robustness/reliability;
- user-accessibility in the exploitation stage (reduced learning and assimilation efforts);
- reliability and robust functionality for dispatching operations (in accordance with exploiting specifications, and eventually including advanced facilities, such as identifying the closest intervention unit to the signaled/detected event);
- specific functions for treating those situations which jeopardize public security;
- mobile communication with the on-site personnel and assistance for them (field support/guidance);
- interoperability with subordinated/related police departments and with other agencies involvable in the management of critical situations (ambulance, fire-fighters, emergency situation inspectorates, civil defence, local/national administration, telephony operators, etc);
- reports generation abilities (including dynamic field data capturing) and the possibility of integrating them with the records management system.

Beside the GIS features, such a system could also include AVL functions (Automatic Vehicle Locator, subscribed under LBS), hereby guaranteeing that the closest police/emergency unit/team will be directed towards the event/incident location, therefore minimizing the intervention time.

The mobile communication component of the dispatching system provides the field personnel with real-time geo-spatial integrated details about the actual incident and situation operating/treating details, and even warning notes. In this way the mobile agent will be better informed before reaching the respective scene, which enhances his own security as well as public safety. A side-effect of this informatics and automated cartography approach consists in freeing the dispatcher operator from the position of unique contact point between the incident and the intervention team, respectively in reducing human errors.

In addition, here we can also count the capabilities of accessing important information from locally, nationally or internationally constituted criminal databases.

3 GEO-INFORMATICALLY ASSISTED BRIEFINGS

There are GIS applications available designed for the facile, suggestive and comprehensive presentation of specific information meeting the needs of police workers in the frame of instruction meetings – daily briefings (on shifts), or briefings expressly caused by criminal emergencies – on the PC screen or by video-projection. The work instructions contain data/details about wanted criminals and about criminal incidents, about suspected people and about recidives, about criminal tendencies and the law enforcement pro-active measures, about risk areas, about the people under investigation, paroled people, etc. In the same information system aerial photography, satellite images, video-camera recordings can be engaged too.

The cartographic vision over the controlled area helps police to study diverse scenarios regarding field-forces distribution (a regular repartition or an issue/event conditioned repartition): the sector can be divided depending on streets, blocks, area units, or upon other controlled criteria. In certain circumstances one can even evaluate the success probability for each scenario (using analyses of previous recorded cases, or quality criteria particularly developed).

Graph 2: A geo-spatial briefing with IT support

The informatics-assisted geo-spatial approach can be useful also in the case of instructing and repartitioning police forces in order to ensure control of the large mass events (shows, concerts, sport events, political/social meetings, officials' visits, etc), or even for effective crowd coordination. And in case of a bad incident occurrence in the frame of such events, the police intervention/action will be more coherent and more rapid due to the knowledge of the geo-spatial situation and due to the possibility of real-time gearing of specific resources and IT&C means.

Such a computer program becomes useful in the tactical organization of raids too (such as the raids focused on illicit-drugs): on the one hand the responsible officers find the building location (and identify the owner/administrator of that building), take into account what is around it, observe accessing ways, measure the distances; on the other hand they establish the detailed mode of approaching/operating – the necessary number of policemen, their positions, communication means and passwords, actions timing/synchronization, police-specific means and equipment transportation, etc.

Also briefing schemes and contents prefigurable scenarios conceiving become possible, which will later require only small updating/adjustments before effective exploitation. In addition, the informatics component of work instructions can be archived (stored on a local disk or in storage devices available through the computer network), and this fact makes it easy to monitor the development of cases and to share this information toward different sections of the police or justice. Storing the operative briefings also facilitates self-briefing when/where this is suitable/appropriate.

It is worth mentioning the fact that digital instructions also means less paper and bureaucracy, respectively more time for the concrete activity of police/justice.

4 CRISIS MANAGEMENT

The GIS can constitute an intelligent software for assistance in special situations or crisis management, ensuring the enhancement of response time and of the treatment efficiency in case of security incidents appearing. Here one can also take into account the pro-active approach, including by developing tactical/strategical plans for restoring normality after a crisis. Such solutions can be used in identifying the geo-spatial and temporal conjunctures which favor crime and security incidents too, in this manner being helpful from the perspective of the pre-established treating/approaching/acting methodologies as well.

The system has the ability to function with direct links to live monitoring points from circumscriptions and from institutional, civil and industrial facilities (such as airports, large warehouses, store networks, fuel distribution networks, etc). By the unified integration of the GIS data/functions with security sensors, with surveillance video-cameras, with telecommunication means (for text, voice, video) and with human interaction, such IT security management applications can deploy in a (quasi-)automated fashion answering procedures/algorithms beforehand prepared (action scenarios involving situation signalling to the implicable persons/institutions, transmitting instructions/information for treating the situation, alarming the intervention forces/troupes, triggering some auto-protecting devices, additional recordings over the event, etc).

We can surely say about such information systems that they also have valences toward the «decision support» (hence a generic management perspective), but their principal effect consists in reducing the reacting and restoring times, and in the mitigation of destruction and losses (therefore, in rising tactical efficiency). In addition, by the technical modernity (as they are advanced digital solutions) and by acting coherence (disciplining intervention/restoring efforts due to the fact that all those involved precisely know what they have to do) – both assumed by implementing/exploiting a such a protection solution – the customers' investitions in security are protected (for institutions, enterprises, communities).

It is more and more often proposed that the Computer Aided Dispatch (CAD) systems from the emergency services (unified-112, Police, Ambulance, Fire-station, Civilian defence, Emergency Situation Inspectorates, Environment guards, etc) should have a cartographical user-interface, so that the dispatching operators should possess an interactive map which can display the location of the emergency calls, and which can also represent the geo-spatial and topological situation of the respective area. This opens the collaboration possibility between these services too (and other administrative institutions affected or involvable in emergency situations).

The cooperation between the police, ambulance, fire-brigade and local administration for united interventions can be achieved with the help of a system conceived to have "multi-agency" capabilities, which should enable the deployment of an unified answer in case of a specific event. Such a system can comprise: CAD (computer aided dispatching having geo-spatial representation and cartographic interaction), records management, telecommunication equipments, mobile data devices, on-site automated reporting. And among its basic requirements we can recognize: robustness (reliability, assimilability); flexibility (adaptability to particular and evolving requirements, connectivity with other information applications, scalability to support operation raising and changing, interconnectivity potential with other circumscriptions/jurisdictions).

From an anthropological perspective we will remark, about such geo-information systems, the linkage attribute between human resources and technological ones.

5 CRIMINALISTICS ANALYSIS

A software solution for crime prevention and treatment and for public safety control helps with a more efficient marking of the hot-spots from the covered area.

The digital cartography approach also assists at preventing crimes through the fact that it can clearly identify crime behaviour (revealing it in different hypostases by specific geo-spatial analysis). Here are several concrete modalities in which such a GIS can assist crime fighting:

» fast and easy creation of trustworthy maps showing events and crime phenomena;

» revealing patterns of criminal actions (hiring and/or disclosing criminal's moving paths, recidivism, the temporal crime coordinate, geo-spatial high-risk spots/zones, etc);

» revealing criminal tendencies in the controlled area (by geo-temporal statistical analysis);

» reducing the time needed for identifying and comparing similar crimes; etc.

The hot-spot points on a digital map – possibly distributed across the urban infrastructure configuration (aligned along an avenue; surrounding a commercial building; along a fuel pipe) or upon the nature geography (on the river banks, at a forest-edge, on a mountain crest) – have two functions:

- become a means of interaction (an interface element) whose pointing by the user (with the mouse cursor) will bring on the screen information about the represented crime events;
- provide a visualization of the geo-spatial crime pattern, revealing tendencies and risk spots/areas.

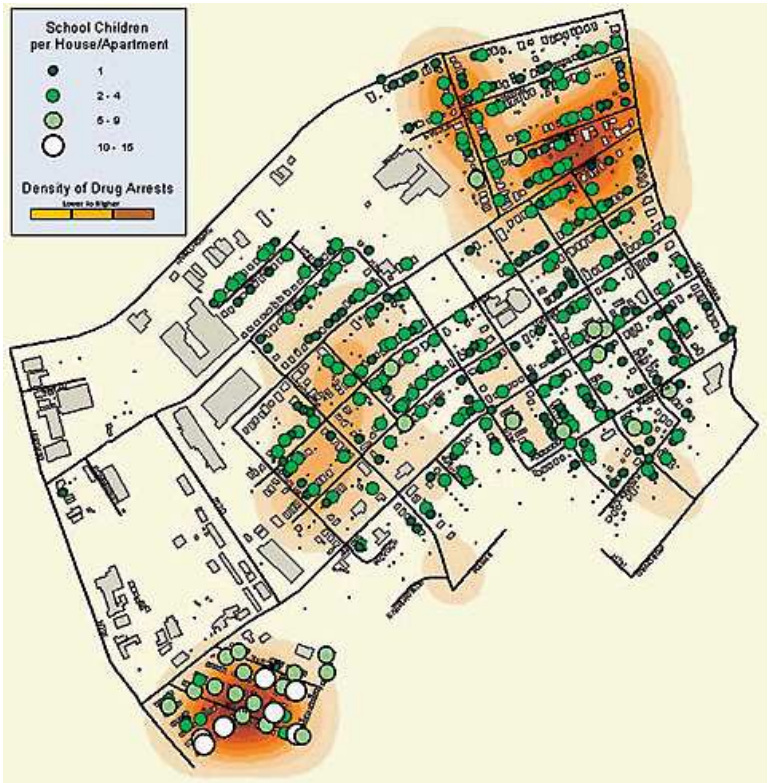
We can observe that most of this criminalistics information is also available to policemen, investigators and detectives by classical means, but scattered and in recipients not easy to consult (files, analogical archives, work annotations, people's memory, etc). Due to the geo-informatics approach the information is fast to retrieve and from a unique query/source, and they can be aggregated in diverse forms and analyzed from different perspectives.

The crimes repeated by the same person usually have something in common, a pattern, a habitude, which – after being revealed with the IT assistance – helps the police to catch the criminal and/or to prevent the crime.

Another benefit of geo-information systems consists in the support of the police officers to draw/establish the route by which the criminal can escape from the crime scene/area – as off-line scenarios (foresights), or as a result of real-time monitoring of that zone – with a positive effect over the on-line assistance given to the teams/patrols from the respective area as well.

Because from a graphical perspective the GIS has a «metric» character, the investigators also benefit from the «precision» attribute when they analyse the moves done in criminal acts:

- representing/revealing the real/probable routes/paths/ways of entering/departing in/from the crime scene;
- exact measurements of the distances between buildings and facilities;
- evaluation of the time lapses needed, inclusively for the transport of the means involved in crime; etc.



Graph 3: Spatial relations between children density and drug arrests

Hot spot statistics, generated by time-conditioned GIS analyses, can say when/where there are chances the next event to happen, therefore the police can prevent its deployment/occurrence. Such studies also help with the proficient placement of surveillance devices (establishing the most suitable locations and orientations).

Policemen know from their expertise that the crime phenomenon is not constituted of isolated facts, that there are causal or human relations between apparently distinct events, therefore when a crime is solved indices can appear to resolve other cases. On the one hand, by visually approaching the incidents – this being the substance of geo-science – specialists can see connections that otherwise are not visible/obvious. On the other hand, the informational unification (assumed/caused by implementation of such an information system) allows the current user to access results from the works of other investigators too.

From the police/judiciary management point of view, the assimilation of such information solution can lead to the restructuring and optimization of the police resources.

The cartographic representation of the criminal incidence can be also oriented outside police department: toward public (for warning, with an educational purpose, or for public services transparency reasons); toward mass-media (press communication; (extra)ordinary reports); towards other interested/involved organizations (law-courts, prosecutors and attorney offices, educational institutions, social services, human rights institutions, European integration, etc); or channelled to population categories who constitute with predilection the targets for crimes (such as store owners).

Revealing criminal patterns (disclosed through analysing the criminal incidents previously recorded in police databases) helps to solve related events as well as the prevention of future/probable events and the mitigation of their effects (by deploying proper measures).

The analyses revealing criminal patterns are most suitable for large urban communities. The geo-information system of a city will centrally record/store huge collection of informational entities (hundreds, thousands, millions):

critical calls (signaling events before start, in their course, or after);

complaints (signaling risk situations and potential ones);

arresting the persons as flagrant offenders or as being pursuit by police as crime suspects; etc.

Accessing these data, along with their analysing abilities by the geo-information system, helps the investigators to more easily identify the criminal situations and to answer/respond more efficiently to the crime events. The police personal can visualize the city circumscription-after-circumscription (the cartographic representation can theoretically comprise anyhow// GIS sources, allowing a better identification of geo-spatial relationships and particularities of the town) and even has the ability to follow the suspects towards the location where they are supposed to run and hide.

A «parametrical» interrogation example: “how many X type events have occurred in the Y days (salary days for the Z company) in an area surrounding for W meters the V barroom?”.

But more complex analyses (gearing more data types, aggregated from diverse perspectives, or even using spatial/alpha-numerical subqueries) can reveal more subtle aspects (such as the time-shifted causality relations) or other indirect linkages between the geo-spatial configuration, phenomena, events and other conjunctures.

The strategical cartography capabilities provide criminalists with a intuitive manner of analysing and visualizing the crimes classified on diverse criteria (among which the geo-spatial component/attribute forms a valuable connector). The result of statistical analyses help the executive personnel to take measures for stopping the peaks of crime activities intensifying before becoming worrying tendencies. At operative levels, the same analysing functionalities become useful for criminal locating and arresting. Moreover, benefiting from «information-telecommunication» integration and from performant organization, police professionals can access/receive such information by fast means (radio-telephony, e-mail, instant-messengers) before they arrive at the crime scene.

Also, geo-information can be used for analysing (and preventing) car crashes, because by studying the automobile accidents from an area (city, county) one can rapidly reveal and understand the causes/circumstances which provoked/favoured them. In this application the abilities of replaying certain analyses under different parametrization will be extremely useful – studying “what if” scenarios involving

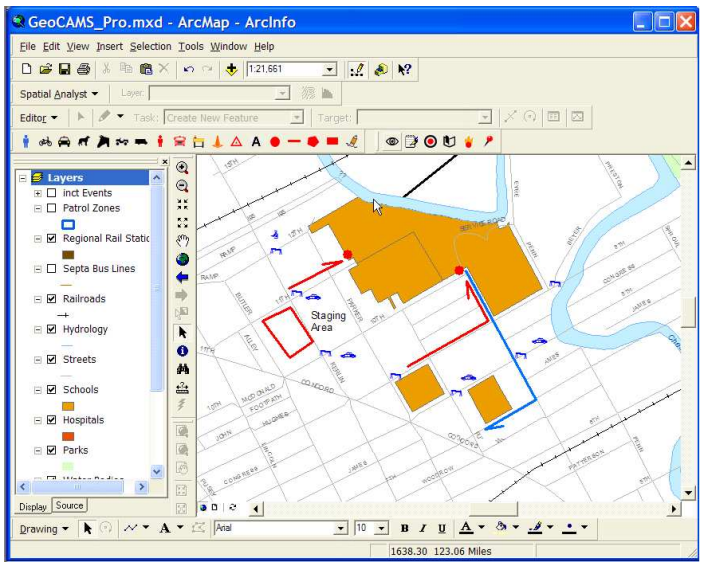
variation regarding speeds, weather conditions, traffic crowdedness, visibility, road surface type and state, vehicle power, tire type/state, etc – so unchaining an intelligence which can help with reducing collisions causality. Likewise, the operative activity of auto-traffic police can benefit from such optimizations, mainly by assuring/consolidating those locations and those day/week times which have revealed a high accident rate (by supplementing with agents and specific materials). Also in this direction, when accidents occurrence thematic maps can be published, the GIS becomes a public education vector.

6 CRIMINALITY CONTROL AND MINIMIZATION

A criminality control specialized GIS helps to visualize and analyse the information describying the incidents from an area. The geo-spatial distribution of crimes, explicitly showed and followed, allow the police specialists to maximally exploit their resources to satisfy/cover the rising request of critical services. This information system can include functions such as following:

- recording the call (made by phone or by other means) and the incipient information;
- triggering the treating/intervention procedures (signaling, alarming, informing, instructing, assisting, monitoring);
- automatically getting the cartography of the incident;
- tools/capabilities for dynamical interrogation (including spatial query engaging the GIS native entities in any combination) and for exploiting the digital model;
- computing and revealing the hot spots on the jurisdictional map;
- the ability of selecting the incidents on temporal criteria (hour, day, date, season, year);
- printing maps (in composition profiled on concrete necessities, in any constituency and at any scale) for disconnected (off-line) analysis or for field on-line assistance;
- fast generation of complete reports (predefined and/or definable, and with a dynamic link to the database, providing trust and assuring the data freshness);
- query defining, editing and re-deploying;
- searching criminal incidents by diverse criteria (classification, type, data, hour, frequency, address/location, road crossing neighborhood, user-defined buffer, people's names for criminals, suspects, victims, court sentences, etc);
- statistically revealed risk and crime tendencies/patterns;
- suggestive and comprehensive graphical interface (including MapTips able to be revealed when the mouse cursor stays over the criminalistics significative graphical entities); etc.

By collaboration between city-halls and the police, schools can benefit from IT systems assisted protection for crisis management. These can integrate call centres and departments/services from the police, and also video monitoring from key locations in the protected site/buildings and automated check of specific automated security sensors (intruder alert for limited access areas, proximity sensors, fire/smoke detectors, etc), maps, geo-spatial imagery (off-line or eventually on-line satellite images), site/building designing plans, intervention/evacuation plans, inside/outside photographic pictures, etc. Such systems can provide critical information to the police, to fire-stations, and to other protection/emergency services, thus helping the fast formation/development of the best and fastest answers for emergency situations, and reducing the negative effects (concerning human's integrity and freedom, and property damage).



Graph 4: The digital plan of a school situation intervention

Naturally, for applying such strategies and implementation at a local/national level several administrative incentives or even legislative initiatives are needed, but – before all – people must understand the potential of these solutions. Likewise, such programmes can be extended to other public vital facilities (courts, communitarian buildings, cleaning-water plants, etc).

In the same geo-security domain one should also subscribe certain IT&C solutions designed for goods planning, relocation and protection (from equipments to facilities and buildings). Thus, the inventory administration for geographic spread resources enterprises/institutions can be completed with functions for security, relocating planning, real-time tracking for displacement, etc. Such applications can be also exploited through the Internet, LAN, or VPN, and can interact with other organizational information systems (human operated of automatically functioning).

In those countries where the juridical/penal organization uses probation (conditioned/paroled release, or with suspended punishment) there are systems which dynamically follow the location of potential criminals, simultaneously offering advanced capabilities for continuous communication, which helps with fighting and preventing crime repetition by conditionally released people or by recidivists. By combining cell telephony with the GIS technology, and based on a monitoring centre assisted by a specialized GIS, such a system automatically tracks the real-time location of potential criminals, facilitating, when needed, the communication between the parolee officer and the conditionally released person. In fact, the monitoring centre operator (geo-informatically assisted and having telecommunication means) becomes “the eyes and ears” of the responsible officer, therefore he can be charged with more cases/tasks.

In such an approach, the person who is considered as having crime potential is forced/constrained to wear at the ankle a small device which – by using the GPS based dynamic geo-locating technology – transmits the location information to the monitoring centre operators (or toward the responsible officer), with a meters precision. When connected to the GIS application, the officer can identify and ad-hoc establish particular restrictions for access (to prevent the monitored person from going into certain locations, such as parks, schools, etc), therefore the monitoring systems operators and/or the parolee officer will receive a signal/warning when/if the conditioned person is approaching/entering an excluded area. Moreover, by the bi-directional communication feature of this system, these professionals can initiate a dialogue with the respective person to warn him and to guide him, thus preventing the breaking of the parolee release. The system can somehow de-tension the difficult relation between the released person and the parolee officer. Likewise, the monitored person understands that is dealing with a hard to trick system. And, on the other hand, the officer effectively gets:

» an additional and substantial continuous help in his mission;

» the possibility to monitor the assigned persons from any location (anywhere an Internet connection exists, including wireless);

» uninterruptible and reliable functionality (sometimes in any global location, due to the combination of satellite tracking, the unlimited cartography ability of the geo-informatics system, and to the continuous communication through mobile telecom).

In the advanced countries there are well-tuned geo-information applications designed for assisting the kidnapping cases (having effective features for spatial locating and for public/citizens cooperation).

7 GEO-INFORMATIC APPLICATION IMPLEMENTATION

Surveying and maintaining public security/safety (by the police inspectorates/sections) can benefit from criminalistics cartography informatics/digital tools to access, display and analyse data concerning crime incidents (previous incidents, current/deploying or in course of solving). This information usually includes: the crime location, suspect address, geo-spatial marks, police jurisdiction, and other geo-referenced data. The GIS application will be able to deploy the following analysis types:

- studying the crime events occurrences;
- analyses of the automobile accidents (events in auto traffic);
- cartographically revealing crime high risk points (hot spots);
- assistance for judicial/penal instrumentation/prosecution of the cases;
- logistic support (organization, resources, planning, tactics);
- tracking the recorded persons known for the sexual abuses;
- neighbourhood surveillance;
- cartographic assistance at releasing the arresting/holding orders, searching orders, property sequestration orders, etc.

An essential component in such systems consists in the locating intelligence, which can have a critical role in analysing important information and to ensuring citizens' security. In addition, the cartographic data flux/flow involved in police dispatching can be integrated with dynamic updates through GPS in order to supply the exact location of an incident, or of the field team who will also receive routing/orientation instructions.

From a somehow synthetic perspective one can identify the following stages/phases for implementing and starting a GIS solution for criminality control:

1.identifying and defining the base requirements and the particular/local specifications;

2.database configuration and collecting the data describing previous police activity (especially from unsolved cases or from recidivist potential cases);

3.installing the application and populating/linking with existing data (and configuring the "server");

4.testing and/or teaching the information system administrator (the IT&C responsible person from the section/department/institution);

5.installing the "client" application and instructing the final users.

Generally, such software applications run on/under the Microsoft Windows operating systems, and are built on/in GIS renowned environments/platforms (however we also notice the existence of several solutions designed for alternative operating systems, such as Unix, Linux, MacOS, and the increasing tendency toward the "open-source" domain). Usually these applications use data files in GIS known formats and accept to read/import data in many standard formats (GIS/CAD, database, tables, spreadsheet, text, raster/bitmap images, satellite images, multi-media documents, complex documents, etc).

8 AT THE END

By engaging complex geo-spatial analysis functions, and by absorbing information from partners (from administration or from civil society), the GIS application becomes an essential element in the fight against crime and anti-social behaviour.

On most of the GIS renowned platforms commercial solutions are already developed, designed for criminality control and for law enforcement through the geo-spatial approach, and they can be the object of

studies, bids, contracts and public acquisitions (of those administrations which want to control crime in their circumscription – local, county, zonal, national, regional, continental).

9 AFTER THE END

From the point of view considered by this theme of "geo-informatics in law enforcement and crime mitigation", beyound the plan (because sometime «to plan is not enough») there are also other things/issues needed (or just recommended for the succes of the project), such as:

- education for the clerks (public servants);
- involvement of a larger/broader number of persons/people;
- shifting atitudes (regarding the subject or concerning the methods);
- obtaining public acceptance;
- political/strategical incentives to leverage the plans;
- synergy developing.

10 BIBLIOGRAPHY

BĂDUT, M., "GIS – fundamente practice"; Albastra Publishing House, Cluj Napoca, Romania, 2004
BĂDUT, M., "Sisteme geo-informatice (GIS) pentru administratie si interne"; Conphys Publishing House, Vâlcea, Romania, 2006

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Application of Tracking Technologies in Spatial Planning Processes: An Exploration of Possibilities

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1 SHORT ABSTRACT

While the application of tracking technologies, like GPS, has been developed substantially in the social sciences and transportation sciences in the last decade, it has failed to make a significant impression in the scientific field of spatial planning. This paper explores the current and future possibilities and the limitations for the application of tracking technologies in spatial planning processes. It is built up around the results of an expert meeting in combination with bibliographical and literature research. After defining the principle application areas of current research on tracking technologies within planning and after sketching its crossdisciplinary character, the paper concludes by formulating major challenges and a future research agenda.

2 INTRODUCTION

2.1 Setting the scene

Contemporary technologies are capable of tracking indviduals and groups of people in their daily life paths. Tracking in the context of this paper can be defined as the capturing and registration of the position in time and in space of a person or a transportation vehicle over a period of time in a technological information device and/or system. Individual movement patterns are the main concern. In addition, tracking includes the registration of the accumulation of multiple tracks of individually tracked people or vehicles over time. In this case, intensity (mutliple people or vehicles) and frequency (multiple moments) are the main concerns. GPS (Geographical Positioning System) and other tracking systems in navigation devices, mobile phones, PDAs (Personal Digital Assistants) and laptops, although, have been developed for other purposes than research applications in urban design and planning. Research in sociology, geography, transport planning, logistics, biology have already been using tracking technologies for their research purposes since the 1990s.

From the start of the millenium, accuracy of tracking technologies increased substantially and mobile technologies were steadily invading daily life. Research using tracking technologies has boomed since. However, the fields of spatial planning and urban design have yet to embrace these information and communication technologies (ICTs) in both their conceptualisation of urban systems (see for an exception e.g. Drewe 2003) and in their possibilities in urban research. Moreover, the application of knowledge on activity patterns of people in spatial planning seems to be standing still since the 1980s. Although the reasons for these two omissions are an interesting study object, this paper focuses on possibilities rather than on causes. Furthermore, this paper focuses on spatial planning rather than on urban design, although both are subject of research within the overall research approach for Urbanism On Track .

2.2 Why tracking technologies?

There are a number of reasons why urban designers and planners should embrace these new technologies as part of their research repertoire. First, urban design and planning influence the long-term spatial conditions for daily activity patterns of people (Klaasen 2004). We claim in this paper that without knowledge of the activity patterns of people, urban designers and planners run a larger risk of their plans creating the spatial conditions for undesirable behaviour (e.g. with larger energy consumption), limiting desirable behaviour or excluding groups of people with limited possibilities from desirable or even necessary daily activities. One of the most prominent, although not exclusive, tools to get insight in daily activity patterns of people is tracking technology.

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Second, the contemporary flexibilisation, emancipation and diversification of the rhythms and places through which people shape their lives puts pressure on the suppositions held by contemporary urban designers and planners about the behaviour of people. Moreover, recent studies on public space show urban designers ill capable of estimating the use of space (e.g. Golicnik 2005). Tracking technologies might offer insight in these dynamics.

Third, tracking technologies offer the possibility to collect and relate large data sets on activity patterns of people. Computation and modelling of these large data sets, e.g. in Geographic Information Systems (GIS), but also other systems, can give insight in the relations between the temporo-spatial configuration of activity patterns, the temporo-spatial configuration of physical infrastructure, the temporo-spatial configuration of socio-economic clusters and networks and the temporo-spatial configuration of urban functions. This way tracking technologies offer a diagnostic tool in urban design and planning that can deal with contemporary urban complexity.

A fourth reason for using tracking technologies in urban design and planning, following this last line of thinking, is that they have proven useful – or at the least are being explored - as additional research method or even replacing traditional methods such as travel diaries in time-use, activity and transport research (see e.g. Wolf, Guensler & Bachman 2001; Verbree, Maat, Bohte, Nieuwburg, Oosterom & Quak 2005) With respect to urban design and planning, an important step forward is the possibility to overcome problems related to visualising verbal or numerical data through tracking technologies.

2.3 Outline of the paper

This paper explores the current and future possibilities and limitations of the use of tracking people in planning processes, in fundamental research in spatial planning and with regard to the translation of tracking-based empirical findings to applicable knowledge for spatial planning. The preliminary research results presented here combine the outcome of bibliographical and literature research with the results from the expert meeting Urbanism On Track on January 18, 2007 at the Delft School of Design (DSD) at the Faculty of Architecture, Delft University of Technology (see also Schaick & Spek 2007).

The following section sets the scene by describing the demarcation lines and common ground in tracking research. Section 4 elaborates by defining the field of application for tracking research in light of urban design and planning. Next, section 5 gives additional insight into the multidisciplinary character of this field of application. This paper concludes in section 6 with a sketch of the conditions necessary to establish a coherent, multidisciplinary research agenda for the application of tracking technologies in spatial planning. The research agenda proposed in this last part of the paper distinguishes between short term, mid-term and long-term suggestions for future research.

3 URBANISM ON TRACK: A PLATFORM FOR APPLICATIONS OF TRACKING RESEARCH

3.1 Demarcation lines in tracking research

Knowledge on introducing, using and applying tracking technologies is distributed over different fields of expertise. Moreover, the application of tracking technologies in scientific research is in its infancy and artists' projects have played and still play an important role in innovation of applications (see e.g. the project Amsterdam Real Time by Waag Society, 2000). The January 2007 expert meeting Urbanism On Track brought together a number of different research perspectives and methods to learn from each other and to advance on the current state of the art (see Schaick & Spek 2007; compare Goulias and Janelle, 2006, on the FHWA Peer Exchange and CSISS Specialist Meeting: GPS Tracking and Time Geography; compare also the GeoPKDD workshop 'Knowledge discovery for sustainable mobility. The challenges and repercussions of discovering behavioural patterns from people in motion').

Research using tracking technologies shows to be subdivided along several lines. First, one can distinguish between the tracking technologies used. Research results seem to be strongly influenced by the choice of hardware. Similarly, different types of hardware can cater to different types of research questions. The major distinction along this line distinguishes between the use of GPS-technology (e.g. Kochans, Janssen, Bellemans & Wets 2005; Shoval & Isaacson 2006; Nielsen & Hovgesen 2004) and the use of triangulation of mobile phone signals (e.g. Ratti et al 2005, 2006, 2007; Shoval 2007 forthcoming). Accuracy of geographical position measures and the agility of finding geographical position fast are important factors.

Although less relevant to spatial planning on higher scales, visual tracking with video technology is a strong field of research as well, in particular based in surveillance-oriented research (see e.g the Joint IEEE International Workshops on Visual Surveillance and Performance Evaluation of Tracking and Surveillance [editions 1998-2006; in conjunction with International Conference on Computer Vision]).

Second, research differentiates along the lines of dominant modes of transport in the research project. Dominant categories are pedestrian tracking (Spek 2006, see fig.1), automobile tracking by in-vehicle GPS-devices (see the Lexington-dataset from 1997, see Zhou & Golledge 1999 and Kwan 2000 for subsequent research, see fig.2) and tracking of vehicles of public transport such as buses (see Sevtsuk & Ratti 2007) or other service transport such as taxis (an artistic example can be found at http://www.cabspotting.org [acc. March 14, 2007], see fig.3). The distinction between unimodal and multimodal tracking studies is a point of attention as well when looking at results form tracking studies.

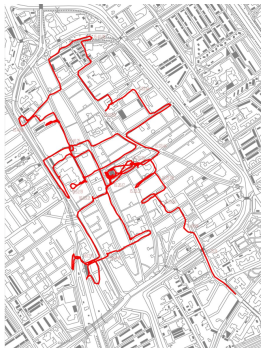

Figure 1: Example of pedestrian tracking from Delft, the Netherlands. Source: Spek (2006)

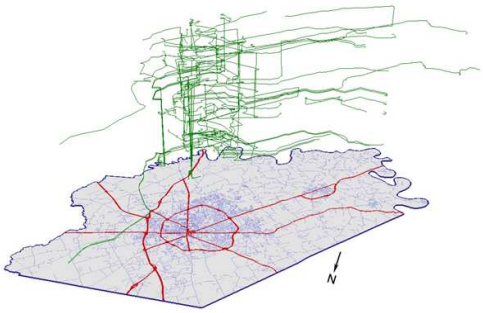

Fig 2: Example of automobile tracking based on the 1997/1998 Lexington GPS dataset. Source: Kwan (2004)

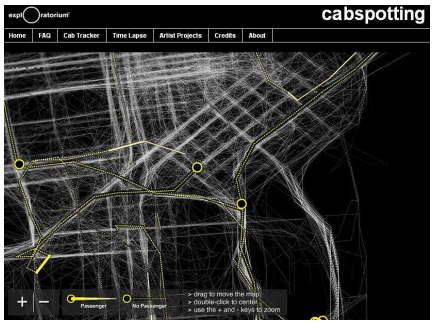

Fig.3 Example of tracking taxis in San Francisco. Source: http://www.cabspotting.org [accessed 14 March, 2007]; courtesy of The Exploratorium

Third, research using tracking technologies develops distinctively different research results by focusing on specific target groups, such as children (Nielsen & Hovgesen 2007), women or ethnic groups (Kwan 2000b, 2002). Specific household configurations have not yet been used as starting point in tracking research, but have been in diary-based activity research (Dijst 1995). A common factor is the attention given to the complete activity patterns of people and the problematisation – e.g. in terms policy recommendations - of the situation of the group under survey. An occasionally made subdistintinction along the same line is the

demarcation of the research project by fousing on inhabitants or visitors based on a demarcation of specific places, neighborhoods or towns such as suburbs, urban centres, recreational areas, events, etc.

The fourth and last major line of differentiation is determined by the scale and scope of the research. Scale and scope of (a) spatial activity pattern, (b) time and (c) number of people are all relevant denominators. Choices with regard to the temporal scale of a study can be, but are not necessarily related to the spatial scale or to the number of participants and vice versa. Research budget is an important factor in making choices regarding scale demarcations of research projects.

A. Both method and outcome differ substantially when the research is spatially limited to a small area, e.g. a train terminal (Millonig 2007) or a large area, e.g. regional activity patterns (research in progress by research institute OTB; see Verbree, Maat, Bohte, Nieuwburg, Oosterom & Quak (2005) and Bohte, Maat, Quak (2006) for starting documents) or the relation between areas and trips of different scales, e.g. in research on touristic travel patterns (Xia & Arrowsmith 2005; compare Shoval & Isaacson 2007). The differences between tracking studies focussing on one activity, on activity chains or on complete activity patterns show similar lines of distinction.

B. Most researchers seem to agree on 7-day periods as the most relevant and feasible time unit for tracking an individuals activity pattern, but research not focusing on activity patterns on an individual level do show different temporal grains of research (e.g. research on the use of a public space in one day and night).

C. The size of the group of respondents is also important, effecting for example differences in the logistics of research and other requirements for data management, but also other types of research claims on for example aggregate effects of behaviour. The choice of tracking technology partially determines this type of scale of a tracking study (see in particular Shoval (2007) and Ratti, Pulselli, Williams, Frenchman (2006) for the large scale possibilities of aggregate mobile phone data due to its ubiquity).

3.2 Common ground in tracking research

Despite these differences, research using tracking technologies builds from a very specific, shared knowledge base. The knowledge brought together in Urbanism On Track shows a strong grounding in research on activity patterns, although on different scales, and in research on travel behaviour formerly using low-tech techniques such as travel diaries (e.g. Dijst 1995), or counting and tracing routes of people by visual observation in stead of tracking technologies (e.g. Gehl & Soholt 2002). A second starting point for most tracking based research is the awareness that the development of tracking technologies as a research tool goes hand in hand with the development of tracking based servcies (see Janelle & Gillespie 2004). The continuing integration in and growing ubiquity of tracking technologies in daily life contributes to an increase of possibilities for scientific research benefiting from commercial applications and vice versa. In this light, ethic considerations on privacy are an integral part of knowledge advancement in the scientific application of tracking technologies. The third and last major pilar for research using tracking technologies is the increased importance attributed to visualising research results. Data from GPS-devices offer simple possibilities to visualise individual tracks. Data-visualisation or geovisualisation is an existent rich field of research (in the context of time-space visualisation e.g. Kraak 2003; Kwan & Lee 2003; Andrienko, Andrienko & Gatalsky 2003) Still, translating aggregate data or large amounts of data of individual tracks into meaningful visualisations remains a challenge.

Although the grounding of tracking technologies seems firm, so far literature research and exchange of knowledge confirms tracking-based research to be poorly linked to spatial planning and its research culture, vocabulary and research questions. This goes as well for urban design. These are grounded in the applied sciences rather than the empirical sciences (see for more on this distinction Klaasen 2004). The following paragraphs (4.1 to 4.3) will go into the possibilities to establish this link despite this distinction.

4 THE FIELD OF APPLICATION

4.1 Tracking People in Planning Processes

Basically, Urbanism On Track is about tracking people in planning and design processes. Most commonly addressed in round table meetings is the desire to test the effects of spatial interventions. Although tracking

people with this purpose seems to be a logical step, it is not simple. Hardly any longitudinal studies exist (see for a notable exception the MOBIDRIVE dataset: Axhausen, Zimmermann, Schönfelder, Rindsfüser & Haupt 2002; also Schönfelder, Axhausen, Antille & Bierliare 2002 on matching longitudinal data from different sources). Moreover, no studies using tracking technologies are known to have purposefully tested before and after spatial interventions. One can ask if this is because the technique is relatively new and still in development – most studies so far can be regarded pilot studies, only since a couple of years research is focussing structurally on tracking techniques – or because there are structural problems in applying tracking technologies this way, such as unwillingness to commission longitudinal research from spatial planning practice. However, examples are available where planning practice has commisioned research on activity patterns for spatial planning purposes (see Boelens, Sanders, Schwanen, Dijst & Verburg 2005, fig. 4).

Awareness of the importance of use-aspects is prevalent in the field of spatial planning and design, although to a limited degree (see e.g. from different angles Klaasen 2005 and Gehl & Soholt 2002). Application of tracking technologies in education of planning professionals and in concrete design and planning projects can be an important step forwards in the development of awareness of activity patterns of people. Besides scientific knowledge derived from tracking people, aspects of playing with the tracking instrument by stakeholders in planning processes and communicating through tracking-based visualisations are most relevant in this context. The use of layer approaches where visualised tracks are superimposed on geographical and functional maps can add value to this application (for a critical review see e.g. Schaick 2005).

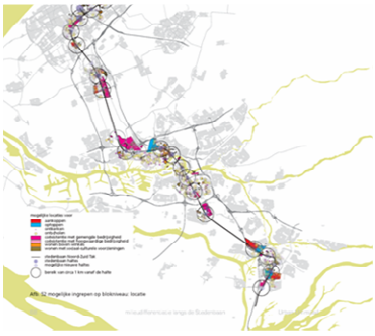

Figure 4: An example of a planning process incorporating knowledge on activity patterns in the development phase: the initiative for the lightrail project Stedenbaan, South Wing, The Neterlands. Source: Boelens, Sanders, Schwanen, Dijst & Verburg (2005)

A last concrete starting point for using tracking technologies in light of spatial planning and design is to actually avoid the necessity for physical planning. Knowledge derived from tracking people can deliver the information to manage the movements of people and vehicles, real-time or through delivering information and services. Dynamic management has been developed mainly in traffic planning where the investment in new physical infrastructure is high enough to trigger alternatives to physical planning. Tracking technologies offer a shift in focus for spatial planning from hardware planning, creating spatial conditions, to software and orgware planning, creating temporal and information conditions (compare Boelens 2005). The effect is that the time scale of planning shortens considerably, implicating both positive and negative aspects, which will not be addressed here. This paper focuses primarily on long term spatial planning in relation to urban design interventions.

4.2 Supporting Fundamental Research in Spatial Planning

Besides planning practice, the field of application for tracking technologies in spatial planning and design extends to fundamental research, testing hypotheses on the interplay between physical networks, functional networks and behaviour of people. One can distinguish two angles to approach fundamental research in spatial planning with tracking technologies. First, tracking technologies can be used to test old hypotheses, such as constraint-based theories (e.g. Hagerstrand 1970) and choice-based theories (e.g. Chapin 1974) of human behaviour. Second, knowledge from tracking technologies can be used to develop spatial organisation principles. Spatial organisation principles are theoretical models of the complex configuration of urban systems, which can be used as design guides in the development of site-specific spatial designs and plans (see Klaasen 2004, see fig.5). Still, it is a big step to get from the data collected in tracking based research to

an organisation principle or a theoretical model of an urban system. One of the main problems is the use of empirical findings in designs and plans, which the following paragraph addresses.

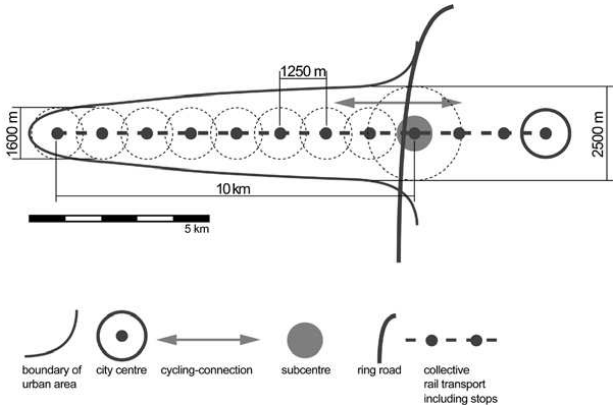

Figure 5: An example of a spatial principle in the form of a theoretical model of an urban system, that can be based on knowledge of activity patterns: an urban lobe. Source: Klaasen (2004)

4.3 Translation of Empirical Findings to Applicable Knowledge

A fundamental problem in using the results of tracking based research in spatial planning is that the results are empirical data, while spatial planning and urban design deal with changing the spatial setting in which empirical data is collected. One can question if the results of tracking technologies have any meaning for the situation after a spatial intervention. A spatial intervention seems to render the tracking outcomes irrelevant. How can we overcome this problem? Another problem of translating empirical findings is related to getting representative samples in tracking studies that have sufficient value and validity for drawing general conclusions for the specific purpose of spatial planning and design on activities and travel behaviour of people.The research field interested in tracking technologies, both within spatial planning circles and elsewhere, is not unanimous on handling these problems. Different solutions are suggested and attempts undertaken in literature and round table discussions.

Overstating the unanimity within scientific fields, one can list a few preferences, based on the findings from the expert meeting Urbanism On Track. Transportation oriented scientists prefer a modelling and simulation approach. Urban designers seem to prefer an approach focussing on increasing awareness of human behaviour. Some express the desirability of developing design principles through tracking based research. Spatial planners and for a part geographic information specialists seem to prefer multi-tier and/or multi-method approaches. Geographic information specialists and transportation specialists both trust in the long run for answers to be provided by the development of extensive databases or data warehousing. More generally supported by different specializations are (1) the application of longitudinal measurements using tracking technologies before and after spatial interventions and (2) multi-actor, multidisciplinary approaches to planning. Both these approaches are said to encounter significant problems in research and planning practice. The remainder of this paper focuses on the latter.

5 INCENTIVES FOR MULTIDISCIPLINARY RESEARCH

Previous sections have established the main distinctions between several types of tracking research and discovered common ground for tracking research. The last paragraphs focused on specific possibilities for the application of tracking technologies in spatial planning and design. The remainder of this paper focuses on the multidisciplinary character of applying tracking research in spatial planning and a research agenda based on this multidisciplinarity.

5.1 Blurred distinctions between fields of knowledge and between science and pratice

The introduction of tracking technologies is giving a new incentive for multidisciplinary research initiatives on spatial planning processes which combine knowledge from (a) human geography, (b) transportation sciences, (c) environmental psychology, (d) geographic information systems and (e) spatial planning and design (compare Goulias & Janelle 2006). For example, this can result in the application of more accurate transportation models, which can be applied in spatial planning with a mobility perspective or transportation planning with a spatial perspective. Also, the use of tracking data of mobile phones and research on urban

navigation and route choice is starting to blur the distinction between spatial planning and mobile services (also LBS – Location Based Services). Moreover, the introduction of ICTs in general seems to offer new possibilities to refresh the theoretical frameworks of both time geography and planning, for example with the concept extensibility (see Kwan 2000a). However, most of the current research still relies for the major part on the solid theories on people's activity patterns of several decades ago (Hagerstand 1970, Chapin 1974). Artistic projects using tracking technologies are pioneering research rather than scientists. The following parapgraphs will develop this blurred vision of existing expertise along three lines: from the perspective of what tracking technologies offer and do not offer (par. 5.2), from the perspective of possible and existing overlaps between bodies of knowledge (par 5.3 and 5.4). and from a theoretical perspective (par 5.4).

5.2 Beyond Technological Novelty: Enriching Tracking Data

The attractiveness of the novelty of tracking technologies can be regarded a major factor in putting effort in gathering specialists together for research purposes. The complexity of research projects using tracking devices seems much larger than those using traditional techniques. This is not only due to the complexity of using the technology. It also seems to be an effect of the eagerness displayed by researchers from multiple fields to take part in research in this pioneering stage. However, research limiting itself to the technology will probably fail to get beyond playful exercises and have an artisitic rather than a scientific output.

Raw tracking data basically consists of the coordinates of a series of locations in time and space of a tracking device. Exactly this accuracy in location and time is the greatest advantage of tracking devices in comparison with diary techniques or questionnaires. However, as such, the information directly derived from the raw data is most often not enough to draw significant conclusions about behaviour or activity patterns. Additional information is needed to answer most research questions relevant to spatial planning, e.g. on the type of activity, together with whom an activity took place or the question if the tracking device was carried all the time and by the right person (compare Lee-Gosselin 2002). Additional data can be collected simultaneously or indirectly from other sources (see Verbree, Maat, Bohte, Nieuwburg, Oosterom & Quak 2005; Janssen, Wets, De Beuckeleer & Vanhoof 2004). It can also be derived from the raw data or previously derived information through the use of algorithms or other computational techniques (see e.g. Wolf, Guensler & Bachman 2001). To decide on relevant research questions and methods to collect additional data and to interpret results, research teams are currently developing multidisciplinary teams, including several technology specialists, database specialists, geographers and planners. Most often the last group is limited to transportation specialists, but spatial planners or urban designers do get in on research teams occassionally (see e.g. Institute for Mobility Research IMOB at University Hasselt, Belgium).

5.2 Transportation and Pedestrian Mobility in Spatial Planning

Besides the binding force of the new technology itself, mobility as a theme has developed in recent years as an important vehicle for multidisciplinary research. Although the research culture of transportation sciences and practice differs substantially from that in spatial sciences and practice, research programmes and knowledge centres based in policy practices have been developed (e.g. Ruimte & Mobiliteit, Synergin and Transumo). Awareness of the relation between infrastructural development and spatial development is grounded in the introduction of innovative applications of information and communication technologies (e.g. dynamic traffic management) as well as innovation of transportation technologies (e.g. light rail and high speed rail networks). A central concept to this multidisciplinary field is door-to-door mobility (Ministerie van Verkeer en Waterstaat 2005), although in the tool network analyses this concept has not gained firm ground after all (Peijs 2006). Research on pedestrian mobility shows similar starting pints for multidisciplinary research (Spek 2006). Tracking technologies could help in this respect.

5.3 Mobile services, ICTs and Spatial Planning

In addition to research-driven motives for multidisciplinary research, earning money by adopting and developing tracking technologies is a major incentive to bring together multidisciplinary teams. On the one hand commercial companies are doing research on tracking technologies for the innovation of services. On the other hand spatial, transport and information sciences are doing research focussing on innovation of knowledge on human behaviour. Management and ownership of tracking databases is the holy grail in this context. However, the organisation of knowledge exchange between specialists and between different stakeholders is a major problem. Universities, companies and governmental bodies each hold part of the

puzzle. Round table discussions suggest universities, in particular research groups in spatial planning, can play a relatively neutral role through which all parties can benefit of exchanging data and information.

5.4 Cross-disciplinary Theoretical Frameworks

The potential to develop large databases of human behaviour is one of the attractions of tracking research. In this light, database specialists are currently developing the conceptual frameworks to deal with these datasets. Simultaneously, as an effect of an accumulation of research on network theory in multiple fields (computer sciences, sociology, geography, mathematics, urbanism, etc.) hypotheses are being developed to grasp the complexity of interaction of individual people, social networks, functional networks and physical networks (see e.g. Carrasco, Hogan, Wellman & Miller, 2007; Knaap, 1997; Larsen, Urry & Axhausen, 2006; Dupuy, 2007 forthcoming). Although large differences can be distinguished, convergence of ideas on the structure and workings of networks is perceivable and conceivable (see Schaick 2005, ongoing research). Three trends seem relevant for the application of tracking technologies in urban design and planning:

- The focus on the individual as unit of analysis, as a crucial addition to area-based, flow-based or network-based views. Especially the vocabulary around the concept activity patterns (originally developed in social geography mid 20th century) seems fit to reflect this trend. The question What about people in regional science? from Törsten Hägerstrand seems to be taken seriously in tracking research.
- The reoccurence of multi-tier or multi-layered frameworks in research on conceptual models from different fields (e.g. see Wachowicz 2007). The layer approach in spatial planning helps prioritizing agendas and mobilizing knowledge (see e.g. http://www.ruimtexmilieu.nl >> lagenbenadering [accessed March 14, 2007]). Similarly, multi-layered frameworks, focusing on the application of tracking technologies in spatial planning as well as being applicable in modelling or other data-oriented apporaches, can be useful in bridging gaps between research cultures and vocabularies.
- The importance attached to visualising data.

As already came forward from different angles in previous sections in this paper, some of the largest challenges for applying tracking in spatial planning are related to the visualisation of tracking data. One risk of using visualisations of tracking data directly in spatial planning lies in its empirical nature. Another challenge is the coherency between visualisations of tracking data and spatial planning visualisations. Still, the possibility to raise awareness in the minds of urban designers and other spatial planners of, for example, people's commuting and shopping patterns is a major step forward that can be taken by introducing tracking technologies. This goes as well for the awareness of recreational patterns in spatial planning processes, since nowadays in the Netherlands non-work-related transport of people takes up more than a third of both the number of displacements and distance travelled (Harms 2006).

One can hypothesise that stimulating the convergence of theoretical frameworks on this level can help developing multidisciplinary research on the application of tracking technologies in spatial design and planning.

6 A FUTURE RESEARCH AGENDA

This last section defines the necessary conditions to establish a coherent, multidisciplinary research agenda for the application of tracking technologies in spatial planning. The research agenda proposed in this last part of the paper distinguishes between short term, mid-term and long-term goals for future research. All goals ask for starting up research initiatives in the near future.

6.1 Future research goals

On the short term, starting now, the expert meeting and the literature offer a number of starting points to apply tracking technologies as existing at the moment: (a) raise funding for multidisciplinary work, (b) develop a discourse on privacy and ethical considerations on using tracking technologies in the conctext of urban planning and design, (c) develop a road map for implementation in urban design and planning, (d) start using tracking technologies in participatory planning processes as a serious gaming tool, (e) develop sophisticated visualistion tools and principles beyond the hype of Google Earth, building from geovisualisation, but focussing more on meaningful representations for planning and design processes.

Other goals can be aimed for on a relatively longer term, for example in five years time. Research on these subjects is already starting, but can be strengthened in both research effort and multidisciplinarity: (a) creating conditions for comparitive research using data from studies using tracking technolog. Different directions of research could focus on standards and/or compatibility of tracking data, data warehousing and supportive comparitive research on transportation systems and urban systems alike; (b) operationalising behavioral and decision models based on tracking data; (c) develop new ways to collect data using innovative tracking technologies or innovative applications of tracking technologies for specific design and planning oriented research, for example the development of longitudinal studies.

Trying to formulate research goals on a longer term runs the risk of becoming futuristic. Both technological advancements and societal trends become highly insecure and unpredictable on this time horizon. Two tiers of thinking seem to dominate discussions on this long-term research future: (a) real-time planning and (b) sustainability. However, for this paper, these subjects are too large to develop. We can conclude that tracking technologies are here to stay. It can be regarded the task of multiple disciplines to develop in cooperation applications of tracking technologies in urban design and planning that, metaphorically, go beyond "building iron bridges as if they were made of wood" .

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8 REFERENCES

ANDRIENKO, N., G. ANDRINEKO & P. GATALSKY: Exploratory Spatio-Temporal Visualization: An Analytical Review. 2003, Journal of Visual Languages & Computing 14(6): 503.

AXHAUSEN, K.W., A. ZIMMERMANN, S. SCHÖNFELDER, G. RINDSFÜSER & T. HAUPT: Observing the Rhythms of Daily Life: A Six-Week Travel Diary. 2002, Transportation, 29(2) 95-124.

BOELENS, L., W. SANDERS, T. SCHWANEN, M. DIJST & T. VERBURG: Milieudifferentiatie langs de Stedenbaan - Mobiliteitsstijlen en Ketenprogramma's voor Milieu's die Sporen. 2005, Rotterdam/Utrecht, Urban Unlimited/Universiteit Utrecht, in opdracht van Provincie Zuid Holland - Afdeling Ruimtelijke Ontwikkeling.

BOELENS, L.: Fluviology - a new approach of spatial planning. 2005, Utrecht, University of Utrecht. Inaugural speech.

BOHTE, W, MAAT, K, & QUAK, C.W.: Integratie van GPS, GIS en Internet voor het Meten van Verplaatsingsgedrag. In CVS (Ed.), Samenwerken is Topsport (pp. 1329-1349). 2006, Rotterdam: Colloquium Vervoersplanologisch Speurwerk (CVS).

CARRASCO, J.A., HOGAN, B., WELLMANN, B., MILLER, E.J.: Collecting social network data to study social activity–travel behavior: An egocentred approach. Forthcoming 2007, Environment & Planning B

CHAPIN, F.S., Jr.:Human Activity Patterns in the City. 1974, New York: John Wiley and Sons.

DIJST, M.: Het Elliptisch Leven : Actieruimte als Integrale Maat voor Bereik en Mobiliteit. 1995, Utrecht: Royal Dutch Geographical Society

DREWE, P.: ICT and urban form, 'old dogma, new tricks'. 2003, Delft: Faculty of Architecture, Delft University of Technology

DUPUY, G.: Urban Networks – Network Urbanism. Forthcoming 2007, Amsterdam: Techne Press

GEHL, J. & SOHOLT, H.L.: Public Spaces and Public Life – City of Adelaide. 2002, South Australian Government, Planning SA/City of Adelaide/Capital City Committee/Gehl Architects

GOLICNIK, B: Urban landscape between design practice, usage and reseach. 2005, Conference Life in the Urban Landscape. International Conference for Integrating Urban Knowledge & Practice Gothenburg, Sweden. May 29 – June 3, 2005

GOULIAS, K. & JANELLE, D.: Report on The FHWA Peer Exchange and CSISS Specialist Meeting: GPS Tracking and Time Geography. 2006, FHWA/CSISS: 10-11 October 2005 The Upham Hotel — Santa Barbara, California

HÄGERSTRAND, T.: what about people in Regional Science? 1970, European Congress of The Regional Science Association Copenhagen '69, Copenhagen, Regional Science Association.

HARMS, L.: Op weg in de vrije tijd - Context, kenmerken en dynamiek van vrijetijdsmobiliteit. 2006, Den Haag: Sociaal Cultureel Planbureau (SCP)

JANELLE, D. G. and A. GILLESPIE: Space-Time Constructs for Linking Information and Communication Technologies with Issues in Sustainable Transportation. 2004, Transport Reviews 24(6): 665-677.

JANSSENS, D., WETS, G., BEUCKELEER, E. de, VANHOOF, K.: Collecting activity-travel diary data by means of a new computer-assisted data collection tool. In: 2004, Proceedings of the European Concurrent Engineering Conference (ECEC), April 19-21, Hasselt, Belgium, s.l., , pp. 19-21

KLAASEN, I.T.: Knowledge-based Design: Developing Urban & Regional Design into a Science. 2004, Delft, Delft University Press.

KLAASEN, I.T.: Putting Time in the Picture. In: 2005, HULSBERGEN, E.D., KLAASEN, I.T. & KRIENS, I.: Shifting Sense: Looking Back to the Future in Spatial Planning. Amsterdam, Techne Press.

KNAAP, W.G.M. van der: The tourist's drives: GIS oriented methods for analysing tourist recreation complexes. WAU dissertation, 1997

KOCHAN, B., D. JANSSENS, T. BELLEMANS & G. WETS. Collecting Activity-Travel Diary Data by Means of a Hand-Held Computer-Assisted Data Collection Tool. In: Proceedings of the 16th Mini - EURO Conference and 10th Meeting of EWGT. Poznan (Poland), 13-16 September, 2005

KRAAK, M.P. (2003). The space-time cube revisited from a geovisualization perspective. 21st International Cartographic Conference (ICC) 'Cartographic Renaissance', Durban.

KWAN, M.-P.: Feminist Visualization: Re-envisioning GIS as a Method in Feminist Geographic Research. 2002, Annals of the Association of American Geographers, 92(4):645-661.

KWAN, M.-P.: Human extensibility and individual hybrid-accessibility in space-time: A multi-scale representation using GIS. 2000a; In:, D. JANELLE & D. HODGE (eds.), Information,Place, and Cyberspace: Issues in Accessibility. Berlin: Springer-Verlag, 241-256.

KWAN, M.-P.:Evaluating Gender Differences in Individual Accessibility: A Study Using Trip Data Collected by the Global Positioning System. Final Report to the Federal Highway Administration. 2000b, FHWA/Department of Geography, The Ohio State University

KWAN, M.-P. & LEE, J.: Geovisualization of Human Activity Patterns Using 3D GIS: A Time-Geographic Approach. 2003; in M.F. GOODCHILD & D.G. JANELLE. Eds. 2003. Spatially Integrated Social Science: Examples in Best Practice, Chapter 3. Oxford: Oxford University Press.

KWAN, M.-P. & LEE, J.: Geovisualization of Human Activity Patterns Using 3D GIS: A Time-Geographic Approach. 2004; in M.GOODCHILD & D. JANELLE, eds., Spatially Integrated Social Science, 48-66. New York: Oxford University Press.

LARSEN, J., URRY, J. & AXHAUSEN, K.: Mobilities, Networks, Geographies. London: Ashgate, 2006

LEE-GOSSELIN, M.: Some reflections on GPS-supported travel survey methods in an increasingly ICT-rich environment, Presentation at Workshop on ICT, Innovation and the Transport System, Arlington, January 2002.

MILLONIG, A.: Application of Tracking-Based Research in the Development of Mobile Pedestrian Navigation Systems. In SCHAICK, J. van & SPEK, S.C. van der: Urbanism On Track – Expertmeeting on the application in Urban Design and Planning of GPS-based and other tracking-based research; Pre-seminar proceedings, 2007. Delft: DSD, Delft University of Technology.

MINISTERIE van VERKEER en WATERSTAAT: Innovatie voor Mobiliteit – Innovatieacties uit de Uitvoeringsagenda Nota Mobiliteit. 2005, Den Haag: Ministerie VWS

NIELSEN, T.S. & HOVGESEN, H.H.: GPS in Pedestrian and Spatial Behaviour Surveys. Paper for Cities for People, The Fifth International Conference on Walking in the 21st Century, June 9-11 2004, Copenhagen, Denmark

NIELSEN, T.S. & HOVGESEN, H.H.: STM Research – The Suburb Case. 2007; in: Presentation for Urbanism On Track. Delft: DSD, Delft University of Technology.

PEIJS, K.: Van Netwerkanalyse naar Netwerkaanpak. Letter by the Minister of Traffic to the parliament (Tweede Kamer). Ministerie van Verkeer en Waterstaat, 2006. [available from http://www.verkeerenwaterstaat.nl/onderwerpen/mobiliteit_en_bereikbaarheid/; accessed March 14, 2007]

RATTI, C, PULSELLI, R.M.,WILLIAMS, S., FRENCHMAN, D.: Mobile Landscapes: Using Location Data from Cell-Phones for Urban Analysis. 2006, Environment and Planning B: Planning and Design. Vol. 33; pp. 727 - 748

SCHAICK, J. van: Integrating the Social and Spatial Aspects of Urban Systems. In: 2005, HULSBERGEN, E.D., KLAASEN, I.T. & KRIENS, I.: Shifting Sense: Looking Back to the Future in Spatial Planning. Amsterdam, Techne Press.

SCHAICK, J. van & SPEK, S.C. van der: Urbanism On Track – Expertmeeting on the application in Urban Design and Planning of GPS-based and other tracking-based research; Pre-seminar proceedings, 2007. Delft: DSD, Delft University of Technology.

SCHÖNFELDER, S., K.W. AXHAUSEN, N. ANTILLE & M. BIERLAIRE: Exploring the potentials of automatically collected GPS data for travel behaviour analysis – A Swedish data source. 2002; in J. Möltgen, and A. Wytzisk (Eds.) GI-Technologien für Verkehr und Logistik, IfGIprints, 13, Institut für Geoinformatik, Universität Münster, Münster, 155-179.

SEVTSUK, A. & C. RATTI: Experiments in Urban Mobility Analysis in Rome Using Mobile Phone Data. In: SCHAICK, J. van & SPEK, S.C. van der: Urbanism On Track – Expertmeeting on the application in Urban Design and Planning of GPS-based and other tracking-based research; Pre-seminar proceedings, 2007. Delft: DSD, Delft University of Technology.

SHOVAL, N., ISAACSON, M.: The Application of Tracking Technologies to the Study of Pedestrian Spatial Behaviour. 2006, The Professional Geographer. Vol. 58, pp. 172 - 183

SHOVAL, N.: Commentary: Sensing Human Society. 2007, Environment and Planning B: Planning and Design 34(2), pp. 191 – 195

SHOVAL, N., ISAACSON, M.: Tracking Tourists in the Digital Age. 2007, Annals of Tourism Research. Vol.34 pp. 141 - 159

SPEK, S.C. van der: Optimizing Routing and Safety for Pedestrians: a Tool for Pedestrian Oriented Design. Presented at Walk21, Melbourne 2006. [available at http://www.walk21.com/conferences/conference_papers_detail.asp?Paper=85&Conference=Melbourne; accessed March 14, 2007]

VERBREE, E., MAAT, K., BOHTE, W., NIEUWBURG, E. van, OOSTEROM, P.J.M. van, & QUAK, C.W.: GPS-Monitored Itineray Tracking: Where have you been and how did you get there. 2005; in G Gartner (Ed.), Proceedings of the symposium 2005 location based services & telecartography Vol. 74. Geowissenschaftliche Mitteilungen (pp. 73-80). Wenen: TU Wien.

WACHOWICZ, M.: Towards an Ontological Framework for Representing People in Motion. 2007; in SCHAICK, J. van & SPEK, S.C. van der: Urbanism On Track – Expertmeeting on the application in Urban Design and Planning of GPS-based and other tracking-based research; Pre-seminar proceedings, 2007. Delft: DSD, Delft University of Technology.

WOLF, J., GUENSLER, R., & BACHMAN, W.: Elimination of the Travel Diary: Experiment to Derive Trip Purpose from GPS Travel Data. 2001, Transportation Research Record; No. 1768; pp. 125-134.

Xia, J. & ARROWSMITH, C.: Managing Scale Issues in Spatio-Temporal Movement of Tourist Modelling. 2005, Proceedings of the Spatial Science Institute Conference: Spatial Intelligence, Innovation and Praxis. MODISM 2005 International

Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand. Spatial Sciences Institute of Australia, Melbourne 12-15 December 2005.

ZHOU, J.J., R. GOLLEDGE: A GPS-based Analysis Of Household Travel Behaviour. WRSA Annual Meeting, Kauai, Hawaii, August 1999.

reviewed paper

Simplified Guided Visibility Sampling for Location Based Services

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1 ABSTRACT

Location plays an increasingly important role in many urban mobile computing and application scenarios. Location based information services for mobile phones and PDAs that provide their users with contextually relevant data - such as local yellow pages search or "where is"-services that guide users to the nearest pharmacy or restaurant - have become widely available on the market.

In this paper, we describe a system that enables novel interaction methods and user interfaces for future location based systems by introducing an additional context parameter beyond location: visibility. We argue that mobile application scenarios greatly benefit from knowledge about the visible environment around the user: Information that is related to objects, geographical features or buildings that are visible to the user may be contextually more relevant than information about objects that are not; interactive, ego-centric maps on mobile devices provide added value if they contain indications of the visibility of surrounding features, as has been shown by [Froehlich et al]; visibility information can even enable entirely new interaction metaphors on mobile devices equipped advanced sensors such as GPS and digital compass, as has been described by [Egenhofer] and [Simon et al].

Based on the guided visibility sampling algorithm [Wonka et al.] we have developed a high performance visibility computation service for handheld devices that gracefully degrades under high load.

2 INTRODUCTION

A number of future service scenarios are based on handheld or portable devices. These range from personal digital assistants (PDAs) and tablet PCs, to smart phones, all the way to low-end cell-phones. As these devices are portable, their actual location plays an increasingly important role in designing services for special applications.

2.1 Location based Services

Location Based Services (LBS) that provide mobile phone users with information related to their immediate environment have been offered by mobile network operators since the late 1990's. Typical examples of LBS offered today are direction finding services or yellow pages-like services (e.g. for finding the next pharmacy or nearby restaurants, see Figure below), mapping and traffic information services, as well as community-oriented applications that facilitate social interactions like chat or messaging by allowing their users to share their own location with other users.

Figure 1: State-of-the-art location based service.

To estimate the position of the user, current LBS implementations typically take advantage of the fact that the location of the GSM cell tower a user is currently connected to is known to the network. Since the width of the area covered by a single cell tower may, however, range from a few hundred meters to several kilometers, this location estimate is rather coarse. Also, the necessity to perform a lookup in a central

database that relates cell tower locations with geographical coordinates imposes scalability limitations in the network. Recently, it has become more common for state-of-the-art smartphones and PDAs to feature built-in GPS receivers. Regulatory initiatives that require network operators to provide position data for mobile phones in case of emergency calls, like the US E911 regulation or the European E112 counterpart, further stimulate this trend. Consequently, newer LBS implementations rely on GPS receivers to estimate user locations, leading to a considerably improved location granularity.

2.2 Visibility from a region in space

Visibility is a core problem of three dimensional computer graphics: visibility computations are necessary for a number of tasks such as occlusion culling, shadow generation, image-based rendering, inside-outside classifications, motion planning, and navigation. While visibility from a single viewpoint can be calculated quite easily, many applications require the potentially visible set (PVS) for a region in space, which is a much more complicated problem. Although a number of excellent from-region visibility algorithms exist, most of them are only applicable to a limited range of scenes, require complex computations, and sometimes significant amounts of memory. For this reason, sampling-based solutions have become very popular for practical applications due to their robustness, general applicability, and ease of implementation.

Although exact solutions for computing visibility from a region in space have been rare [Duguet and Drettakis; Durand], recently two new algorithms have been published [Nirenstein et al.; Bittner] and subsequently improved [Haumont et al.; Mora et al.]. Both of these algorithms are exact and work for general scenes, but due to the complexity of the underlying problem, and the numerical robustness of the implementation can lead to issues that may degrade their solution to be not perfectly exact anymore.

Based on this experience our research group, together with some scientific partners has developed a new, sampling based algorithm that has a vastly superior performance, and although it is not exact, the quality and correctness of the computed visibility solution in some cases exceeds the results of the so-called exact algorithms due to the numerical stability of the new method [Wonka et al.].

3 USING VISIBILITY IN LOCATION BASED SERVICES

The use of a visibility-based query mechanism offers two key benefits over traditional querying, as applied by todays LBS: First, information can be tailored considerably better to the user's context, since points of interest that are visible (for example places in the same street as the user) are most likely more relevant than those that are hidden (e.g. places two blocks away), even if they are closer to the user with regard to their bee-line distance. Second, visiblity-based querying enables new types of geo-spatial user interfaces on mobile phones equipped with orientation sensors such as compass and tilt sensors, as they are currently becoming available on the market.

3.1 Information Relevance

Unlike desktop GIS (geographic information systems) that typically present geo-spatial information on a map on the screen, mobile geo-spatial information systems and location based applications relate geo-spatial information to the user's immediate real-world environment; the user is physically immersed in the geographical region associated with the search space. [Gardiner et al] suggested that the spatial query operations currently offered by spatial databases – such as bounding queries or a fixed radius around a center location – are inadequate under these circumstances. They have concluded that a reference frame based on the user's field of view is more appropriate in the case of mobile spatial querying.

Furthermore, a user study conducted by [Froehlich et al] that compared different types of user interfaces for geo-spatial data access has confirmed that visibility plays an important role in the users' understanding of which points of interest are more relevant than others. An explicit indication of the visibility of nearby geographical features was particularly appreciated in textual user interfaces (which are still the most common presentation format for state-of-the-art LBS) and map-based presentations. We therefore argue that visible points of interest can indeed be considered more relevant for location based services, even if they are further away than other, hidden points of interest.

3.2 Orientation-Aware Location Based Mobile Interaction

Mobile phones equipped with navigation-related features like integrated GPS or digital compass have recently become more commonly available on the market. The growing proliferation of such devices not only promises to drive the demand for geo-spatial applications and location-based applications; it can also enable entirely new ways of how users interact with geo-spatial information in the near future: For example, visibility querying based on GPS- and compass-data from a mobile phone essentially allows users to identify geographic objects by pointing towards them (see Figure 2).

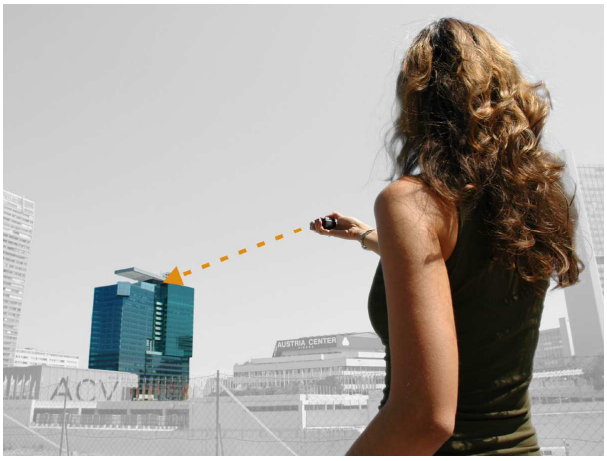

Figure 2: Visibility-facilitated mobile interaction: The Geo-Pointer – accessing geo-spatial information by pointing.

4 FAST COMPUTATION OF THE VISIBILITY FROM A REGION

In a service scenario where a huge number of requests for the complete visibility information from various handheld devices need to be computed by a small number of servers, the computational cost for computing this information by simple means can become prohibitive. In order to handle this situation, we took the forward sampling step of guided visibility samping as a basis for server based visibility computation. The server maintains a database of the 3D-geometry of the city or region in which the service is offered. Whenever a handheld device needs information about the visibility of objects in its vicinity, its location is transmitted to the server, and the server responds with a set of object ids for those objects which are visible from the location of the handheld device, or in a service based approach with all location based services associated with the visible objects.

The forward sampling step of guided visibility sampling is based on starting with a number of random visibility samples, and then extending the set of visible objects, by sampling in the vicinity of them, i.e. the initial samples act as seeds in a flood-fill like sampling process.

In order to speed up the main operation in this sampling approach, namely the intersection of visibility rays with the object database, a pre-calculated kd-tree is built. Although this is a potentially time-consuming operation, it only needs to be performed once for the geometry database, and the resulting k-d tree can be stored. The k-d tree has the additional benefit of being rather memory-efficient, as its size grows with O(N log N) in the number of objects in the geometry database.

For a cost-efficient service, it is necessary to process a huge number of request in a relatively short time. Due to the nature of the underlying algorithm our implementation can handle a single visibility computation within a data set of millions of triangles within a small fraction of a second. In addition to this impressive performance, the service is scaleable in two more directions: parallelization and service quality. Since the database underneath this kind of service is only used in a read-only fashion for the visibility computation, the algorithm can be trivially parallelized for multi-core systems with nearly linear speedup in the number of CPUs, and the geometric data set can be partitioned onto multiple servers, each of which is responsible for a different region. Another way to speed up the performance of the server is by degrading service quality. Although each single request can be handled in a small fraction of a second, it is even possible to restrict the processing time for each query. As guided visibility sampling finds most of the visible objects within the

early parts of the computation, any restriction will only affect a small portion of the overall result. Thus even when the service time is limited the most important visible objects will be found by our algorithm.

5 RESULTS

We implemented our server to automatically adjust its quality of service based on its load. Whenever its service queue is filling up, it is gradually reducing the processing time per query so that it can empty the queue. When the queue is empty it increases the processing time per query again. In order to evaluate the quality of service, we determined the percentage of visible triangles found (when compared to the total number of visible triangles) as a function of the processing time per service request. We performed this test for 100 000 service requests on current PC hardware and plotted the result. The data set that was used for the test represented the city of St. Pölten. Figure 2 shows the results of this evaluation. Clearly, the algorithm finds more visible triangles the longer the processing time per request, and the correct result is only available asymptotically. However, after only about 60 milliseconds, already 90% of all visible triangles are found, and after 150 milliseconds, 95% of all visible triangles are found. Additionally, the triangles are found with a probability proporitonal to their apparent size from the view point, so even after only a few milliseconds the triangles that are found to be visible cover nearly all of the visible objects. Note also, that within the service application a typical object with an associated service, e.g. a house in the city, consists of more than one, typically at least 10 triangles, and if only one of these triangles is found, the location based services associated with this object can be offered.

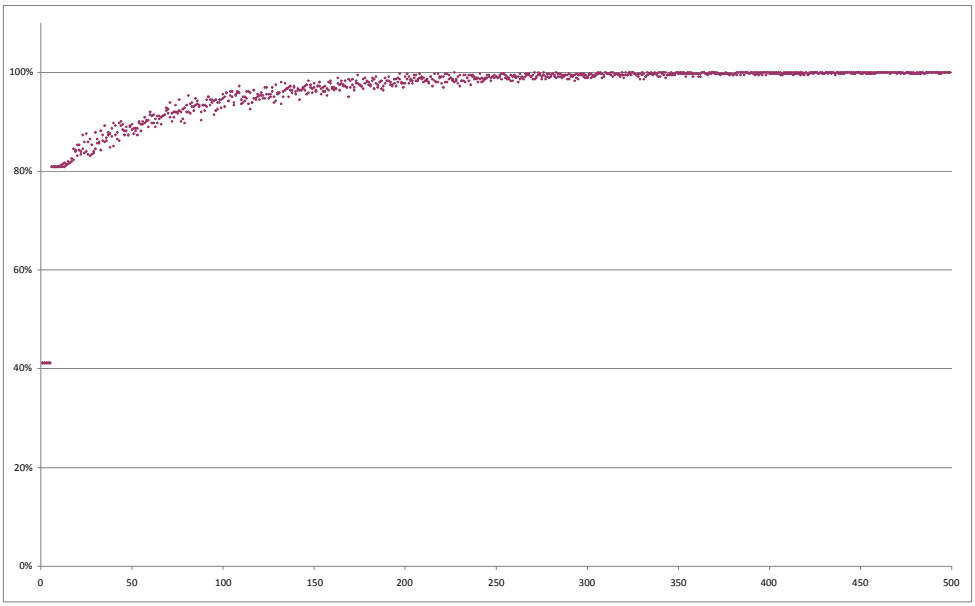

Figure 3: Percent of all visible Triangles found versus time in milliseconds. Although the correct result is only available asymptotically, after only 150 milliseconds 95% of all visible triangles are returned. Note also that even after only 5 milliseconds, most of the visually important triangles have been found, see Figure 8 for more details.

In order to investigate the performance further, we examined a few typical queries. An example of such a query can be seen in figure 4, which shows the map of a city with the marked location of a typical query. All visible triangles are drawn in green, all invisible triangles are drawn in red. As the actual number of visible triangles is a very small portion of all triangles in the database only a tiny fraction of the drawn map is marked in green. More detailed views of the same situation are shown in figure 5 and 6.

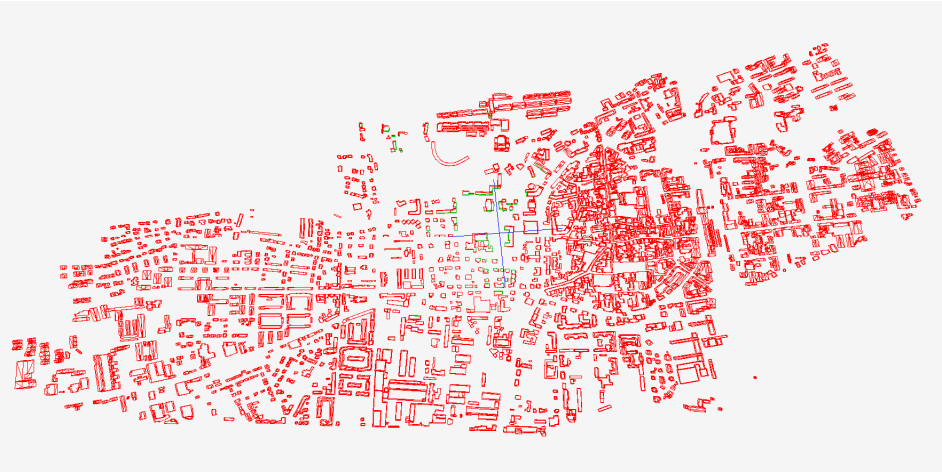

Figure 4: Map of a city with a marked location based service query point and the query result of all triangles found to be visible drawn in green.

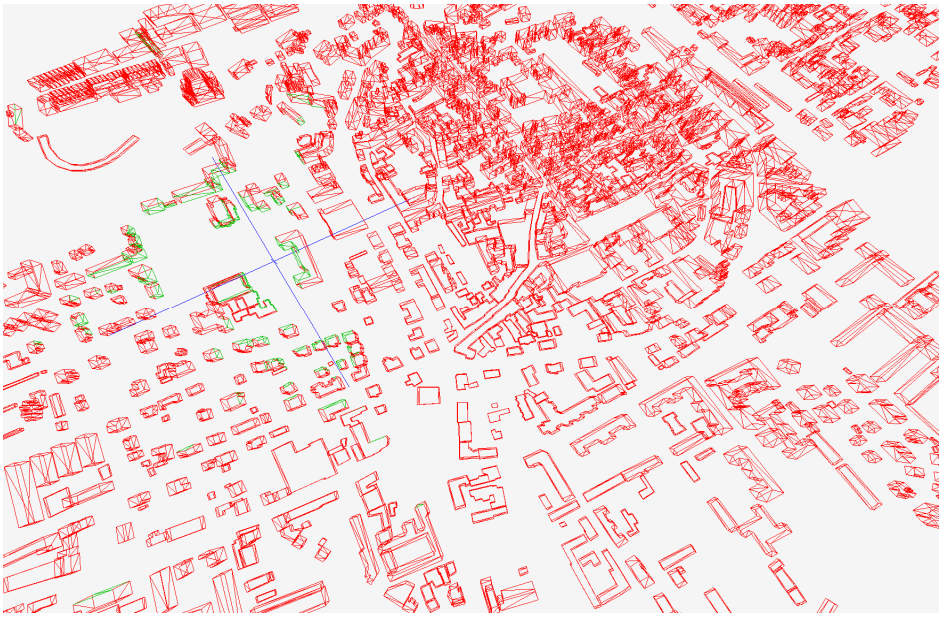

Figure 5: Enlarged view of the map in figure 4.

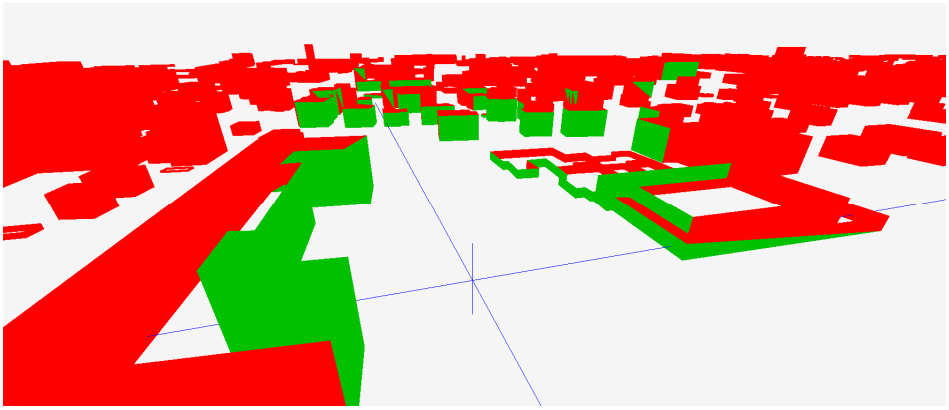

Figure 6: Solid rendering of the query result.

Figures 7 and 8 show the visibility query result as seen from the query point after asymptotic convergence and after 5 milliseconds. Obviously an exact visibility solution requires that all visible triangles have been identified (or drawn in green color) and this is the asymptotically converged result in figure 7. But figure 8 shows, that after a processing time of only 5 milliseconds, the overwhelming majority of visible triangles have been identified, and moreover for each building (i.e. object) that is visible at least one visible triangle

has been found. Thus in this case, any object based visibility service will deliver the correct result after only 5 milliseconds. We therefore estimate, that the chance of missing a visible object approaches zero after only a few tens of milliseconds.

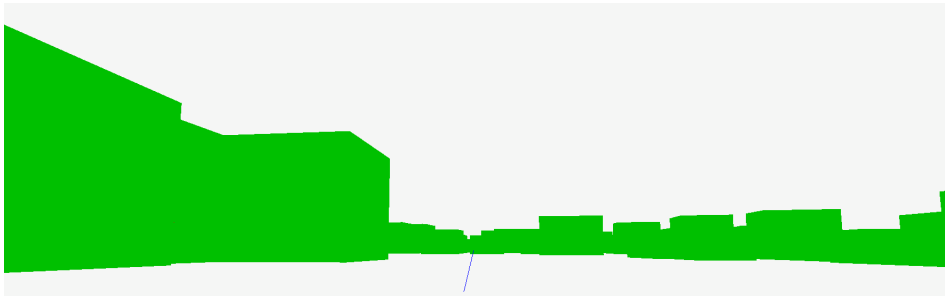

Figure 7: Perfect service response of a visibility query, as seen from the query point: all visible triangles are marked in green.

Our method returns this result only asymptotically.

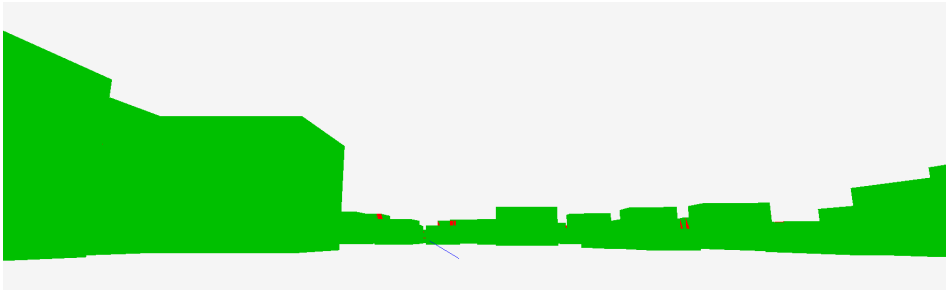

Figure 8: Service response after only 5 milliseconds of processing time as seen from the query point: only a very small number of the visual important visible triangles have not been marked as visible (e.g. appear red), but all service relevant objects have been identified.

6 CONCLUSION AND FUTURE WORK

We have demonstrated a viable solution for computing visibility information that is useable in location based services. Due to the high performance of the method, typical visibility queries can be serviced in a few tens of milliseconds on simple PC hardware. The method has been shown to be scaleable in its service quality, and easily parallelizable for arbitrary service volume. The visibility information that is generated can be used to refine existing services in order to offer visibility-facilitated mobile interaction metaphors such as the Geo-Pointer. A possible improvement of the algorithm for this type of service can be achieved by using the information about the association of triangles to objects to avoid sampling triangles that belong to objects that have already be found to be visible. At a conservative estimate this improvement will speed up the algorithm by another factor of 2. In this cooperation between the ftw Research Center and the VRVis Research Center which are both partly funded by the K+ program, we plan to follow up on this research by actually implementing some useful sample services that are based on visibility information.

7 REFRENCES

BITTNER , J . Efficient construction of visibility maps using approximate occlusion sweep. In SCCG ’02: Proceedings of the 18th spring conference on Computer graphics, 167–175. 2002.

DUGUET, F., AND DRETTAKIS , G. Robust epsilon visibility. In Proc. ACM SIGGRAPH 2002, 567–575. 2002.

DURAND, F. 3D Visibility: Analytical Study and Applications. PhD thesis, Universite Joseph Fourier, Grenoble, France. 1999.

EGENHOFER, M. J.: Spatial Information Appliances: A Next Generation of Geographic Information Systems. 1st Brazilian Workshop on GeoInformatics, Campinas, Brazil, 1999.

FRÖHLICH, P., SIMON, R., BAILLIE L., ANEGG, H.: Comparing Conceptual Designs for Mobile Access to Geo-Spatial Information. Proceedings of Mobile HCI 2006, Espoo, Finland, September 12-15, 2006.

GARDINER, K., CARSWELL, J. D. Viewer-Based Directional Querying for Mobile Applications, Third International Workshop on Web and Wireless Geographical Information Systems (W2GIS2003), IEEE CS Press, Rome, Italy, 2003.

HAUMONT, D., MÄKINEN, O. , AND NIRENSTEIN S. A low dimensional framework for exact polygon-to-polygon occlusion queries. In Proc. Eurographics Symposium on Rendering, 211–222. 2005.

MORA, F., AVENEAU, L., AND MÉRIAUX, M. Coherent and exact polygon-to-polygon visibility. In Proceedings of Winter School on Computer Graphics 2005, 87–94. 2005.

NIRENSTEIN, S., BLAKE , E. , AND GAIN, J. Exact from-region visibility culling. In Rendering Techniques 2002, 191–202. 2002.

SIMON R., FRÖHLICH P., ANEGG, P.. Beyond Location Based - The Spatially Aware Mobile Phone. Proceedings of the 6th International Symposium on Web and Wireless Geographical Information Systems (W2GIS 2006), Hong Kong, China, December 4-5, 2006. Springer Lecture Notes in Computer Science, vol. 4295/2006, pp 12-21.

WONKA P., ZHOU K., WIMMER M., MAIERHOFER S., HESINA G., RESHETOV A. Guided Visibility Sampling. Proceedings of Siggraph 2006, Boston, Massachusetts, USA, July 30-August 3, 2006.

🏆 *reviewed paper*

A comparison of static and dynamic visual research methods for assessing respondents' preferences of social trail use conditions as a basis for recreational trail planning in urban areas

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Keywords: Bicyclists, Walkers, Static, Dynamic, 3d Computer Animation, Still Rendering, Motion, Social Preferences, Character animation

1 ABSTRACT:

Preferences for trail use conditions in urban recreational areas are dependent on many environmental and social factors. This study investigated four social factors: number of visitors on the trail, user composition, direction of movement and motion using a multivariate visual stated choice survey. Several trail use scenarios were developed and respondents (N=149) were asked which of the presented scenarios they would prefer. In order to elicit the influence of motion static (still renderings) and dynamic 3D computer animations presenting the social trail use conditions were developed. All factors under investigation were highly significant in both approaches. A high number of visitors, a high share of bicyclists and mainly oncoming other visitors were disliked by the respondents. Also a range of significant interactions between these factor levels was discovered. The dynamic approach showed strong interconnections between the level of use and the user composition and between user composition and the direction of movement. The results are from interest for city planers and park managers, because the knowledge of user groups' preferences allows managing visitor flows by providing preferred conditions.

2 INTRODUCTION:

Recreational areas are of great importance for the city inhabitants' quality of life. However, many urban recreational areas suffer from a high density of visitors and multiple uses, leading to exceeded social carrying capacities, unsatisfying leisure experiences, and use displacement (Arnberger, 2005; Arnberger & Brandenburg, in press). Non mobile social groups even lose the possibility of proper daily recreation at all. Additionally, unsatisfying leisure possibilities do not only affect the inhabitants' quality of life directly, there are also some striking indirect effects. Nowadays motorized traffic is mainly motivated by the purpose of leisure. Insufficient local leisure possibilities cause displacement of mobile groups which increases traffic flows. More (n.D.) and Tyrväinen and Väänänen (1998) found that the monetary value of realties is influenced by near recreational areas. Trends indicate that the use level of local recreational parks in build up areas will continuously increase in the next decades (Aoki et al., 2002; Sumiyoshi & Uchiyama, 2002; Spies et al., 2006). This is caused by an increase of the average age of the people in general and the higher popularity of leisure sports and leisure activities (Arnberger & Eder, 2007; Spies et al., 2006). This will tighten the task of providing acceptable recreational areas.

Beside the environmental resource conditions, the social trail use conditions, such as the level of use, user composition and user behaviour have a strong influence on the visitors' leisure experience. A range of studies have been carried out to investigate visitors' social preferences for managing recreational trails, using narrative and visual research methods. Recently multivariate visual methods have been used to investigate the relative importance of various factors which influence the visitors' perception of crowded conditions (Arnberger & Haider, 2005).

The number of visitors on a trail is found as an important predictor for how acceptable social trail use conditions are (Manning et al., 1996; Manning, 2004, Arnberger & Haider, in press; Reichhart et al., 2006). However, the number of visitors in a recreational area is not the only responsible factor for the visitors' evaluations and sensations of the use density. Much more, it is the individual situation-based affective evaluation of these social circumstances (Arnberger, 2003; Manning, 1999). The personally perceived visitor load can differ from the actual user load. The theory of "stimulus overload" and the theory of "social interferences" are mainly used to describe this complex socio- psychological connection between social environment and individual experience. These theories were adapted for the crowding experience in recreation areas (Andereck & Becker, 1993). The "stimulus overload" theory focuses on stress appearance when people are confronted with complex situations, such as crowded environments. The theory of "social

interferences" roots in the personal space needed to fulfil requirements, as for example for solitude or space for carrying out some sport activities. These theories indicate in a theoretical way what a pile of empirical studies have meanwhile confirmed; additional factors, such as user composition and behaviour of other visitors have a significant influence on respondents' preferences (Roggenbuck et al., 1993; Rudell & Gramann, 1994). For urban park management this is important, because it is often easier to control one of these factors than directly limiting the amount of visitors, which is not an acceptable management measure especially for urban regions (Arnberger & Haider, 2005).

3 METHODOLOGY

Multivariate visual methods have proven as a sophisticated possibility to gather respondents' preferences for trail use (Manning, 2004; Arnberger & Haider, 2005). However, static images or photos can not provide all information, which visitors would experience in the real world, such as motion, noise and smell. This study compares a static multivariate research method using still renderings with a dynamic method by means of 3d computer animations. Beside the investigation of visitors' preferences for social trail use conditions, the two research methods (static and dynamic) were carried out in order to investigate if and how motion has an influence on the respondents' evaluation of visually presented social trail use conditions. A stated choice model was used to investigate the role of several social factors for trail use preferences.. In both methods, static and dynamic, the same three social factors with three levels each were included (Table 1). Out of the choice decisions the respondents took, it was possible to estimate the relative importance of each factor under investigation. For analysis of the discrete choice experiment the random utility theories of McFadden (1974) builds the basis. The analysis was undertaken in SPSS 14 using logistic regression.

Factors and factor levels	**Level 1**	**Level 2**	**Level 3**
Number of visitors	4	8	16
Direction of movement	25 % come to / 75 % go away	50 % come to / 50 % go away	75 % come to / 25 % go away
Composition of users	25 % Cycling / 75 % Walking	50 % Cycling / 50 % Walking	75 % Cycling / 25 % Walking

Table 1: Factors and factor levels

To create the dynamic and static scenarios, we needed a technique which allowed a very accurate control over all parameters in the filmstrips. The following methods to produce films displaying social trail use conditions in a dynamic manner were tested: "real film", "blue box" and "3d computer animation". It turned out that modelling and animating the crowded scenes in a 3d application is the most practicable way to fulfil the very strict needs of a proper choice model.

In total, 27 static trail scenarios and 27 animated trail scenarios were produced using the 3d software 3d Studio Max. The character animation was handled by the integrated tool "Character studio". The trail scenery was three dimensionally rebuilt within the software, ensuring that the motion and perspective caused scale as well as the visibility of the characters looked close to a real world film. For modelling of the characters common 3D polygon modelling techniques were used.

For the still renderings a typical moment of the 20 sec animation strip was extracted and saved as a static slide. The background of each film and image was created using a manipulated photo of a 120 m trail section in a recreation area in Vienna in order to generate an impression of the characters moving in a real world environment.

The still rendering sets and the 3d animation sets showing different social trail use conditions were presented to 149 landscape planning students during a lecture. All images and animations were shown in pairs of two, i.e. choice set, and the respondents had to choose which of the two trail use conditions they would prefer. The order of presentations was changed to avoid any starting point biases: two groups had to first evaluate their 16 static trail scenarios organised into pairs and, afterwards, the 16 dynamic scenarios in pairs as well, while the other groups started with the dynamic scenarios. Each set was shown for 60 seconds. All choice sets where shown in a standardized manner with two video beams to two different groups at the same time.

Each student evaluated eight 3d animation sets and eight still rendering sets. The scenarios and the combination how the scenarios were combined have been exactly the same for the dynamic and the static sets.

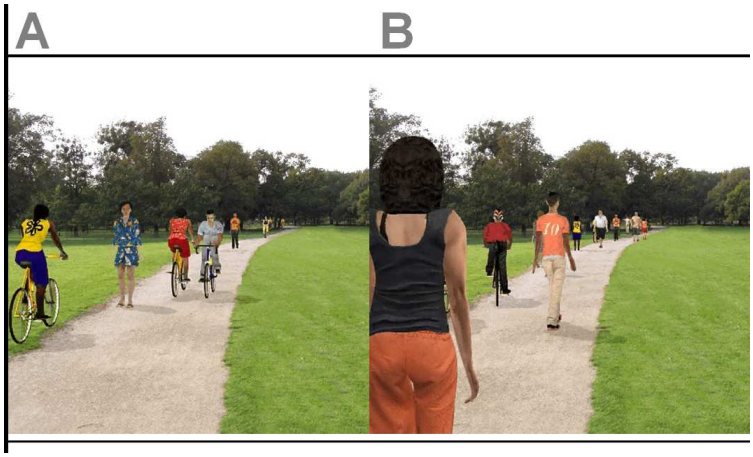

Figure 1: Choice set consisting of two still renderings

4 RESULTS

Figure 2 and Table 3 presents the results of the binary logistic regression models, for the static and the dynamic approach, including the main factors under investigation. The regression coefficient indicates the "part worth utility" of the presented factor level, which shows the relative influence on the respondent's choice. A positive part worth utility describes that compared to the basis level, the respondents tended to chose scenarios with these factor level presented, whereas negative values indicate that the presented factor level was disliked by the respondents.

In both approaches most factors were highly significant (Figure 2, Table 3). The number of other visitors on the trail was the most important predictor variable for the respondents' choice decision. The scenarios with only four people in view were most preferred. The composition of visitors played also a major role. Scenarios with few bicyclists were preferred over scenarios with many bicyclists. The direction of movement was in both approaches (static and dynamic) for the level "75% facing the observer" highly significant. However, its influence was rather small compared to those of the other two factors.

In the static survey the number of visitors was more important for the respondents' preferences than this was the case for the dynamic survey. However, the other two factors, direction of movement and user composition, seemed to influence the respondents' choice decisions more in the dynamic approach than in the static. This may indicate that the visitors' behaviours were evaluated more sensitively in the dynamic approach.

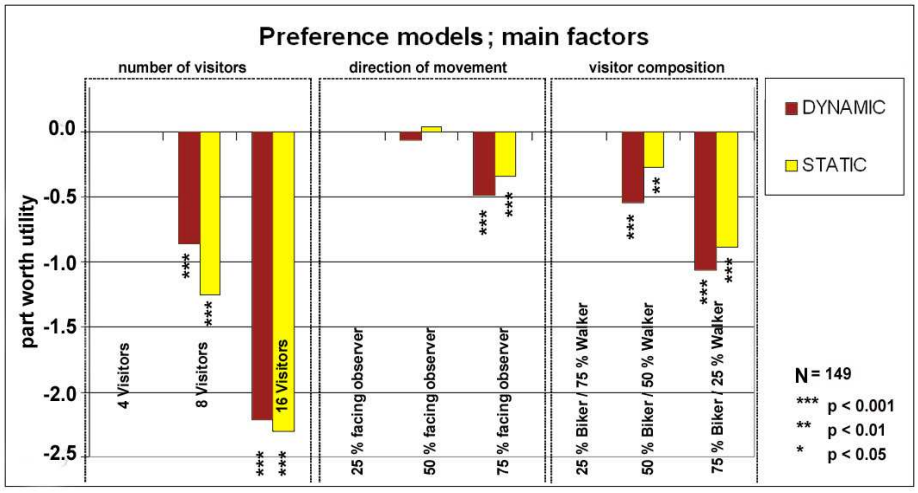

Figure 2: Part worth utilities for the main effects only models regarding preferences for trail use conditions depending on the kind of presentation

In a next step, interactions between the various factor levels were included (Table 2). Using the likelihood ratio test (Louviere et al., 2000) the models' quality increased significantly compared to the main effects only models for both approaches. The model of the dynamic approach predicted 68.8% of cases correctly, the model of the static approaches 70.9%. In the dynamic approach seven interactions were significant, whereas only three interactions were significant in the static approach. Most factors and interactions, which were significant, tended to be rather similar in both approaches (Table 2). However, some interactions were only significant in the dynamic approach, such as the interactions "16 Visitors x 50 % Bicyclists" and "16 Visitors x 75 % Bicyclists". Additionally, interaction between use level and user composition were experienced more importantly when motion was presented. This indicates that using the dynamic methodology it is possible to estimate more precisely interconnection and dependences between various factors. In particular, at peak use level the dynamic model showed that various social factors were of great importance for the respondents' perception of the conditions. Similar to the main effects only models, the number of visitors remained the most important factor for the respondents' choices. However, in the dynamic appraoch some interactions such as between use level and user composition had a stronger regression coefficient than the number of visitors. The user composition played an important role in both models. In particular, fast moving user groups (bicyclists) were evaluated more negatively in the dynamic approach. The direction of movement was in all approaches significant; in the dynamic approach, however, it had a stronger influence.

Factors and factor levels	**Static Presentation**	**Dynamic Presentation**
Number of Visitors	Parameters	Parameters
4	0.000	0.000
8	***-1.255	***-.874
16	***-2.146	***-1.449
Direction of Movement		
25% facing/75% go away	0.000	0.000
50% facing/50% go away	.156	.320
75% facing/25% go away	**-.387	*-.350
Composition of Users		
25% Cycling/75% Walking	0.000	0.000
50% Cycling/50% Walking	-.312	*.454
75% Cycling/25% Walking	***-.592	*-.344
Interactions		
(16 Visitors) x (50 % Bicyclists)	-.075	***-1.178
(16 Visitors) x (75 % Bicyclists)	*-.522	***-1.722
(50 % facing observer) x (50 % Bicyclists)	.099	**-.773
(50 % facing observer) x (75 % Bicyclists)	*-.545	**-.669
(75 % facing observer) x (50 % Bicyclists)	***-1.255	***-.874
Constant	***1.633	***1.324
Correctly predicted	70.9%	68.8%
Cox & Snell R-square	.190	.216

Table 2: Regression coefficients for the main effects and interactions for respondents' choice decisions (N = 149); ***p <.001; **p <.01. *p <.05

In a further step, preferences of respondents with rich experience in bicycling were compared to respondents who rarely went cycling. We undertook this investigation to prove whether experienced bicyclists have other demands than inexperienced bicyclists. The sample was divided into two groups, using the mean of bicycling activities respondents carried out during the last year. Respondents who went cycling more at least four times a year were referred to the specialised bicycling group. It is discussable whether respondents who go cycling more than three times a year can be called "specialised" in this activities or not. The estimated part worth utilities of cycling specialists differed slightly compared to the model for respondents who do cycling less than four times a year(Table 3). We did not include any interactions for this comparison, because of the low sample size of experienced bicyclists (n=28).

Factors and factor levels	Cycling > 3x/year	Cycling > 3x/year	Cycling <= 3x/year	Cycling <= 3x/year	General model	General model
	STATIC Presentation	DYNAMIC Presentation	STATIC Presentation	DYNAMIC Presentation	STATIC Presentation	DYNAMIC Presentation
Number of Visitors	Paramter	Paramter	Paramter	Paramter	Paramter	Paramter
4	0.000	0.000	0.000	0.000	0.000	0.000
8	***-1.182	**-.783	***-1.279	***-.860	***-1.253	***-.855
16	***-2.139	***-2.309	***-2.380	***-2.215	***-2.301	***-2.206
Direction of Movement						
25% facing/75% go away	0.000	0.000	0.000	0.000	0.000	0.000
50% facing/50% go away	-.197	-.263	.272	-.070	.033	.133
75% facing/25% go away	-.485	**-.702	**-.365	***-.493	**-.343	**-.461
Composition of Users						
25% Cycling/75% Walking	0.000	0.000	0.000	0.000	0.000	0.000
50% Cycling/50% Walking	-.318	-.122	-.030	***-.548	*-.274	***-.609
75% Cycling/25% Walking	***-.999	*-.503	**-.396	***-1.064	***-.885	***-1.061
Constant	***1.819	***1.630	***1.439	***1.846	***1.717	***1.803
Correctly predicted	68.8%	70.7%	67.7%	66.9%	69.0%	68.1%
Cox & Snell R-square	.178	.191	.182	.189	0.183	.193

Table 3: Regression coefficients for main effects – comparison between respondents who cycle more than 3 time a year, respondents who cycle less than four times a year and general preference model (N = 149); ***p <.001; **p <.01. *p <.05

The "number of visitors" was highly significant across all models, and therefore did not differentiate between the respondents regarding bicycling. The number of visitors was in all models the strongest predictor for the choice respondents' would take. The factor level "16 other visitors in view" was most disliked, but also 8 visitors in view were evaluated more negatively than 4 visitors in view. Comparing the part worth utilities of the static models with those of the dynamic the results indicate that in particular 8 visitors in view were evaluated more negatively in the static approach than this was the case for the dynamic approach.

Investigating the preferences of respondents' who went cycling more that three times a year some minor differences between the survey approaches were gathered. Whereas the static model only suggests that beside the number of visitors the user composition played a significant role for the choice decisions, in the dynamic model also the direction of movement was from importance. The dynamic approach shows that regular bicyclists do like to cycle in the same direction as most other visitors. Both models static and dynamic indicate that a high share of bicyclists was disliked by regular cycling respondents.

For respondents with low cycling activity the direction of movement was significant in both models. Similar to the dynamic cycling model the respondents preferred to walk or cycle in the same direction as others. For user composition the dynamic model for non regular cycling respondents estimates the factor levels "50% Cycling/50% Walking" and "75% Cycling/25% Walking" as highly significant, wheras the static model only indicates the highest share of bicyclist as singifcantly negatively contributing to the respondents' choice decisions. This describes that particularly in the dynamic approach the user composition was evaluated more sensitively, which could be explained through the differences in speed. Over all a high share of cyclists is disliked from all user groups (walkers and bicyclists), however non-cycling respondents evaluated high shares of cyclists more negatively that bicyclists did.

This study is explorative in a methodical point of view and therefore it was of interest to investigate, how the respondents did perceive the survey method. For both approaches more than half of the respondents could put themselves well or very well into the shown scenarios. People pretended they could put themselves better into the trail scenarios when they were presented in a dynamic way. While for the still renderings 54.5% of the students answered they could put themselves very well and well into the shown scenarios; for the

animation strips 60.2% answered they could put themselves very well and well into the scenario. However, these differences were not significant.

For the dynamic approach also the extent of realism was investigated. Surprisingly, even though the graphic style of the animations was rather poor, almost 70% of the students evaluated the animations as very realistic or realistic. Additionally, the respondents were asked to evaluate the quality of the virtual character behaviour. The evaluations of the behavioural realism were much worse, than the general evaluation of the grade of realism. Only 38% of the respondents found the behaviour of the presented visitors very realistic or realistic. This is due to the somehow robotic animation style. However, it could also indicate that the strict design of this choice survey (the exclusion of many factors from real world) appears not to be realistic to the respondents. A correlation was found indicating that people, who stated that they could imagine themselves well into the shown scenarios, also rated the images and animations as more realistic.

5 DISCUSSION

A range of studies used visual presentation of recreational conditions (Manning et al., 1996; Vallerie et al., 2006; Arnberger & Haider, 2006; Arnberger, 2003) concluding that the results are usable to estimate real visitor preferences. Haider (2002) points out that stated choice surveys might collect very accurate and close to real behavioral data, because the respondents basically also have to choose between alternatives if they go to a recreational area. Manning (2004) argues that visual presentations of recreational scenarios are more suitable to identify recreational standards than narrative methods. So far, however, it was not known how motion has an influence on the respondents' preferences for social trail use conditions. Therefore, two visual research approaches were compared to investigate the role of motion.

All factors under investigation did significantly contribute to the respondents' choices in both approaches. However, the dynamic approach was more sensitive to the interactions between the factors. Although some differences in the evaluations of the static and dynamic trail scenarios were ascertained, the study indicates that both static and dynamic choice experiments seem to have the capability to assess respondents' preferences for social trail use conditions.

The number of visitors was the most important factor for the respondents' choice; the more people were on the trail, the less preferred was the scenario. This result matches with several other studies in this field (Arnberger, 2005; Manning et al., 1996) and is in line with the stimulus overload theory. The relative importance of the factor "composition of visitors", presented through various shares of bicyclists and walkers, was differently evaluated in both approaches. In general, scenarios dominated by walkers were more preferred than bicyclists dominated ones (Figure 2). However, the interactions revealed that the higher the use levels were, the less preferred were bikers, particularly in the dynamic scenario. A high share of fast moving users in crowded situations seem to have evoked respondents' safety concerns. This result documents that bicyclists can lead to a reduction of the recreation quality in recreational areas.

The direction of movement was significant in both approaches. It is remarkable that also the static approach is capable to investigate motion related factors. However, dynamic models were more sensitive to the direction of movemen. In particular, interactions between the direction of movement and the user composition could mainly be observed with the dynamic approach The evaluations of the recreational scenarios worsen when the direction of movement was towards the observers. Particularly oncoming bicyclists received low preference scores. Respondents seemed to dislike being confronted with many oncoming visitors, while preferring to walk or cycle behind others or being confronted with an equal share of oncoming and going away persons. The students were more sensitive to the direction of movement when the dynamic presentation was used (Table 2). Surprisingly, no significant interactions between a high level of use and the direction of movement was found.

Summarizing, high use levels, oncoming users and a high share of bicyclists were evaluated negatively. In particular, using the dynamic appraoch it was possible to asses respondents' preferences and interconections between various factors in detail. Although the number of visitors was in most cases the strongest predictor for respondents' preferences, some interactions with other social factors played a major role. At peak use times, for example, the evaluations of high share of bicaclists even worsen which would be of interest for

park management. A similar results received Arnberger (2005) using a static image-based choice model of another recreation area in Vienna interviewing on-site visitors.

Because directly limiting the amount of visitors in urban recreational areas is not an acceptable management measure, the significant influence of other social factors on visitors' leisure experience offers additional options for managing urban trail use. The user composition of visitors and the direction of movement are found in this study - similar to several other studies (Arnberger & Haider, 2005) - as influencing social factors. A large share of bicyclists was evaluated negatively from all user groups, even regular bicyclists. Separating user groups and offering different trails for walkers and bicyclists might be an option to reduce conflicts. The direction of movement should be regulated for cycle trails, because oncoming bicyclists reduce respondents' acceptance of the trail conditions dramatically. For heavily crowded trails the acceptance could be improved through a rather homogenous direction of movement.

Limitations of this explorative study pertain to the low sample size and the homogeneous structure of respondents. All the 149 respondents were students of the BOKU in the second year of their "landscape architecture "study. To increase the quality of this study more respondents would have been necessary. Additionally, on-site visitors could be interviewed, but technically, this is not possible with the used presentation techniques (Video Beam). Also the graphic style and the motion of the presented visitors were till far away from realism, and probably could be improved a lot. It would be also interesting to investigate if and how different graphic styles and the abstraction from the genuine world influence the results.

Even though motion is one additional attribute in the investigation, there are other missing sensations people would have in real world like smell, noise (Newman, 2006; Manning, 2004) and even taste. In this study only three attributes were included, because of its focus on the comparison between static and dynamic trail use scenarios. However, animated choice experiments could include much more attributes (Haider, 2002). Also the issue how interactivity in means of how the respondent itself would move through a certain scenario might be of highest interest. Through recently rapidly developments real-time render- and sound engines it should be possible to investigate different factors which influence social carrying capacities of visitors in virtual environments.

6 REFERENCES:

ANDERECK, K.L., BECKER, R.H.: Perceptions of Carry-Over Crowding in Recreation Environments. Leisure Sciences, 15: 25-35, 1993

AOKI Y., FUJITA, H. AOKI, K.: Measurement and analysis of congestion at the traditional Japanese garden "Korakuen" In A. Arnberger, C. Brandenburg & A. Muhar (Eds.), Monitoring and Management of Visitor Flows in Recreational and Protected Areas Vienna: Institute for Landscape Architecture and Landscape Management, pp. 264-270, 2002

ARNBERGER, A.: Soziale Tragfähigkeitsgrenzen für Freizeitaktivitäten in städtischen Erholungsgebieten. SCHRENK, M. (Ed.) 10th International Conference on Information & Communication Technologies (ICT) in Urban Planning and Spatial Development and Impacts of ICT on Physical Space. 2005, 525-532. http://www.corp.at/html/corp2005.html, 2005

ARNBERGER, A.: Modellierung sozialer Tragfähigkeitsgrenzen von Erholungsgebieten. Dargestellt am Erholungsgebiet Wienerberg [Modeling social carrying capacities of recreation areas - The recreation area Wienerberg]. Unpublished doctoral dissertation, University of Natural Resources and Applied Life Sciences, Vienna, 2003

ARNBERGER, A., & Haider, W.: Social effects on crowding preferences of urban forest visitors. Urban Forestry and Urban Greening, 3(3-4), 125-136, 2005

ARNBERGER, A., EDER, R.: Monitoring recreational activities in urban forests using long-term video observation. FORESTRY, 80(1), 1-15, 2007

ARNBERGER, A., BRANDENBURG, C.: Past On-Site Experience, Crowding Perceptions and Use displacement of Visitor Groups to a Peri-Urban National Park. Environmental Management, in press.

HAIDER, W.: Stated preference and choice models – A versatile alternative to traditional recreation research. In A. Arnberger, C. Brandenburg & A. Muhar (Eds.), Monitoring and Management of Visitor Flows in Recreational and Protected Areas Vienna: Institute for Landscape Architecture and Landscape Management, pp. 115-121, 2002

LOUVIERE, J. J., HENSHER, D. A., & SWAIT, J. D.: Stated choice methods – Analysis and application. Cambridge, UK: University Press, 2000..

MANNING, R. E. & FREIMUND, W. A.: Use of Visual Research Methods to Measure Standards of Quality for Parks and Outdoor Recreation. Leisure Sciences, 36, 2004

MANNING, R. E., LIME, D. W., FREIMUND, W. A., & PITT, D. G.: Crowding norms at front country sites: A visual approach to setting standards of quality. Leisure Sciences, 18, 39-59, 1996

MANNING, R. E.: How Much is Too Much? Carrying Capacity of National Parks and Protected Areas, In A. Arnberger, C. Brandenburg & A. Muhar (Eds.), Monitoring and Management of Visitor Flows in Recreational and Protected Areas Vienna: Institute for Landscape Architecture and Landscape Management, pp. 306, 2002

MANNING, R. E., & VALLIERE, W. A.: Coping in outdoor recreation: Causes and consequences of crowding and conflict among community residents. Journal of Leisure Research 33(4), 410-426, 2001

MANNING, R. E., VALLIERE W. A., WANG, B., & JACOBI, C.: Crowding norms: Alternative measurement approaches. Leisure Sciences, 21, 97-115, 1994

MCFADDEN, D.; Conditional Logit Analysis of Qualitive Choice Behavior. In: Zarembka P. Frontiers in Econometrics. Academic Press, New York: 105-142, 1974

NEWMAN, P., MANNING, PILCHER, TREVINO & SAVIDGE.: Understanding and Managing Soundscapes in National Parks: Part 1- Indicators of Quality Siegrist, D., Clivaz, C., Hunziker, M. & Iten, S. (eds.) (2006). Exploring the Nature of Management.Proceedings of the Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.University of Applied Sciences Rapperswil, Switzerland, 13-17 September 2006. Rapperswil.pp193, 2006

REICHHART, T., ARNBERGER, A., MUHAR, A.: Assessing trail use conditions using still rendering and 3D computer animation. In: Siegrist, D., Clivaz, C., Hunziker, M., Iten, S., Exploring the Nature of Management. Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas., 13.09.-17.09.2006, Rapperswil; Proceedings of the Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas. University of Applied Sciences Rapperswil., 331-332,2006

ROGGENBUCK, J.W., WILLIAMS, D.R., WATSON A.E.: Defining Acceptable Conditions in Wilderness. Environmental Management, 17: 187-197, 1993

RUDDELL, E.J., GRAMANN, J.H.: Goal Orientation, Norms, and Noise-Induced Conflict among Recreation Area Users. Leisure Sciences, 16: 93-104, 1994

SPIESS, H., MÖNNECKE, M., WASEM, K., KÜMIN, D.: Local Recreational Areas: Accounting for Peoples' Needs in the Development and Selection of Planning Instruments, Siegrist, D., Clivaz, C., Hunziker, M. & Iten, S. (eds.) (2006). Exploring the Nature of Management. Proceedings of the Third International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas.University of Applied Sciences Rapperswil, Switzerland, 13-17 September 2006. Rapperswil.193, 2006

SUMIYOSHI, Y., UCHIYAMA, K.: Recent Trends of Park Use at Tokyo Metropolitan Area , . In Arnberger A., Brandenburg C., Muhar M. (Eds.): Monitoring and Management of Visitor Flows in Recreational and Protected Areas, Conference Proceedings, Institute for Landscape Architecture and Landscape Management, Bodenkultur University: Vienna: 284-289, 2002

TYRVÄINEN L., VÄÄNÄNEN, H.: The Economic Value of Urban Forest Amenities: An Application of the Contingent Valuation Method. Landscape and Urban Planning, 43: 105-118, 1998.

VALLERIE W. A., PARK L. OB, HALLO J. C, STANFIELD R. E., MANNING R. E.: Enchancing visual research with computer animation: A study of crowding-related standards of quality for the loop trail at Acadia National Park. http://www.issrm2006.rem.sfu.ca/abstractdsip_popup.php?id=629, 11/05/2006, 2006

🏆 *reviewed paper*

City of Corfu : The Tranformation of the Physiognomy of a Capital City To A Provisional One Through Testimonies From Literature

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1 INTRODUCTION

The historical line of a city has a significant impact in the formation of its physical and emotional physiognomy which the city projects. It plays a major part in the creation of the speech (logos) and myth (mythos) that determines each significant urban formation. Let us not forget that the speech and the myth establish the ideological foundations of a city. However, the historical context does not only influence the above two elements of its physiognomy; it also plays a central part in the formation of its society, and the architectural space is a significant factor in determining society formation, according to the theories of Rossi, Hiller and Hanson[1] ; in turn both society and architecture are defined significantly by the historical and, consequently, social events.

In addition, we should not forget that the inheritance of the historical events in a city determines the social, political and economic system that governs the city. His system, according to Joseph and Julia Stefanou[2] , is the main factor for the physiognomy of the city, since it influences its form, style, size and development. Nobody can argue that one of Vienna's most celebrated characteristics was the period in history when the city was the capital of the empire of the Hapsburgs. Similarly, all the other historical events that happened in the same space have also left their traces in the image of the city. Another example is that of Venice, a city that projects through its current image its history as the naval and commercial metropolitan capital of Medieval and Renaissance.

However, though we all recognise the city as a witness and evidence of its historical past, we usually overlook other sources of its history where the city still maintains a main part. Moreover, the participation and visibility of the urban space in other forms of historical text reinforces its dominance of certain periods of time. This omission usually occurs due to the fact that in the indirect sources of historical facts, the presentation of the historical reality is not usually the main objective. In this case, the historical reality of the city is view through its reflection. However, the presence of the urban space establishes reinforces realistic the narration of the historical event, since it sets the 'scene' for the action, offering a realistic backdrop to engulf the story.

2 HISTORICAL SOURCES IN RELATION WITH THE URBAN LANDSCAPE. (THE CITY AS A SOURCE OF HISTORY)

The historical landscape of a city is embedded in its monuments and the written narrations that relate with the city. As A. Rossi suggests, there are two major principles that helps us to comprehend the development of a city; its city planning blueprint and its monuments that are visibly the most important elements for the city and present a sense of historical cohesion together with the memories that creates to its population. But there are other elements that express the history of the urban space. One of those elements is literature, which has proven to play an important role in the creation of the myth and speech (logos) of the city. Literature gains social importance and presence in the world through the interaction with politics, law, technology, language, education, property, individual creativity and the other cultural traditions and thoughts regarding significant issues. In this way, literature is incorporated in the mechanisms and codes that society uses to transform the random incidents into meaningful signs. Since we mainly talk about naturalistic fictional narrative, the writer is obliged to proceed carefully checking the accuracy of facts and details in order to recreate places and social activities.

Let us not forget that in early antiquity historical incidents were reported through poetry (Homer) or other forms of literature. As literature was developing its links with historical narration were integrated. Many

[1] URBAN DESIGN AND DEVELOPMENT LABORATORY, NTUA, The Physiognomy of the Hellenic City, National Technical University of Athens Publications, Athens 2000

[2] STEFANOU, J., & STEFANOU, J., Description of the Image of the City, University Publications, National Technical University of Athens, 1999

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historians have declared that poetry, paintings, novels, folk songs and art in general have allowed in many cases academic researchers and scientists to analyse historical events and let them experience the historical moment in a way that no other historical source could.[3]

Within narrative fiction, the writer has the opportunity to narrate the city's historical background and bring into life. The buildings, the streets, the people and their activities constitute the canvas for the writer to paint a picture of reality to wrap his or hers fictional story. On the other hand we have to consider that there are certain limitations to the use of novels and other forms of literature as historical documents, as in the use of other primary or secondary documents. Perhaps the most evident is that of literary license, the freedom of the author of the fiction to manipulate historical facts or events for purposes of literary effect or style. This is a question that must be determined as well in the use of all other fictional works. Hence the reader must be reminded to judge literature for its value as a historical document with the same critical questions and methods as one judges all other potential sources [4].

3 RESEARCH APPLICATIONS

Due its significance in defining human progression, the city of Corfu has been naturally the subject of many research projects and studies; amongst those, key are the studies regarding the image of the city and the ways that this image is being projected. In every circumstance, city space or the city itself projects a mixture of its eternal and temporary elements, as they are defined by the behavior of its inhabitants collectively as well as individually. The orientation of those characteristic elements is a constant quest, since life in the city is ever changing, unstoppable, progressing in fast pace. On the other hand, we cannot ignore the facts that the very elements of the physiognomy of a city are established and documented as necessary knowledge for the smooth running of one's life. Simultaneously, the physiognomy of an urban built space produces certain impressions that lead to the formation of opinions regarding the space that determine the attitudes or actions that people will take towards this particular environment. Finally, the elements of the physiognomy of the city will also create to the individual a set of concepts, which in return manifest the different ways they experience the city through all their senses.

A series of abstract (immaterial) values comprises the myth and the written artifacts of the urban landscape, two important factors for defining its physiognomy. Such factors are the history evidenced in the written and monumental, physical form (it includes also politics, economic and cultural history), folk tradition, social anthropology and literature. The latter in particular is a very strong factor in mapping the city's image, since it involves rational and emotional elements. In addition, literature is essential in promoting to the reading audience this particular image that will create expectations, emotional involvement and sightseeing interests.

There is the opportunity to conduct a research on the stimuli that novelists have received from a specific space as well as the ways that they developed these stimuli in their novels. In the next stage it would be interesting to measure how much impact these novels had in the reading audience and record the emotional and mental expectations they generated to real and virtual visitors. The conclusions from this type of study and research would assist the architects and city planners in making decision towards their redevelopment and regeneration plans as they will understand not only the space's functionality and physical formations but also the social and psychological impact it has in the human collective conscience.

In addition, this kind of research, if used in an organised process, aims to preserve the physiognomy of certain city's areas with significant historical or traditional elements. Especially for the city of Corfu the historical fact that it used to be a capital city at one point transformed its architectural identity. Every research that looks into presenting this transformation from a metropolis to a regional city of a new state, it could also help to identify the elements whose preservation or regeneration could enhance the city's physiognomy, inform its restoration and functionality that had in its historical past. The application of this

[3] OSCAR HUNDLIN, Truth In History, Harvard University Press, Cambridge 1979
GORDON A. CRAIG, History As A Humanistic Discipline, in Historical Literacy : The Case Of History in American Education, Paul Cagnon, MacMillan, New York 1989
JOHN DEWEY, Art as Experience, Minton, Balch & Co, New York 1934
E. W. EISNER, Cognition and Curriculum, Longman Press, New York 1982
[4] CHARLES W MACUNE, Latin American Literature as a Source of History, in The History Teacher vol. 22, 1988, p 500

research could also help local authorities plan their policies around tourism and education activities around historical and architectural monuments.

4 THE CASE OF CORFU: THE HISTORICAL LANDSCAPE

Corfu had always been in the route of ships and migration; a city that offered refuge to a mixture of people from different cultural backgrounds. It had always been in the crossroads of two worlds – the East and the West – and therefore its society had to deal with both. The ability of the city throughout its history to integrate constantly new rulers, civilisations and citizens without any struggle had given Corfu an iconic status as a cosmopolitan European city. Corfu has an excellent geographical position within the Mediterranean and this has often determined the city's major historical role. Apart from the meeting place of populations, Corfu has assimilated cultures and ideologies, and achieved a co-habitation of different elements in harmony.

The city had been a shelter for the Byzantines when Constantinople came under the Ottoman Empire (1453), for the Greeks who fled to the West (1669), for Albanians and Slaves when they were under pressure from the Ottoman rule in 15th and 16th century, and many members of Corfu's aristocracy were descended from those nations. Similarly it was a city shelter for the refuges Souliotes (1800-1815), as well as the Italian rebels of the 19th century. At its harbour was sheltered for a few days the princess sister of French king Louis 16th when prosecuted by the Jacobeans. Everybody who passed through Corfu has left its traces in the collective memory of the city. The fact that none of the monuments of any minority that passed through the island was destroyed purposely, shows how respected this collective memory was.

In more recent history (14th to 19th century), Corfu was the first of the Ionian islands to be separated from mainland Greece – this division was administrative only. Corfu shared apart from its geographical proximity with mainland Greece a strong sense of common language, culture and tradition. However, the city and mainland were fated to follow different historical paths for some time. While avoiding the Ottoman rule, Corfu turned to the West to establish strong administrative, economic and social connections; the island came under the rule of different western states, mainly that of Venice. Corfu's geographical position and its proximity to Italy - a gateway to the Adriatic sea – contributed to its prosperity as a naval, strategic and commercial base. Although it was constantly under the fear of invasion from foreign states and beside the fact that the different invaders left their signature in the architecture of the city, in essence Corfu was another Greek city whose local cultural characteristics were developed grew gradually without ever being forcefully interrupted. The architecture of the city is distinguished for its western influences; however, these 'foreign' elements are adapted to fit a Greek city. The buildings follow the western morphology but they are build by local craftsmen who follow the Greek and Byzantine maxim of adapting everything to the human level.

The society that developed through the six centuries of co-habitation of the indigenous population of Corfu and the Latin West, is distinguished for the special characteristics which on one hand are also barriers for its identification as a pure Western or a pure mainland Greek city; Corfu remains a hybrid. The results of this co-habitation can be seen even today. Within the Balkans, Corfu is one of the few places whose building avoided any Ottoman influences, unlike any other part of eastern Mediterranean. It managed to progress with a civilization that is based on Greek tradition but it also has Italian influences.

Its turbulent Mediaeval years ended with its integration under the rule of Venice in 1386 and it remained under the Venice rule till 1797. The Venetian rule left its signature in the architectural physiognomy of the city. As it was at the edge of the Ottoman Empire, Venetians invested in the city with a set of fortifications, which were designed and executed by leading architects and civil engineers of the time. In particular, in 15th and 16th century the Old and New Fortress were built. Its construction was a combined effort of craft, science and innovation – it was a success of man-made work over wild nature. Mountains were reduced to plains, harbours were built, new inlets were created, fortresses were erected; as the Venetian member of the Council Nicolo Zeno observed, "the place was strong by nature, but with our art it has now become unconquered".

For a little over than 120 years (1669 to 1797), Corfu remained the capital of the Easter part of the Venetian Democracy, the last European fortress – together with Vienna – to abort the Ottoman Empire's imperialistic plans during the 17th and 18th century. Corfu was a city synonymous with the defence for the preservation of the European civilisation.

The 'neo-Corfu civilisation' that developed throughout this historical period was a variation of the central European one. However, Corfu had chosen to be fully incorporated in the European cultural landscape without loosing its special identity and its Greek, Jewish, Latin routes. Some evidence of this is the emergence of opera and lyric theatre, during the 17th century. Italian companies were competing for a slot in the central theatre. Even Casanova comments in his Autobiography that he felt 'at home' during his stay in the city for two to three years as captain in the Venetian Navy circa 1726.

In 1797 French Democrats invade the island and the claim it as the heirs to the Venetian Democracy. They will soon been replaced by the allied forces of the Russians and Ottomans who put the foundations for an independent state of the Ionian Islands under the protection of the Sultan. After a very short period when the island and the city are under the rule of Emperor Napoleon, the Ionian State is established as a independent state under the protection of the British Empire. The establishment of the British rule follows with the appointment of a British Commissioner, his administration and his army. At the same time we see the establishment of significant institutions such as the first Greek university and a Parliament that will be the place for debate for new political ideas.

Since the 18th century we see the presence in the local community of a strong powerful class, a feudal aristocracy, who managed to assimilate all the foreign aristocrats and maintain a level of independence towards the central government. Moreover, we have the absence of a Church administrative structure, Catholic or Orthodox, due to the competition of Venice with Papal Rome. This is quite unique in relation with the structure of society being developed in mainland Greece. This new form of society developed in Corfu was more devoted to progressive thought and as a result it created many inspirational personalities.

In this Corfu is where Empress of Austria Sissy decides to retire, leaving through her stay one of the most characteristic monuments of this era, a combination of Austrian sensitivities and the empress personal taste; the elegant villa of 'Achilleon' is till today on of the most popular monuments in Corfu with a high number of visitors each year.

From the beginning of 1860s, Great Britain has decided to withdraw its high protection on the island and the Ionian State. Taking its cue from the coronation of the new Danish prince George as the King of Greece, Great Britain announces the agreement for the unification of the Ionian islands to mainland Greece. This decision was a result of negotiations that impose hard terms on the Greek side. The agreement announces neutrality of Corfu (maintaining free passage through its waters) – this results in the demolition of part of the fortress in Paxis. The Greek state accepted all the financial obligations towards the foreign governments, companies and individuals, honouring previous arrangements and agreements. This results in increasing the Ionian public debt. The Greek state even agrees to pay redundancy fees to all the British officials due to loose their position as a result of the Union. The unification takes places in September/ October 1864.

After its union with Greece under the rule of King George I, the whole local idiosyncrasy and character of Corfu city is being compromised; its cultural and intellectual wealth is now subject to the choices of the Centre.

5 LITERATURE TESTIMONIES THE TRANSFORMATION OF CITY OF CORFU PHYSIOGNOMY

Our first testimony is from Constantinos Theotokis, one of the major Greek novelists and intellectuals of this era (late 19th century). His novel "Slaves and their Chains" is considered the first social Greek novel. He was born and lived for great part of his life in Corfu during the time that the island was being incorporated in the mainland state of Greece. In his short stories one can find strong ideological messages as he is trying to interpret his time and the social landscape. In "Slaves and their Chains" we watch the effects that the new reality of the union has upon a family of Corfu aristocrats. In particular we note:

The bad financial condition of many aristocrats due to the end of their tax relief and their new tax obligations. Similarly the abolition of the use of serfs (like the Russian pre-revolutionary servants) and of the feudal previous system meant that they now had to pay wages to their working hands. The aristocrats who failed to respond to the new status quo were driven to bankruptcy and financial ruin.

The emergence of a new economic class of professionals (doctors and lawyers) together with the bankers and high-level officials of the new administration. The members of this new class seem to seek social recognition

through marriages with members of the old aristocracy. In addition, we see the appearance of the first industrialists who have close relationships with the new political landscape.

Throughout the book the decline of the old aristocratic mansions is presented through the description of the decay of their furnishings and decorations, and the disappearance of heirlooms, which are now sold out of financial necessity.

It is also evident the role that Corfu used to play in the past as a centre of international mobility from mainland Greece to Europe and as a place of refuge for Greek officials during the Ottoman occupation.

It is recorded the emergence of new suburbs like Yalos, as places of residence for the new influential economic classes. Those residences have elements lent by the old mansions but they also have modern (end of 19th century) European elements and facilities. (p. 83)

- Social events like 'ball dances' are used as the meeting places of the old and the new classes of Corfu. (p. 83)
- Corfu is also presented as place of migration for the Greeks that used to live in Europe and prefer to stay there in their return to Greece, due to its similarities with the other European cities. (p. 89)
- The new influential class is eager to raise its status in comparison to the old aristocrats through their participation in charitable activities and other opportunities they have to show their wealth. (p. 90)
- Young people who study in Europe – mainly England and Germany – return either as agents of new revolutionary social ideas or rationalised nationalistic dogmas.
- The social conventions of the past continue to repress the emotions of the new bourgeois. However, the first cracks appear and moral deviances are excused in exchange for money.
- In many places in the book, a nostalgia of the old rule is being expressed; the old aristocratic traditions and the metropolitan character of the city. For example, in the following extract, an old aristocrat reminiscences during a social event: "Our city, so much admired by civilised nations … our poor island … the last fortress of culture. And none of you, the young people, does not care any more to preserve, not for our traditions and history, the glorious history of this glorious place, nobody wants to remember those glorious years, the great years of the Venice rule …" (p. 116).
- Finally, in the book (p. 230), one can also find the emergence of the new social code and behaviour that characterises the new Greek state: acquisition of a place as a civil servant equates to social and financial stability. Those positions have now become an object of political influence and negotiation for every government.

A lot of evidence of the transformation of the city of Corfu and its society are also included in Theotokis' extended short story "Honour and Money". There we can note the following:

- The corruption of the civil servants who serve first the will of the government that has appointed them rather than the civil interest.
- The rise of smuggling as means of bypassing the heavy taxation imposed by the new Greek administration which has resulted in the increase of many product prices.
- We find there again evidence of the decline of many aristocrats and their need to achieve some connection with the new financially vigorous upper-middle class through influential marriages.
- Due to the decline of the aristocrats, we see the acquisition of the old aristocratic mansions by the new financially powerful bourgeois and high level civil servants arriving from mainland Greece.
- We also witness the first collisions of the political parties on a regional level and the marginalisation of the old aristocratic rule.
- We also witness the emergence of the new working class – and their habitat at the margins of the city – that is becoming increasingly self conscious and seems to overcome the social barriers of the past and demand a more central role in social activity.

Nicholas Conemenos is a Corfu-born intellectual who lived end of 19th and beginning of 20th century in the city of Corfu. In many of his texts that have the form of chronicles or short stories we are allowed glimpses of the changes in the city or the preservation of particular elements in its physiognomy. In particular in one of his texts he writes about the changes in the use of the Spaniada – the open space between the old Fortress and the city. He reminds us that in the year of the British "protection" the place did not have any cafes, apart from one or two workshops that produced sweets and liquors. He observes that in the years after the Union many cafes opened in the area that expanded their seating area outdoors, which slowly became a meeting point for Corfu citizens , similarly to an ancient Greek/Roman Agora. He then continues to the nostalgic description of buildings around the Spaniada area that do not exist any more. In addition Conemenos wrote a little chronicle around the demolition of Porta Reale to make way for a new road. The writer objects of the destruction because he believes that Porta Reale is a monument, an arch which "for one reason on another one finds in central roads in all the major European cities and where they are and are considered jewels of the place…"

The Athenian writer Michael Mitsakis visited Corfu city twice in 1894, when he stayed for a whole year, and at the end of 1896 – beginning of 1897. As a result he wrote five short stories with traveller's impressions. In his texts we can note:

- The first impression of the city as his ship approaches the harbour and he gazes at the two Fortresses – the Old and the New.
- He is impressed by the varieties of the bourgeois block of flats of Corfu city, with their tall and narrow five or six storeys.
- He also notes the multiculturalism of the population of the city which includes Greeks, Italians and Jews.
- In his impressions from Corfu he lists the two palaces, of St George and St Michael, and of Mon Repos. The former is work of the British Captain and Civil Engineer Simon Whitmore. The front of this monumental complex of buildings is inspired by Palladian models with its Doric set of columns which is interrupted by the arches of St Michael and St George so that it can then be reunited at its ends around the north side of Spaniada, where it is located. Mitsakis acknowledges it past glory when it was constantly used by the British Commissioner at the beginning of the Ionian Polis and its current museum status as it is now only used once a year for the formal reception of King George of Greece on his annual visit to the island. For Mon Repos, Mitsakis informs us that is preferred by the King and it is often used as the accommodation for members of other European Royal families.
- Another of his texts is dedicated to the Prisons of Corfu city presenting their innovative building and operation. The Prison building of Corfu were erected during the period of the British rule on the island (first half of 19th century) according to the model of Panopticon Confinement Building, designed by the British politician Jeremy Bentham as part of the prison system reform. Bentham's central idea was that the guard should be able to see at the same time all the prisoners' cells. The particulars in the organisation of the prison buildings under his influence have been acclaimed as progressive for criminal reformation and surveillance by many philosophers like Michel Foucault. The Prisons of Corfu, in use till the present day, was built with some extensions to the central building a little later than the hey-day of Bentham's progressive thinking but with evidence of his influence.
- Finally, another short text is dedicated to an "industrial pavilion" in the city, the Aspioti industry for the production of paper, where the writer observes the close links of the industrials with government, since the later has become its sole customer.

6 CONCLUSIONS

In previous papers we have proved that literature gains social visibility and presence in the world through its interrelation with politics, law, technology, language, education, property, individual's creativity and many other cultural elements and thoughts around important human issues. In this way, literature is accepted in

those mechanisms and codes that transform simple acts in socially meaningful facts. We have also concluded that the narrative action we can identify the relationship of the writer with the space that he or she lives or chooses to inhabit as part of their world of the novel. In all the narrative actions the writer is being driven by their concepts, ideas and impressions which are directly or indirectly linked with their social and cultural background and position, and influence their choices – even when those choices are made unconsciously. As a result, in the novel we encounter the reflection of the social group that the writer belongs to and the social circumstances that they face while creating the novel. These elements can present us with some vivid images of the urban environment, seen through a series of prisms that add more interest, because they echo the ideologies and social situations that develop the appeal and physiognomy of a space[5].

By applying these results in the case of city of Corfu, we have extracted interesting testimonies about the gradual transformation of the city form state capital to a provisional city.

As we have seen, the recently established state of Greece is struggling to establish a European character for itself, trying to adopt the characteristics of progress presented in a middle- European society, like for example, Belgium. Since most of the cities in the East, such as Thessaloniki, Ioannina, Smirni, Alexandria, even Corfu, and in particular Constantinople, were all far more advanced that the state's new capital Athens. So, many efforts were taken towards bring Athens up to speed and making it a new national centre. Therefore, the Union with the Ionian islands and in particular with Corfu was subjected to this mentality. The city of Corfu was relieved of any cosmopolitan or metropolitan function and was demoted to the seat of regional administrator whose influence was limited to the island and the little islets of Paxis around it. The other Ionian islands were incorporated in different administrative regional offices. At the same time but in a slower pace, the laws and political ethos of mainland Greece started to have greater influence over the life of Corfu citizens though they were often in conflict with the principles that used to govern the society of Corfu in the past.

7 BIBLIOGRAPHY

STEFANOU, J., & STEFANOU, J., Description of the Image of the City, University Publications, National Technical University, Athens 1999

URBAN DESIGN AND DEVELOPMENT LABORATORY, NTUA, The Physiognomy of the Hellenic City, National Technical University of Athens Publications, Athens 2000.

STEFANOU, J.,& BALERMPAS, A, The role of abstract (immaterial) values in projects of urban area regeneration: a case for literature, CORP 2006

CONSTANTINOS THEOTOKIS, THE SLAVES AND THEIR CHAINS, ATHENS 1997

CONSTANTINOS THEOTOKIS, HONOUR AND MONEY, LIVANIS EDITION, ATHENS 1997

MICHAEL MITSAKIS, CORFU, PATAKIS EDITION, ATHENS 2005

EDITED BY THEODOSIS PILARINOS, CORFU: A CITY IN LITERATURE, METECHMIO EDITIONS, ATHENS 2003

[5] JOSEPH STEFANOU & ATHANASSIOS BALERMPAS, The role of abstract (immaterial) values in projects of urban area regeneration: a case for literature, CORP 2006

🏆 *reviewed paper*

The politics of spatial data infrastructures: State transformation, urban governance and the instrumentation of electronic territories

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1 ABSTRACT

With the proliferating conception and implementation of „spatial data infrastructures" (SDI) around the globe, the interaction of state transformation and technological innovation dynamics has entered a critical stage. Spatial reference provides a common ground on which the vast majority of public and private data can become directly interrelated - across all scales and boundaries. The resulting potentials for creating new services, improving (cost-) efficiency, enhancing rational decision making, as well as increasing transparency and participation have swiftly been embraced (in this order) by almost everyone addressing the topic. Yet, the genuinely political character of SDI's has largely been ignored. But it is here that SDI raises the more fundamental questions for the future of democratic societies.

This paper starts from a brief outline of the cognitive and normative framework of SDI. Sustained by a global network of actors, this framework has allowed SDI to gradually evolve from a specialist technical issue to a mainstream policy instrument. Against this backdrop the examples of France and Germany are used to illustrate the particular institutional dynamics that the set-up of national, regional and local SDI's has unfolded. It becomes clear that state actors (national, regional) and the private sector dominate the processes, whereas the requirements of local authorities and civil society occupy a marginal space on the agenda.

These common traits are finally discussed in the light of ongoing state transformation and changing multi-level governance systems. Apparently, SDI's have become seized as strategic projects, helping to construct new representations of the state and to mobilise resources at the urban level. At the same time, the deeper political and structural implications have been evaded as they would question established authority levels, sectoral divisions and governing practices. Therefore, to escape the logic of depolitisation identified and to prevent SDI from becoming an "information one-way", it needs to be placed back in its urban context. If the starting point were local challenges and the needs of stakeholders and citizens, it is argued, SDI may actually offer an interesting opportunity for society to reinvent its democratic culture and urban governance systems.

2 BUILDING "INFRASTRUCTURES": THE DISCURSIVE FRAMING OF SDI

Spatial data can be defined as data with a spatial reference, either direct (coordinates) or indirect (address, postal code, etc.). This comprises not only geographic data describing topography, positions of physical objects (e.g. roads, rivers, buildings) and spatial boundaries (e.g. authorities, cadastre), but also the position of data objects such as socio-economic activities, pollutant concentrations or registration procedures. Today, most data held by public and private agencies has a direct or indirect spatial reference, which makes space a powerful common denominator for interpreting data that describes the dynamics of society in any territory considered.

A framework that aims to enhance the discovery, availability, quality and exchange of spatial data according to certain rules is now widely referred to as a spatial data infrastructure (SDI). The concept first emerged in the early 1990's from international discussions among spatial data experts i.e. practitioners and researchers. Regarding the plethora of SDI definitions available today, it is remarkable that these have mostly been derived from an attempt of classification so far, aiming to interpret SDI by identifying common "components" (data, standards, networks, policy, etc.), "dimensions" (organisation, production, technology, etc.), or main stakeholder groups (data supplier, technology supplier, user, etc.). This has in fact contributed to a convergence towards a particular understanding both in research and practice (Nebert 2004; Williamson, Rajabifard, and Feeney 2003).

However, such an approach implicitly assumes a given "nature" of SDI that appears to reside within certain technological properties and organisational principles, and which is therefore deemed to become reality - sooner or later. It thus underpins a rather deterministic view that cares mainly for overcoming barriers to implementation instead of better understanding the social and political struggles that occur in practice through and about SDI development. For now, little to no room is left for recognising the meaning of apparent differences in the societal appropriation of spatial data technologies, and therefore the pivotal role

of the driving actors and their particular motives. Hence, there is a need to take a closer look at the social construction of SDI, considering also the notions, concepts and practices that have underpinned its development. Here, discourse analysis can help to obtain further insight (Foucault 1971, 1978).

This requires to locate SDI development within the broader perspective of state transformation and changing systems of urban governance. Today's talk of SDI in fact appears to be strongly rooted in a number of interrelated discourses that have shaped the development of the modern (nation) state from the beginning to its latest post-fordist transformations. While their respective weight may vary from case to case, these discourses continue to have a major influence on the development and institutionalisation of practices related to spatial data, with national and sub-national levels increasingly conditioning the local sphere. Analysing their interplay thus raises some more general questions concerning the character and purpose of current SDI's than a discussion of its "nature" suggests. The following sections sketch the key story lines (Hajer 1995) identified from case studies in France and Germany, highlighting their cognitive references and implications for SDI development.

2.1 Infrastructure - population - welfare

"Infrastructure" is a powerful concept with a long history, closely linked to that of the modern state. In 18th century Europe, the traditional conception of the subject/sovereign relation started to transform fundamentally through a rising general search for efficiency and rationalisation in public administration. State power exercise became increasingly oriented at safeguarding individual security and prosperity through policing, health care and other public services (Lascoumes and Le Galés 2004). In this context the concept of infrastructure first appears, defining a key means to develop the "wealth of nations" (Adam Smith), or more precisely the welfare of the population, conceived of as a totality of resources and needs.

For the first time, transport, water, waste, energy and - later on - also communication facilities are envisaged as crucial support systems for socio-economic activity that should be provided by the state, as they organise the distribution of highly homogeneous resources demanded by everyone. This basic notion of infrastructure has gradually extended beyond the physical facilities to also include the related operating procedures, management practices, and development policies, thus framing a broad range of state activities and increasingly also private sector operations (due to liberalisation). It also maintains a highly positive connotation as it is through infrastructures that tax payers obtain a tangible return from their governments.

The concept of SDI suggests a continuity of this understanding, now also embracing the use of spatial data. However, this is precisely where the infrastructure allegory results in a severe reductionism, since spatial data is of course far from being a homogeneous resource. Rather, characteristics such as data types, availability and quality that determine the actual meaning and utility of the data in different social contexts, vary considerably. Further crucial differences are introduced regarding the schedule of data integration (what comes when?), the rules of access formulated (who gets it and how?), and the capabilities and demands of the actual users. Values and preferences are already implied both in the data and in the process of SDI set up, thus blurring the conceptual difference between infrastructure and application. Hence, what is usually depicted as a generic public good, objectively enhancing socio-economic welfare and efficient decision making across sectors and domains, may in practice turn out to be a rather discriminating configuration of data, users and related practices, selectively favouring power positions and resource allocations, and ultimately influencing perceptions and understandings of the state, governance and territorial development.

2.2 Sovereignty – people - territory

Mapping and surveying are constitutive activities for the modern state. To provide the grounds for the control and administration of a resident population (taxation, jurisprudence), sovereigns drew on their military's expertise of measuring and dividing the territory they dominated (or intended to dominate). The continuous demand of the state for this activity led to the establishment of the surveying profession and specialised agencies, providing services for governments and administrations. This crucial role of mapping and surveying for state formation is well reflected in Max Weber's classic definition of the state as constituted through sovereignty, people and territory (cf. Sharma and Gupta 2006, 22; Scott 1998, 369).

Obviously, SDI represents a great opportunity to perfectly rationalise the system of territorial observation, allowing to "zoom in" where required. Its strongly hierarchical conception clearly connects tasks of data collection and management at national, regional and local levels, thus directly aggregating scales to inform

decision making. Moreover, the identity and legitimacy of some of the key actors in SDI development today is very much based on the above definition of the state, which is reflected in their discursive contributions. State mapping agencies, cadastral agencies and surveying professionals thus tend to portray SDI development as a logical extension of their traditional tasks. They successfully claim a "natural" responsibility, simply derived from the spatial reference of most data and their expertise in dealing with geographic data, thereby constructing a durable justification of their activities.

Inevitably, this particular perspective on SDI implies a strong emphasis on hierarchy and state control, on physical geography (reference, topography, boundaries), but also on serving an external demand for information. It equally reinforces existing authority perimeters (nation state, region state, county, municipality) and their representations as these become transferred into electronic space through labelling and access gates (portals). Therefore, although severely contested through the borderless information spaces created, the Weberian state continues to matter when SDI's are built up.

2.3 Knowledge-based economy - market development - liberalisation

Another argumentative cornerstone in the debate over SDI is its assumed contribution to the establishment of an informational or knowledge-based economy. Although widely interpretable, this concept primarily suggests the growing importance of knowledge for economic activity and competitiveness and has therefore become a strategic policy objective (e.g. Lisbon strategy). Correspondingly, the first prospective analyses of the emerging spatial data sector in the 1990's were market studies, aiming to assess and quantify the market volume that a broad uptake of spatial data technologies and the free trade with data could create. The resulting figures were echoed by a cry for liberalising what was labelled a spatial data market from the outset. This emphasis fits well with EU and government efforts for lifting public sector control over activities that could be subject to competition, while the genuine public utility of SDI is not further explored.

With this focus on conditions of (private sector) access to (public sector) data, an important priority is set regarding the development of SDI, which leaves a lasting imprint on its design and functions. The responsible civil servants are discursively reduced to "service providers", working to facilitate business development and supply information to citizens. This orientation is reflected by resources becoming geared towards getting "everything online" (defining standards, interfaces, pricing policies, etc.) instead of rethinking government and administrative practices related to spatial data.

2.4 State modernization - new public management - e-government

SDI development has of course not remained unaffected by the widespread turn to new public management since the 1980's, seeking to extend market orientation in the public sector. The key objective of this management philosophy has been to increase the (cost) efficiency of governments and administrations. Most public sector ICT investments have thus been motivated in the first place by accelerating public service delivery. Hence, we find a first generation of largely independent e-government applications realising a digitalisation of analogue services without modifying procedures (Hill 2004; Lenk 2004). In the following also notions of data sharing, virtual cooperation and participation have started to modify regulation and practices, while the dominant orientation remains to be policy implementation and service provision.

This is where the use of spatial data technologies comes in since it is presented as an opportunity to advance efficiency even further. It is gratefully promoted to modernise the image of the state and its leaders, underlining possibilities for clever management and better public services, casually creating new visual representations of the state (images, internet portals). Apparently, this emphasis is rather following the spirit of early e-government initiatives, prematurely subsuming the vast potential of SDI under the narrow categories of management and service provision, without much consideration of its wider implications for policy design or evaluation (cf. Snellen 2002).

2.5 Technological innovation - technology impact - information society

A key source that nourishes the thinking and talking about SDI is also technological utopianism, a position that has been of major importance for the societal adoption of new technologies. Its starting point is an ideal status of development in the future that is usually based on an extrapolation of technological innovation, while largely ignoring the societal conditions of implementation (Webster 2002). In practice this is often a position put forward by technology specialists, trying to devise a better future to the best of their knowledge.

Society is then seen to transform under the impact of technologies, so that policies should facilitate the emergence of the anticipated information society.

The problem with technological utopianism is of course that, while being fairly influential in current SDI developments, it is not reflecting societal requirements and tends to remain entirely apolitical. With SDI, the utopian vision is the global level playing field for data exchange that would allow a largely unrestricted usage of spatial data by all stakeholders. While the causes may be noble or naïve, the consequence is a massive concentration of SDI on standards and networks, thus neglecting the applications and practices that will actually build upon it. Yet, these will not be determined by a "perfect SDI", but by the users and the multiple (local) restrictions under which they operate. Unfortunately, technology does not offer any guidance here.

3 SDI CONCEPTIONS IN FRANCE AND GERMANY

The story lines sketched above provide the principal cognitive grounds on which current SDI's are being built up. It is through this discursive framework that SDI has gradually evolved from a specialist technical topic to a mainstream policy initiative, constructing "SDI" as a policy issue, reducing complexities, conveying normative connotations, supplying actor legitimacy, preparing coalitions and driving institutional change. Most importantly, this framework has allowed to focus the debate over SDI on a particular set of arguments, while hardly considering others. It forms a rather dominant thrust that has become difficult if not impossible for actors to question or challenge.

This section examines, how such discursive material emanates from actors in practice and how it is being deployed. In Europe, most national SDI's are currently set up with a high-level political mandate for one of the major geographic data producers (e.g. mapping agencies, surveying agencies, cadastral service), while the rest is usually being coordinated by councils of ministries, administrations or GI associations (Janssen et al. 2005). Referring to SDI developments in France and Germany, similarities exist in this respect with intiatives at the sub-national level, whereas at the local level the diversity of approaches is considerable. To illustrate the institutional dynamics that have been unsettled through SDI in these two countries, the key milestones are highlighted in the following, identifying who took the initiative and what forms of interaction were involved. Furthermore, also the principal objectives formulated and issues addressed by the actors are reported to portray the conceptual orientation of these processes.

3.1 The French approach: IFDG

The development of SDI in France is essentially marked by a confrontation between the traditional modes of public geographic data production and services, represented by major national agencies, and the demand for liberalisation advocated by the private sector and its associations. The government has thus been oscillating between these positions, trying to defend the interests of its agencies through the responsible ministries and at the same time to mediate towards the private sector and favour market development. Only in recent years, some emphasis has also been put on the role of geographic information systems in e-government and state modernisation. Local authorities, although the principal users and producers of spatial data, have played a fairly secondary role so far.

Geographic information became an issue in French national politics as early as in 1983, when the central national mapping agency (IGN) decided to quit the preparation of their 1:25.000 scale maps. The special status of the IGN, a large independent public body under the auspices of the ministry of public works, required to recover half of its costs from its customers i.e. mainly local authorities and to a minor extent also the private sector and civil society. The decision of the IGN was therefore based on cost efficiency and demand considerations, but the implicitly growing commercial orientation was critically observed by the private sector, denouncing a distortion of competition. Also coordination of IGN data production with the national cadastral agency DGI (controled by the same ministry) became tenacious as the IGN tended to diminish its consideration for other authority requirements.

Consequently, the minister of state created a commission led by the minister of maritime affairs with the brief to reflect together with private sector actors on a "general policy of French cartography and geographic information". Based on an analysis of the historic evolution of geographic techniques and the economic situation of "the geographic information sector", the commission underlined the need to pursue and reinforce

"traditional activities" (mapping, cadastre), to modernise and decentralise data production, and to support the development of the sector identified.

Most importantly, the work of this commission was continued through the subsequent creation of a "national council for geographic information" (CNIG) by law in 1985. This council is mainly composed of representatives from national ministries (17) and the national data producers (11 including surveyors), while also counting local authority representatives (one region, one agglomeration, two mayors) and two independent experts (scientists). The CNIG lacks a formal decision making competence but acts as a consultative body for the government in geographic information issues. Beyond coordinating public sector data production, it is also in charge of other aspects of geographic information such as RTD, user needs, international cooperation or exportation. The CNIG therefore forms a central relay for the main interests involved in SDI development. Also at the county level (département) similar committees have been established by the government with a focus on coordinating local activities related to spatial data (CDIG). They equally form consultative bodies and are presided by the Préfet. However, any substantial influences of the CDIG's cannot yet be discerned.

Responding to the urge to better articulate its interests in the emerging circles of national level decision making, the private sector founded in 1986 a national "association of geographic information" (Association Française de l'Information Géographique - AFIGÉO). With its slogan of "Modelling the world to better understand it – such is the Leitmotiv of this developing technological domain", AFIGÉO launched studies on "the demand and functioning of the market, evaluating obstacles for its development" (CNIG 1998). It organised multiple events to facilitate exchange between key actors, also in cooperation with the CNIG.

The IGN, however, was very much aware of its own prospects in this emerging market and effectively evaded the efforts of AFIGÉO and CNIG in fear of losing its private financing pillar in exchange of a potentially shrinking and unstable public one. As a result, for almost a decade the struggle revolving around the future organisation of geographic information production and usage became an internal issue of state agencies and ministries, with only minor developments to be observed.

The process was revived after the 1997 general elections and AFIGÉO published its influential "white book" titled "French geographic information in the information society – status and proposals for action" (AFIGÉO 1998). The white book proposed five axes for policy orientation: 1) achieve a quick coverage of national territory (reference data and metadata), 2) develop private GI and IT businesses, 3) clarify market rules, 4) launch export activities and 5) develop research and education. Its central message was therefore to review the status of the IGN in order to improve cost efficiency and enhance economic activity and employment.

Two government reports commissioned by the prime minister in 1999 and 2000 then picked up these recommendations and preconceived a new policy framework. The first report ("Lengagne") suggested the creation of a coherent public reference database for the national territory (référentiel à grand échelle - RGE) and a fundamental modification of the IGN status, making it responsible for the integration and maintenance of the RGE and requiring public data delivery at moderate prices. The second report ("Mandelkern") on "the state and new technologies" concluded that, in general, public digital data publishing should become a legal obligation, being free of charge for data "essential for the exercise of citizen rights."

In consequence, the government decided in February 2001 to fund the creation of the RGE (72%), entrusting this task to the IGN as principal responsible for production, integration, management, maintenance and dissemination. It defined the RGE contents (reference, topography, perimeters, orthophoto, cadastre, addresses) and fixed 2007 as the horizon for its realisation. Moreover, the government gave geographic priority for realisation to "zones of strong economic challenges", where data availability was considered of particular importance. The status of the IGN was then officially reformed by a decree in 2004, safeguarding especially competition and introducing local authority representation in its management board. In parallel, the main objective of the CNIG was reformulated as to "achieve the adoption of a national policy of implementation for a national SDI (Infrastructure Française de Données Géographiques - IFDG), comprising metadata, reference data, common specifications, standards and norms, as well as legal and economic data access modalities" (CNIG 2001). Activities of the CNIG now also started to show results in other domains. When in 2004 a new national e-government strategie (PSAE 2004-07) was adopted, it contained a first explicit reference to geographic information use, framed within the general topic of enhancing service provision ("more", "user-friendly", "trustworthy") and making public administration more efficient

(Ministère de la Fonction publique 2004). Thus, in this respect the related strategic action plan mainly envisages to promote the use of GIS to improve administrative decision making and service delivery.

The narrowness of the orientations that govern the debate at the national level becomes visible when regarding local initatives related to spatial data. Here, the variety of approaches and applications is broad also since many of them were quite ahead of the national level, thus developing rather independently from the emerging conceptual framework. Most notably, in addition to issues of technology and data exchange, cost reduction, service improvement or economic development (CNIG 2000), here also concerns for changing procedures and stakeholder relations play an important role.

For instance in the Lyon agglomeration, where activities for integrating and treating geoinformation date back to the early 1980's. The main interest of the agglomeration authority (Grand Lyon) at the time was to use a common geographical reference and to establish a frame for data exchange between all municipalities in order to enhance planning procedures, regardless of the existence of a national reference. In parallel also the development of metadata and public data delivery (paper, electronic) have been fostered, as well as the definition of a tariff system for data selling, making this entire system operational by 1999.

In 2004 the central city's planning agency (AUL) started to develop a spatial information system at a scale without any institutional representation (urban region). Here, the key issues are rather the centralisation or decentralisation of tasks and responsibilities, defining degrees of public data access that account for the particular sensitivities of the different administrations and political representatives, or achieving consensus about territorial representations produced by the new system.

On the contrary, in the adjacent départment Loire the agency for public works (DDE) decided in 2000 to initiate a public information platform by first making all its digital data available for free, thus turning the common SDI philosophy upside down. Here the process is expected to advance as stakeholders identify requirements and options for harmonisation, data sharing or participation that can gradually be translated into a technical framework drawing on open standards (OGC).

Thus, at the local level it is the very culture of cooperation and participation that is put to the test, questioning the established regulative, cognitive and behavioural frames. When civil society can do what in policy making or evaluation, and how public agencies from different levels and domains can work together in a specific territory appear to be questions that derive directly from the development of new spatial data practices.

3.2 The German approach: GDI.DE®

In Germany, the development of SDI is largely driven by the regional surveying agencies in conjunction with the private sector and their respective associations. Due to the federal structure, it were initatives in some of the Länder that led the way, while the federal government has taken up the issue with a certain delay. It now essentially follows the emphasis of the principal actors on developing the "geoinformation market", while also placing the debate in the context of the federal e-government initiative. The government has provided an organisational framework that coordinates between the different federal ministries and agencies, the regional surveying agencies and the private sector. Similar to the French situation, local authorities have not had any significant influence on the general process so far but often established their own priorities.

In the German system the responsibility for mapping and cadastral activities is with 16 specialised agencies of the the Länder (Landesvermessungsamt - LVermA), mostly under the authortiy of the respective ministries of the interior. At federal level these agencies cooperate within a common association (AdV), while a national agency for geodesy and cartography (BKG) produces complementary data sets at larger scales. During the 1990's the LVermA's have been subject to a general restructuring of public administration, following the philosophy of new public management. This resulted in a change of their status from public administration to public corporation (Landesbetrieb) i.e. legally dependant units that operate on a commercial basis. In parallel, the AdV has been working on a national data model for topography (ATKIS), which after 1996 has become extended towards integrating references (AFIS) and the cataster (ALKIS), now commonly referred to as the "AAA model" (corresponding to the French RGE). All three components have been registered by the AdV as trademarks, apparently with a view to their commercial exploitation.

In 1994 a „German association for geoinformation“ (DDGI) was founded by the key private sector actors, but also involving some particularly active public agencies such as the LVermA of North-Rhine Westfalia (now represented in the DDGI board), Lower Saxonia and Hesse or the BKG. The objectives of the DDGI have been formulated as to „underline the importance of geoinformation; represent the interests of the geoinformation economy; enhance offer, access and standardisation; carry out political lobbying; optimise economic utility […]“. Furthermore, the activities of the DDGI are underpinned by working groups established for the topics of education, geodata market, geodata economy, SDI for infrastructure providers, resources and environmental protection, communication and public relations. It is with the establishment of the DDGI that the notion of SDI started to spread among spatial data practitioners in Germany, considering e.g. the fact that the first global SDI conference (GSDI) took place in 1996 in Bonn, hosted by the DDGI.

It is therefore not surprising that various SDI developments at the sub-national level preceded those at the federal level, especially regarding the case of North-Rhine Westfalia. Here, the government and the LvermA of the Land launched in 1999 the SDI initiative “GDI-NRW”, building on a previous campaign for media and IT business development (mediaNRW). First activities were focused on organisation, standards and specifications, followed by a competetive selection and promotion of pilot projects for the definition of SDI components. In 2001 a public-private partnership was created for the operative management of the SDI initiative (CeGI GmbH), defining an organisational structure that regulates decision making and coordination among the participating actors. The main objective of the GDI-NRW is to „[…] activate the geoinformation market. To this end, different technical, legislative, socio-economic and logistic obstacles have to be identified and overcome, as well as support measures and infrastructure projects developed“ (CeGi 2003). Hence, between 2001 and 2004 broadly disseminated annual market studies have been commissioned to quantify potentials and specify barriers.

At federal level, a first visible reaction to the developing German „geoinformation“ discourse was the creation of an „interministerial committee for geoinformation“ (IMAGI) through a cabinet decision in 1998. This body, chaired by the ministry of the interior and physically hosted by the BKG, is composed of representatives from 10 ministries dealing with spatial data and the AdV as an observer. Its brief was summarised as achieving “a concept for efficient data management by federal state agencies, harmonisation between federal and regional authorities regarding interoperability and questions of data pricing, implementation of norms and standards, and awareness raising regarding the significance and utility of geoinformation, considering marketing approaches for public data selling”(IMAGI 2004).

In 2001 the federal parliament responded to a request strongly driven through the DDGI (e.g. organising business lunches with MP’s) in a first decision on the “use of geoinformation in Germany”. In this decision the parliament requires the government to take action in order to enhance the set up of a national SDI, following the example of the USA. It thus calls for a closer cooperation between levels and sectors (public/private) in order to “modernise economy, science, administration and policy” (Deutscher Bundestag 2001). This was followed in 2003 by a second parliamentary decision equally initiated through the DDGI, requiring improved coordination between federal and regional levels, and underlining especially the conclusions of a study commissioned by the federal ministry of economic affairs. This study highlighted that the “commercial use of geoinformation has a high economic potential and can develop into a market segment with considerable added value, qualified employment and highly innovative products”.

On the operational side, the IMAGI had proposed in 2001 a three-step concept for developing the national SDI (Geodateninfrastruktur - GDI.DE). It envisaged to 1) establish a metainformation system (GeoMIS.Bund), 2) harmonise data stocks, and to 3) gradually start implementing a national portal for data provision (GeoPortal.Bund). In 2003 the heads of regional cabinets adopted an organisational framework for the set up of the GDI.DE - meanwhile also registered as a trademark. It distinguishes a political orientation through the existing e-government working group (16 secretaries of state), and a conceptual coordination by a steering group and the “commission for the geoinformation economy” (GIW Kommission), led by the ministry of economic affairs. The steering group is co-chaired by the ministries of the interior and economic affairs and comprises representatives from the regional ministries (16) and the main associations of local authorities (3). Similarly, for the technical management two offices have been created, one for the “geoinformation economy” and one for the GDI.DE. This structure reflects very well the definition of SDI provided by the AdV in 2002 as the “[…] technological, political and institutional measures to ensure, that methods, data, technologies, standards, financial and personal resources for the production and application of

geoinformation are made available according to the requirements of the economy" . Support in this direction is provided in particular by the GIW Kommission that formulated in 2005 a memorandum titled "digital 'raw material' geoinformation – a contribution to safeguarding Germany as a business location" (GIW Kommission 2005; AdV 2002).

Regarding SDI activities at the local level, it is first of all remarkable that the associations of local authorities have mainly acted as observers, thus accepting the place they have been assigned. Only the association of German cities (Deutscher Städtetag) in North-Rhine Westfalia has picked up the issue of SDI, trying to provide some guidance for its members. However, since this initiative was driven by its working group for municipal mapping and cadastres (composed of local spatial data practitioners), the results have been manuals on "geodata management" and "marketing municipal geodata", mainly following the approach of the AdV and the IMAGI. Consequently, the Städtetag most of all suggests to focus on an efficient central geodata management and data delivery for commercial reuse by transforming the local cadastral departments into "content providers"(Städtetag Nordrhein-Westfalen 2003).

The example of the Bonn region illustrates, though, how local actors have also discovered new challenges and options related to spatial data. Here, the city and its region were confronted with a particular challenge after the 1991 decision to move the German capital functions from Bonn to Berlin. A new inter-municipal cooperation was therefore created (Regionaler Arbeitskreis Entwicklung, Planung, Verkehr - :rak) to manage structural change. While it first focused on the less conflictive issue of housing, more difficult topics such as leisure or retailing/centers have been addressed over time. This work of the :rak has been supported increasingly by the creation of a "regional online planning system" (ROPS), developed in cooperation with universities and private companies. As the system draws on data from the different municipalities, key issues have been to agree over data types to be incorporated, different access levels (public, restricted), as well as the representations to be created. Spatial data sharing, it appeared, is essentially a question of etablishing mutual trust and a framework of social practices that can make it meaningful.

4 SPATIAL DATA AND URBAN GOVERNANCE

The sketched cases of France and Germany illustrate how much SDI development is intrinsically linked to ongoing transformations of the state, its institutions and governing practices. In this, it exemplifies a new type of strategic state intervention that characterise this process at present. While theoretical discussions in the 1990's still predominantly invoked the inevitable "state in retreat" or its "losing control" (Sassen), today a broad consensus exists in recognising the continued central role of the state, as well as a qualitative shift in the forms and orientations of state power exercise that does not contradict the main trends of destatisation, denationalisation and internationalisation (Macleod and Goodwin 1999; Brenner 2004).

Having acknowledged the increasing involvement of the private sector and civil society actors in policy making since the 1980's and therefore a growing pluralism of sites, themes and techniques of policy (Le Galès 1995; Benz 2005), it is the expanding normative use of the concept of governance in policy itself that is significant here. Governing has thus become the art of designing interaction processes between stakeholders that ultimately should produce the desired results, drawing on a wide range of tools to take influence. The capacity and skills that this requires have therefore become a decisive production factor for the competitiveness of the territory concerned (Jouve and Lefèvre 2003).

This is precisely where also the orientation of state action has been subject to change. While the Keynesian welfare state focused on the national scale for regulative intervention to secure its accumulation regime, the past twenty years have seen a growing concern of the state for developing its major urban regions or metropoles. This is reflected in the conception of strategic projects to directly enhance urban competitiveness and exploit endogeneous local resources, ranging from the transfer of competencies or targeted incentivation to large-scale transport infrastructure construction. It is thus the recognition of cities as "motors of growth" for the national economy that has fostered an alignment between national agendas of deregulation and systems of urban governance (Brenner 2003).

These changing forms of intervention and orientation can well be traced in the development of SDI in France and Germany. It is a particularity of SDI that the initiative originates from the private sector and spatial data technocrats, strongly focused on technological innovation and business development. The proximity between both positions, however, has been favoured by the advancing deregulation of the mapping and surveying

agencies through state policies, which is most emblematic in Germany regarding the registration of their products as trademarks.

The decisive state response of making SDI a national policy initiative of high priority was then based upon the growing recognition of the strategic importance of spatial data for linking two core policy strands, namely enhancing economic development and competitiveness and improving the efficiency of public administration (e-government). It is equally motivated by the opportunity provided through SDI for reaffirming territorial coherence and identities, as the vanishing boundaries in real space are replaced by virtual boundaries and access gates (Mitchell 2003). The emerging interest coalition between state and private sector actors is well reflected in the concepts and arguments exchanged. SDI is thus regarded a splendid opportunity for mobilising local resources, unlocking the "treasure" (Greve and Naujokat 2003) of spatial data by building this new infrastructure.

To this end, a range of policy instruments have been deployed. New forms of interaction have been created, including associations, committees, steering groups, councils or commissions across levels and domains, all following specific regulations of participation and decision making. These new structures raise questions of representativeness and legitimacy, in particular regarding the weak role of local authorities, which is reflected in the lack of corresponding concerns in the national debate. Their conceptual absence contradicts the relevance of local authorities as the principal producers and users of spatial data, as they have been estimated to make up for 60% of all spatial data applications (AFIGÉO 1998). Nevertheless, with SDI the urban level rather appears to be instrumentalised as a mere "content provider" and to support a rationalisation of public administration.

5 CONCLUSIONS

As it is conceived today, SDI suggests a separation between a data providing infrastructure and applications that build upon it, selectively using the data required. This utopian perspective neglects that in (local) practice the starting point is often the application, setting up infrastructural fragments that can support it. By giving priority to the "infrastructure", however, governments and private sector actors have provided a strong conceptual frame that is far from being neutral regarding its outcomes. Its consequence is that resources become shifted towards creating an ideal platform for data delivery, that existing institutional settings and representations are being reinforced, whereas the difficult task of rethinking duties and practices in the light of spatial data usage remains undone. SDI thus largely evades any discussions of its possible implications in terms of actor relations and collective decision making processes, simply depicting data as if it where a "raw material" devoid of meaning. Therefore, a definition of SDI as a governance system modifying public and private decision making for particular purposes seems more pertinent than one distinguishing different "components".

To develop alternative concepts of what SDI could (also) be, it might be useful to take a closer look at local level initiatives. The examples given above may have illustrated the kind of political challenges posed as spatial data sharing implies creating new transparencies. Starting from extreme fragmentation and enclosure (of data, archives, systems, etc.), the gradually increasing availability of and access to spatial data and the choice to support selected applications by priority appear to be of strategic importance: When, what kind of data should become available for whom, and for which purpose – these are the questions that need to be asked. The new shapability of spatial data usage thus concerns the relation between government levels, between policy domains, between authority perimeters, and between citizens, public administration, politicians and private business (Reinermann and von Lucke 2002). Apparently, these are essential parameters of urban governance systems. It is here that spatial data applications could help reinvent local democratic culture and decision making by developing new forms of knowledge production, exchange and presentation for policy processes..

6 REFERENCES

AdV. 2002. Geodateninfrastruktur in Deutschland (GDI). In Positionspapier: Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland.

AFIGÉO. 1998. L'information géographique francaise dans la societé de l'information. État des lieux et propositions d'action (livre blanc). Paris: AFIGÈO.

Benz, Arthur. 2005. Governance in Mehrebenensystemen. In Governance-Forschung - Vergewisserung über Stand und Entwicklungslinien, edited by G. Folke-Schuppert. Baden-Baden: Nomos-Verlagsgesellschaft.

Brenner, Neil. 2003. Standortpolitik, state rescaling and the new metropolitan governance in Western Europe. DISP (152):15-25.
———. 2004. New state spaces: urban governance and the rescaling of statehood. Oxford: Oxford University Press.
CeGi. 2003. Geodateninfrastruktur Nordrhein-Westfalen. Leitbild.
CNIG. 2006. Les structures et organisations en information géographique (fiches no.22) [website]. CNIG 1998 [cited 2.3. 2006]. Available from http://www.cnig.serveur-1.net/fiches/22Structures.htm.
———. 2006. Les animations régionales en information géographique (fiches no.35) [website]. CNIG 2000 [cited 2.3. 2006]. Available from http://www.cnig.serveur-1.net/fiches.
———. 2006. Stratégie et programme d'actions du CNIG [website]. CNIG 2001 [cited 20.2. 2006]. Available from http://www.cnig.gouv.fr/.
Deutscher Bundestag. 2001. Nutzung von Geoinformationen in der Bundesrepublik Deutschland.
Foucault, Michel. 1971. L'ordre du discours. Paris: Gallimard.
———. 1978. Politics and the study of discourse. Ideology and consciousness (3):7-26.
GIW Kommission. 2005. Digitaler "Rohstoff" Geoinformation - ein Beitrag zur Sicherung des Wirtschaftsstandortes Deutschland.
Greve, Klaus, and Wolfgang Naujokat. 2003. Schatz im Schrank. Kommune 21 (2):32-33.
Hajer, Marten A. 1995. The politics of environmental discourse. Oxford: Clarendon Press.
Hill, Hermann. 2004. Transformation der Verwaltung durch E-Government. Deutsche Zeitschrift für Kommunalwissenschaften (II/04):17-47.
IMAGI. 2004. Geoinformation und moderner Staat. Frankfurt/M.: Bundesamt für Kartographie und Geodäsie (BKG).
Janssen, Katleen, Jos Van Orshoven, Danny Vandenbroucke, and Margaret Hall. 2005. Spatial Data Infrastructures in Europe: State of Play Spring 2005. Leuven: K.U.Leuven - Spatial Applications Division (SADL).
Jouve, Bernard, and Christian Lefèvre, eds. 2003. Local Power, Territory and Institutions in European Metropolitan Areas. Vol. 6, The Cass Series in Regional and Federal Studies. London: Frank Cass Publishers.
Lascoumes, Pierre, and Patrick Le Galés. 2004. L'action publiqe saisie par ses instruments. In Gouverner par les instruments, edited by P. Lascoumes and P. Le Galés. Paris: Presses de la Fondation Nationale des Sciences Politiques. Original edition, Gouverner par les instruments.
Le Galès, Patrick. 1995. Du gouvernement des villes a la gouvernance urbaine. Revue Francaise de science politique 45 (1):57-95.
Lenk, Klaus. 2004. Der Staat am Draht: Electronic Government und die Zukunft der öffentlichen Verwaltung ; eine Einführung.
Macleod, Gordon, and Mark Goodwin. 1999. Space, scale and state strategy: rethinking urban and regional governance. Progress in Human Geography 23 (4):503-527.
Ministère de la Fonction publique, de la Réforme de l'État et de l'Aménagement du territoire 2004. Plan stratégique de l'administration éléctronique (PSAE), edited by S. d. É. à. l. R. d. l'État.
Mitchell, W.J. 2003. Me++: The cyborg self and the networked city. Chicago: MIT Press.
Nebert, Douglas, ed. 2004. Developing Spatial Data Infrastructures: The GSDI cookbook. Version 2.0 ed. Reston: GSDI Technical Working Group.
Reinermann, Heinrich, and Jörn von Lucke. 2002. Speyrer Definition von Electronic Governance. Speyer: Deutsche Hochschule für Verwaltungswissenschaften.
Scott, James C. 1998. Seing like a state: How certain schemes to improve the human condition have failed. New Haven / London: Yale University Press.
Sharma, Aradhana, and Akhil Gupta, eds. 2006. The anthropology of the state, Blackwell readers in anthropology. Malden/Oxford: Blackwell publishing.
Snellen, Ignaz. 2002. Electronic governance: implications for citizens, politicians and public servants. International Review of Administrative Sciences 68 (2):183-198.
Städtetag Nordrhein-Westfalen. 2003. Geodatenmanagement. Eine Handlungsempfehlung: AG Geodatenmanagement des AK Kommunales Vermessungs- und Liegenschaftswesen des Städtetages NRW.
Williamson, Ian, Abbas Rajabifard, and Mary-Ellen Feeney, eds. 2003. Developing spatial data infrastructures. From concept to reality. London: Taylor & Francis.

reviewed paper

EU-Project: Cross-border Spatial Information System with High Added Value (CROSS-SIS)

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1 INTRODUCTION

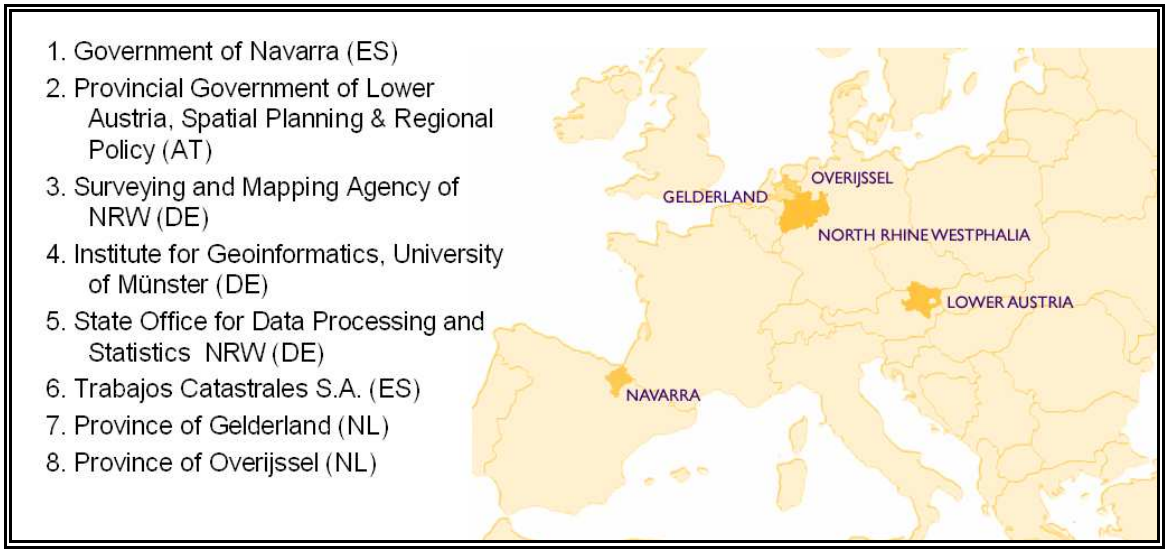
The objective of CROSS-SIS project is to enhance the use of spatial data for spatial decision making in crossborder settings, promoting the modernisation of the regional administrations, the use of INSPIRE and the development of the information society.

2 COOPERATION IN CHANGE ON BORDERS

In the developing Information Society the access to spatial information will be a key factor for spatial related decision making and could be defined as an infrastructure component. Therefore, Spatial Data Infrastructures (SDI) are currently developted on different levels from local to European.

A set of organisations collect geographical data but they have little or no contact with other organisations doing similar work in neighbouring regions (from the European point of view the INSPIRE directive will focus on the harmonisation of the European developments).

The CROSS-SIS-project is partly financed by the European Union within the Interreg III C program with the aim to enhance the use of spatial data for spatial decision making in crossborder settings, promoting the modernisation of the regional administrations, the use of INSPIRE and the development of the information society (www.cross-sis.com). Some further objectives are to achieve greater efficiency in the acquisition, maintenance, management and distribution of spatial data both at regional and cross-national level. The ambitions of the project are closely related to the directives of INSPIRE (http://inspire.jrc.it/) – so a decentralized approach is favoured, also to go further in modernizing the regional administrations and finally arrive at e-government.



Partners of CROSS-SIS

In 2005 all participants Lower Austria (Austria), Gelderland and Overijssel (The Netherlands), Navarra (Spain) and North-Rhine Westphalia (Germany) analysed the available SDIs in their regions. A method to evaluate SDI initiatives in a cross-border context was developed by the Institute for Geoinformatics at the University Münster and used to identify a best-practice in each region. Based on this exchange of knowledge and experiences two pilot-projects are currently implemented in 2006. They should serve as an “opener” for a European spatial data infrastructure as envisioned by INSPIRE.

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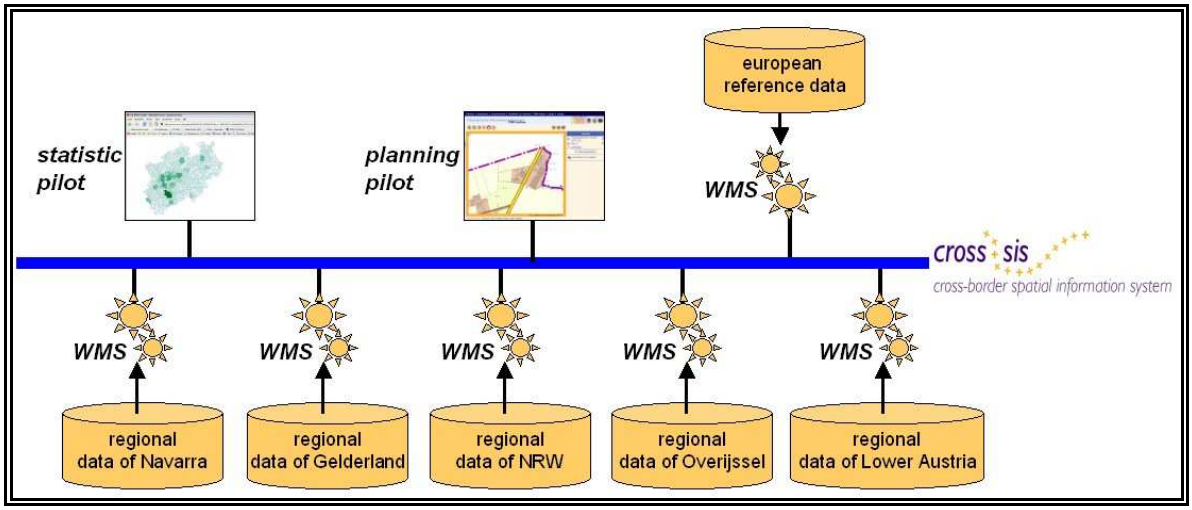
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Josef BENEDIKT



Cross-SIS - Architecture for Web Services

The application of this spatial data at a cross-border level is undoubtedly a crucial element for the support of crossborder management of various domains, e.g. water management, tourism, environmental protection, statistics, etc. This could also be a drive for the development of both cross-border services and strategies even to the extent of common policies on Spatial information and data management

3 GENERAL OBJECTIVES OF CROSS-SIS

The objective of CROSS-SIS project is "To enhance the use of spatial data, as a crucial source for spatial decision making in cross-border settings". The general objectives of the proposal are:

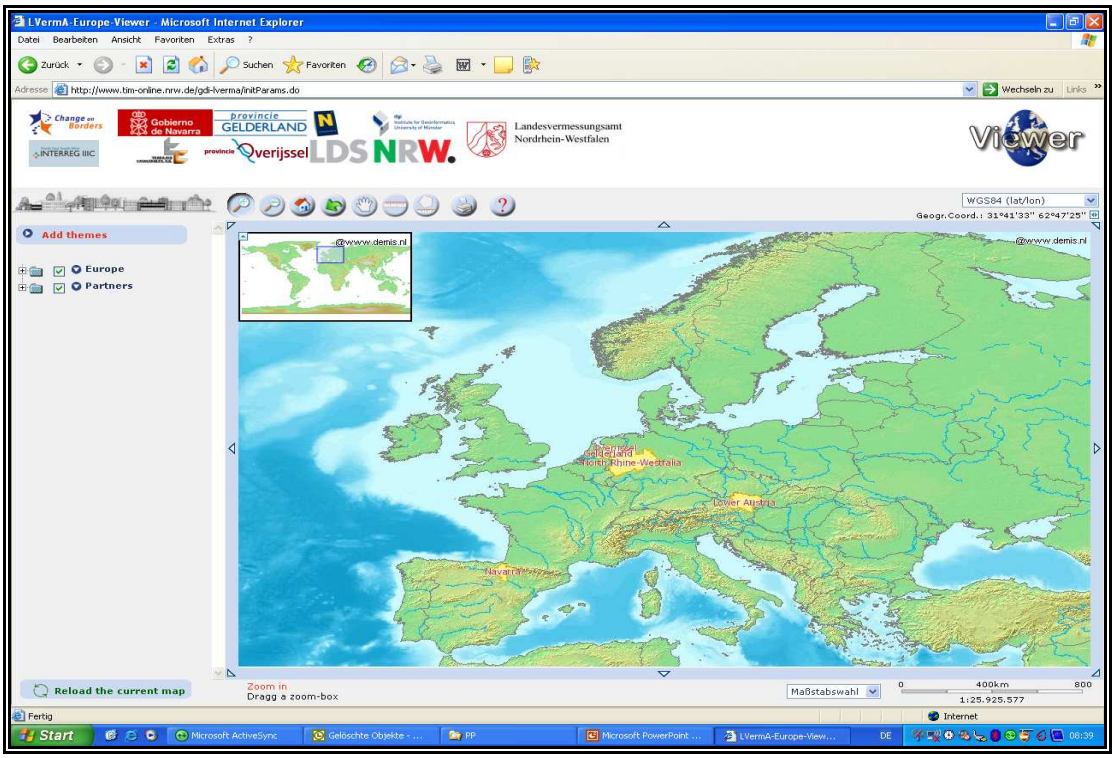
- Demonstrate how Spatial Information Systems can be a strategic tool and contribute to the strategic objectives and decision-making process in cross-border regions.
- Provide solutions/services for cross-border spatial information use by the customers in the European Regions.
- Promote spatial data as a decisive component for spatial decision making in cross-border scenarios.
- Optimise and share investment, human resources, and technology applied to spatial information in cross-border regions.
- Promote the modernisation of the regional administrations and the use of INSPIRE to attain effective e-government.
- Promote spatial data as a crucial component of the development of the information society.
- Provide a collaboration reference for other institutions and regions.
- Improve the know-how on cross-border SIS of the experts participating in the different workgroups defined in the project
- Spread the knowledge of the experiences on spatial management and policies of the regions participating in the project
- Execution of studies and prototypes of the management of cross-border issues in the areas of statistical and planning.
- Increase the know-how and experience of the experts participating in the Workgroups with regards to the technologies and standards to be implemented in the European regions for achieving a European Spatial Data Catalogue.
- Increase the efficiency of the use of SIS as a key tool in the management of cross-border activities and issues in the areas of statistics and planning
- Detect potential collaboration ideas on these subjects for deepening in the cooperation work between the regions.

4 PILOT APPLICATIONS

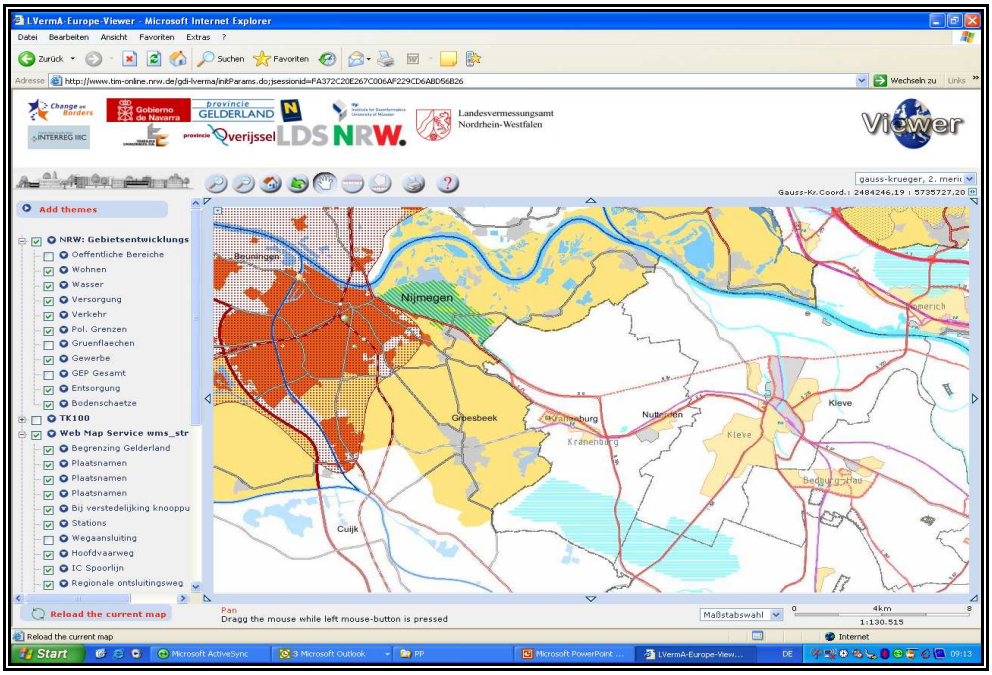
In the CROSS-SIS project pilot applications are currently set up in two specific areas:

4.1 Planning

The purpose of the planning pilot is to develop a WEB-GIS-client that presents comparable regional planning data as interactive maps at a European level. The added value of this pilot is not only to present planning data in a cross-border context free of charge via the internet, but also to follow a service-oriented architecture by utilizing OGC (Open Geospatial Consortium) -compliant technologies. Using these, the planning data is integrated into the WEB-GIS-application via standardized Web-Map-Services (WMS) that each partner will set up. One advantage of this process is the fact that the preparation and the up-dating process for the data are both done decentralized by each partner region. Another advantage of the WEB-GIS-client is the easy-to-use approach for both beginners and experts. The technical architecture is structured to conveniently enable users to interact with the application (choose regions, level of plans, show the related documents).



Planning application: www.tim-online.nrw.de/gdi-europa

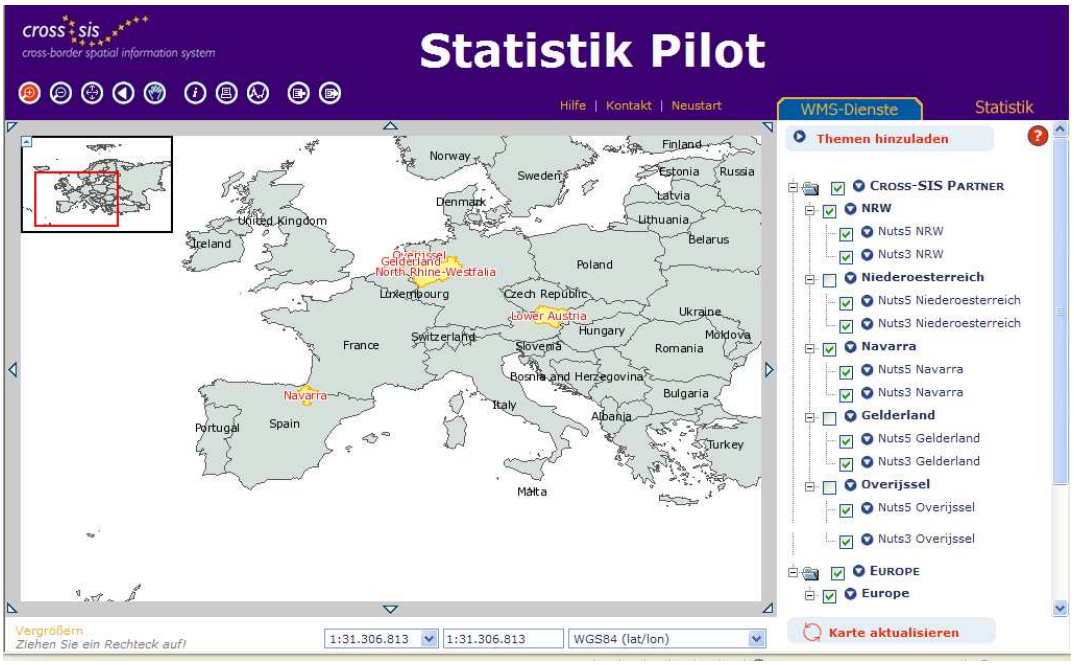


Planning Data from Gelderland and North-Rhine Westphalia

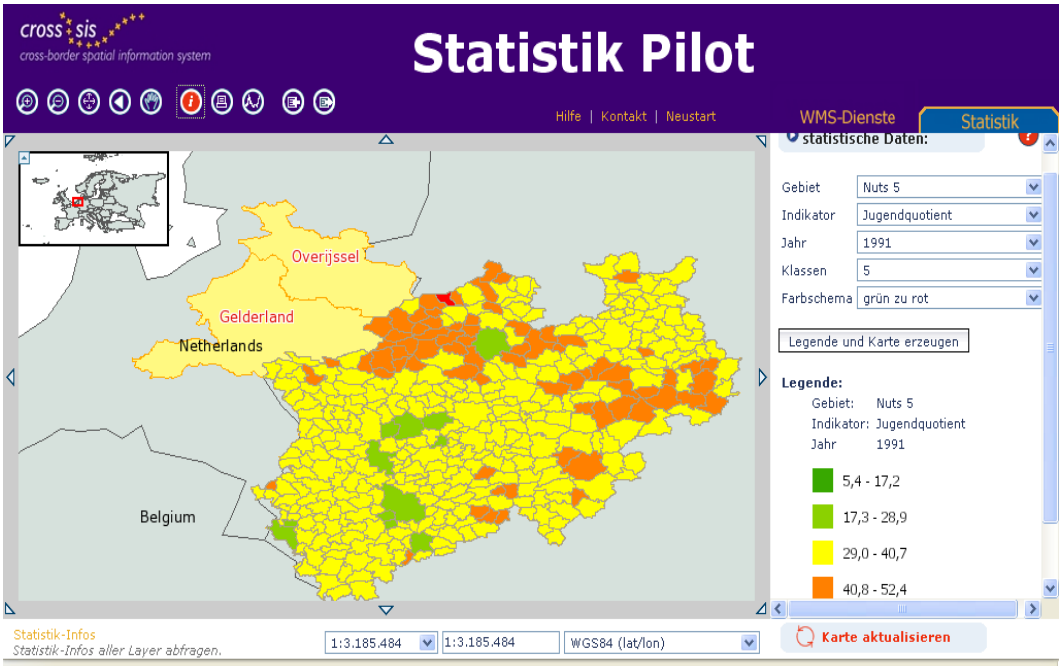
The next step in this projct will be an investigation, how reference systems could be changed automatically (a new topic, during the CROSS-SIS-project an approach to handle this topic came up). In addition the integration of additional decentralised services should be supported.

4.2 Statistics

In the area of statistic the difficulties in harmonizing European data are obvious, showing living conditions in Europe. However, with CROSS-SIS it will be demonstrated that with distributed interoperable web service technologies, which constitute the base for any modern SDI, it is possible to discover, retrieve, visualize and analyze spatial data regardless of the factual physical location of spatial data repositories and geoprocessing facilities. This is a precondition for a seamlessly integrative application of spatial data by statistics professionals in cross-borer settings. But the demonstration will not avoid addressing current semantic data problems. In contrary, it shall also reveal fields for future research. The purpose of the statistical pilot is to develop a WEB-GIS-client that presents regional statistical data as interactive maps at a European level. The added value of this pilot is to present statistical data in a cross-border context, free of charge via the internet, and also to follow a service-oriented architecture by utilizing OGC (Open Geospatial Consortium)-compliant technologies. Using these, the statistical data is also integrated into the WEB-GIS-application via standardized Web-Map-Services (WMS) that each partner will set up. As a special option it is possible to search for customized selected indicators from EUROSTAT on a regional European level. The search results are visually represented in maps.



Statistic Application: www.gis3.nrw.de/crosssis



Statistic Application: www.gis3.nrw.de/crosssis

5 CONCLUSIONS

The author wants to give an overview of the CROSS-SIS project, including the state-of-the-art of the SDI-initiatives in the participating regions. He also wants to explain the basic principles that have been developed to implement a spatial data infrastructure at a regional European level and that direct the specification of the two pilot projects.

As the project is closely linked to the INSPIRE principles the main objective of the project is achieved if the prototypical system provides the platform for European regions to represent their kind of data.

6 REFERENCES

Home page CROSS SIS: www.cross-SIS.com
Maria Cabello: CROSS SIS-Seminar in Brussels, Inside Inspire, The CROSS-SIS experience, 20. September 2006, Brussels
Maria Cabello: Workshop Pamplona, Navarra en el desarrollo de INSPIRE, 24. March 2006, Pamplona, Navarra
Riecken, Jens: CROSS-SIS, 12th EC GI & GIS WORKSHOP, ESDI: Setting the Framework, 21 – 23 June, Innsbruck, Austria

🏆 *reviewed paper*

Scenarios of land use change in Europe based on socio-economic and demographic driving factors

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1 ABSTRACT

In this paper we will present scenarios of land use change on European scale that were developed in the course of geoland, an Integrated Project funded within the 6th framework program of the EC. The Spatial Planning Observatory, which is part of geoland, will generate products and services based on EO data, geo-spatial and statistical data, fulfilling the demand of spatial planning as provided by European, national and regional regulations and policies. The products and services comprise indicators, spatial typologies as well as models and scenarios, which are presented in tabular, graphical and map forms.

Scenarios of land use change provide alternative views of future landscapes, depending on the underlying assumptions of the scenarios and the modelling approaches applied. The aim is not to forecast future development, but to reveal impacts of economy, society and current spatial patterns on future spatial development and to show different pathways of spatial development. Our scenarios focus on the development of artificial surfaces such as residential areas based on statistical Eurostat data and CORINE Land Cover data in a selected European test region. For modelling future landscape scenarios past development patterns were analysed and interrelations between land use, economic and demographic data were derived. The methodology of multiple linear regressions was applied to learn more about the relationship between settlement development and several explanatory variables which have been identified as driving factors for settlement growth (or decline) such as demographic development, economic structures and changes, etc. The resulting linear regression equation statistically explains past land use changes and can be applied for estimating future land use change scenarios. A common scenario approach is the extrapolation of current trends into the future (business as usual, trend-scenario) assuming that no change of current policies and driving factors occurs. Additionally, we will present scenarios that result out of alternative assumptions on population development using population projections from Eurostat (baseline variant, high and low population variant, no migrations variant, high fertility variant, younger and older age profile population variant).

Traditional scenarios mainly focus on either land use or statistical data as input. The specific approach in our scenarios is that statistical, not land use related data such as demographic and socio-economic development are considered as driving forces for land use change. Thus, the interdependency between society and landscape is incorporated into the scenario calculations. In this paper we will explain our approach in detail and present different scenarios of land use change at the European NUTS 3 level derived from regression analysis demonstrating the interdependency between demographic and land use development.

2 INTRODUCTION

The land use change scenarios presented in this paper were developed in the course of the Integrated Project geoland, funded within the 6th framework program of the EC. The Observatory Spatial Planning (OSP) is part of geoland and aims to introduce innovative Earth Observation (EO) derived land cover/land use products into spatial planning procedures and methods. The land cover/land use data are combined with socio-economic information and integrated in GIS procedures and models (for details see www.gmes-geoland.info). The OSP-consortium comprises users and political representatives as well as research organisations and companies. The European policy framework is considered in the project by referring to the European Spatial Development Perspective (ESDP) and to findings from the European Spatial Planning Observatory Network (ESPON).

Within geoland the team of the Austrian Research Centers, division systems research, was engaged in developing spatial typologies, indicators, land use transformation models and scenarios on European scale. European spatial indicators developed from our team within geoland were already presented at the CORP 2006 (Steinnocher et al. 2006). These previous works already revealed patterns and dynamics of land use

change in Europe. Thus based on these findings, we aimed to derive potential future transformation patterns for residential and industrial land use on European scale. These scenarios will be presented in this paper.

We chose the scenario technique, because on the one hand it is crucial for planners and politicians to get a picture of a plausible future world, in order to develop strategies and measures for or against certain development paths. On the other hand it is not possible to predict future development in its whole complexity. Thus, the technique of scenario planning is a good device for exploring different possible futures, for facilitating the understanding of complex relationships and for creating an awareness of different possibilities. Scenario construction appears to be an "all-rounder" in the field of complex problem solving (Wiek et al. 2006). Different scenario typologies exist. However, several typologies reflect the view that futures studies explore possible, probable and/or preferable futures (e.g. Amara 1981, see figure 1), which means a differentiation into the questions What will happen?, What can happen? and How can a specific target be reached? (Börjeson et al. 2006).

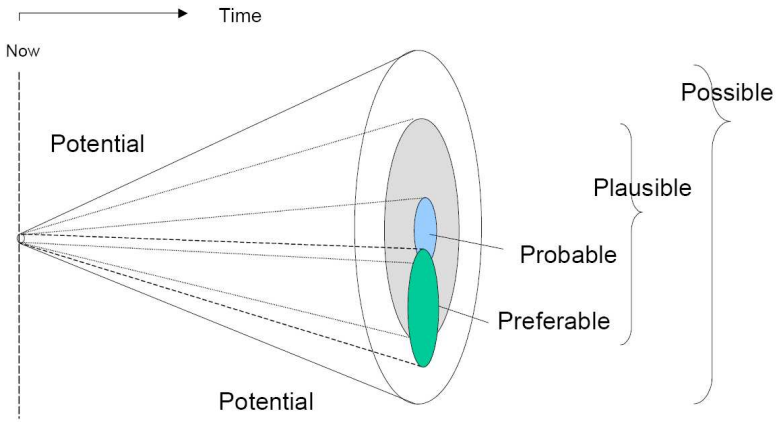


Figure 1: The "futures cone"

Source: Voros 2005 adapted from Hancock and Bezold 1994

Another frequently used approach is to distinguish scenarios between extrapolation scenarios, expert judgement, inclusive approaches and imaginative approaches (Kuhlman et al. 2006): Extrapolating scenarios are based on the extrapolation of existing trends, expert judgement draws on the knowledge of experts about driving forces and most likely developments, inclusive approach means that a set of future scenarios is developed in the hope of also capturing the "real" future (applied e.g. by the Intergovernmental Panel on Climate Change (IPCC 2001)) and the last one, the imaginative approach, asks people to image things which might happen in the future (applied e.g. by PRELUDE project implemented by the European Environment Agency).

The scenarios developed in the geoland project do not aim to exactly forecast what will happen, but to provide alternative views of the future based on major driving forces. We start with an extrapolating scenario and develop further a set of future images of European land use patterns. Our scenarios of land use change visualise images of potential future landscapes, depending on the underlying assumptions of the scenarios and the modelling approaches applied. The aim is not to forecast future development, but to reveal impacts of economy, society and current spatial patterns on future spatial development and to show different pathways of spatial development.

3 DATA AND TEST SITE

For spatial analyses and scenario modelling a test site of approximately 390.000 km2 has been chosen, which comprises Austria in its centre and covers the surrounding countries including new EU member states. The test site represents a wide range of heterogeneous geographic landscapes including Alpine areas, costal zones as well as flat terrain with urban and rural areas. Besides Austria, it comprises the Czech Republic and Slovenia and also parts of Germany, Slovakia, Hungary and Italy are included. Figure 2 shows extent and location of the geoland test site within Europe.

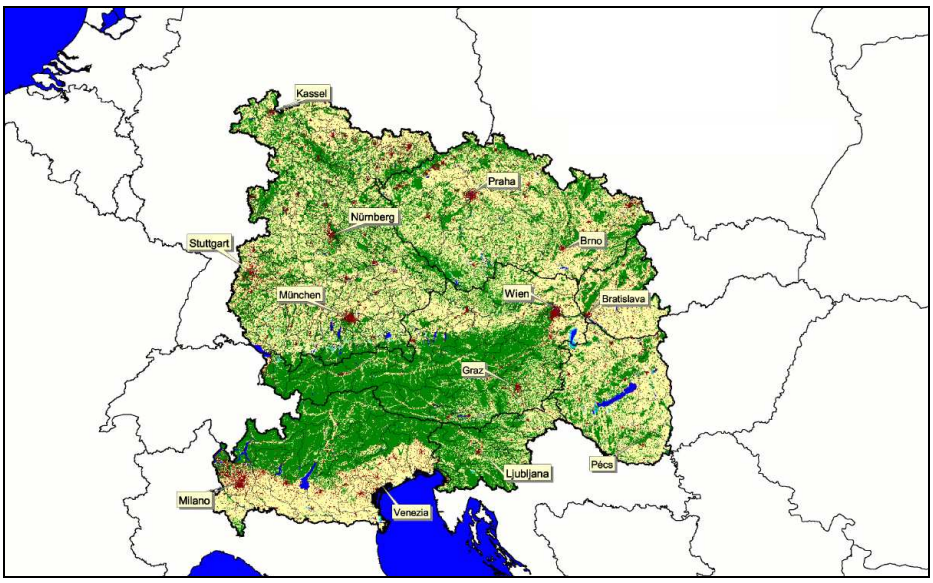


Figure 2: Land use patterns of the geoland test site
Source: land cover data: CORINE land cover level 1 (2000)

We aimed to derive land use scenarios with the help of statistical data and current land use patterns. CORINE land cover (CLC) data on level 2 delivered basic spatial data for analysing land use patterns and calculating land use changes. CLC data provide an essential basis for spatial analyses on European scale, because they are derived from satellite imagery and ancillary data sources on a standard methodology and are classified by a common nomenclature (EEA, 1999). Thus, CLC databases are a valuable source of harmonized data on land cover patterns and changes. Since 2005 CLC data are available not only for one single date, namely the year 1990, but also for 2000. At the same time, the first data base (CLC 1990) was revised and corrected, in order to allow comparing, analysing and evaluating the land cover dynamics between these two dates.

Statistical data from the Statistical Office of the European Communities (Eurostat) were the second essential source for our spatial statistical analysis. Eurostat collects data from the statistical offices of the member states and delivers harmonised data on national and regional (NUTS 2, some NUTS 3) scale. Eurostat offers a range of national and regional datasets covering different areas of European statistics such as demographic statistics, economic accounts and environmental statistics. For our analyses we extracted demographic and socio-economic data form the regional statistics database of Eurostat.

Basically, Eurostat is a valuable data base for European wide analyses down to NUTS 2 or – for some indicators – even NUTS 3 level. However, data are not available on a finer scale. Availability of historic data is also limited, particularly for the new member states, where most statistical series start only in the mid 1990s. Although Eurostat data base offers a wide range of present and historic statistical data, forecast data are scarce. Future projections of indicators only exist for population development on national scale or on European scale, which is too coarse for scenarios on NUTS 3-level. Recently, 3 population variants (baseline, low population, high population) are also available on NUTS 2-level.

The following CLC and Eurostat data were selected and incorporated into further statistical analysis:

CLC data 1990 and 2000

- share of major land cover types per NUTS 3 area
- ratio of different land cover types

Eurostat regional statistics data

- demographic data
  - population
  - population density
  - change of population / population density
- socio-economic data
  - employees (different sectors) and changes
  - purchasing power parity and changes

4 METHODOLOGY

Our scenarios focus on the development of artificial surfaces such as residential (CLC class 11) and industrial areas (CLC class 12). As traditional scenarios mainly focus on either land use change or statistical data as input data, our specific approach is to combine statistical Eurostat data and CORINE Land Cover data on European scale. Statistical, non-land use data such as demographic and socio-economic development are considered as driving forces for land use change. Thus, the interdependency between society and landscape provide the base for the scenario calculations.

For modelling future landscape scenarios past development patterns were analysed and interrelations between land use, economic and demographic data were derived. First, the availability of statistical data was proved. We required data on NUTS 3-level for the EU25 member states and for 2 different dates, namely 1990 and 2000, analogue to the CLC-data. Although statistical data from Eurostat are enlarged and improved continuously, data are not available in the same completeness and time range for the entire EU. We used CLC data from 1990 and 2000, but partly we had to combine them with statistical data from 1995 and 2000 due to lacking availability of data from 1990 (e.g. data on purchasing power parity). Changing NUTS-codes over time also caused additional efforts. A problem in terms of resolution resulted from the different sizes of NUTS 3 areas in different countries. NUTS 3-regions of the Czech Republic can almost be compared to NUTS 2-regions in Germany, which shows extraordinary small NUTS 3-units. Thus, in the EU-project SENSOR a NUTS X classification was developed primarily based on the NUTS 3-regions, but changing the German NUTS 3-regions into NUTS 2 (Verweij et al. 2006). We applied another approach and adapted the German NUTS 3-units to the spatial planning regions of Germany as will be discussed later.

After a first data research and data collection the correlations between different variables were explored in order to get an overview about the relationships between the variables. This led to a preliminary selection of relevant variables for the regression. Generally, the purpose of a multiple regression is to learn more about the relationship between several explanatory variables and a dependent predicted variable. In our case, changes of residential and industrial areas were to be explained by statistical and land cover variables. As explanatory variables socio-economic data (employees, purchasing power parity), demographic data (population, population density) and land cover data were used. To avoid multicollinearity, it had to be proved if two or more independent variables correlated as to exclude variables with high autocorrelation. Then a stepwise regression was calculated in which the predictor variables were added or removed iteratively so that at the end the most explanatory non-autocorrelating variables remained. The result of this statistical procedure was a linear regression equation which explained past land use changes in the selected European test region and which was applied for estimating future landscape transformation scenarios. The statistical procedure was carried out by using the statistical software SPSS.

Every regression refers to basic underlying assumptions. The calculations of future scenarios were based on two approaches: First, the approach of extrapolating scenarios was applied. It was assumed that statistically

significant relationships observed in historic settlement patterns and dynamics are also valid for future development. Thus, in this scenario historic trends were extrapolated from current state into the future (trend scenario). Second, expert judgments and assumptions on global trends were considered in the scenarios. Current expectations regarding demographic developments on European level were used for developing different scenarios.

5 FIRST REGRESSION RESULTS AND LESSONS LEARNED

In a first step, a common scenario approach was applied, namely the extrapolation of current trends into the future (business as usual, trend-scenario). In this case statistical relationships between the variables explained by linear regression are extrapolated into the future for estimating future landscape transformation scenarios. It is assumed that past land use changes will continue and no change of current policies and driving factors occurs.

The first regression runs revealed that certain variables worsened the R-square results while others were still missing in the regression and thus, were included in the following calculations. Further, the German part of the test site appeared to be a challenge for statistical regressions: first due to the small NUTS 3-regions and second due to the contradicting development of population and settlement area in former Eastern Germany.

The first problem was solved by adapting the German NUTS 3 regions to the spatial planning regions ("Raumordnungsregionen") of Germany (www.bbr.bund.de).

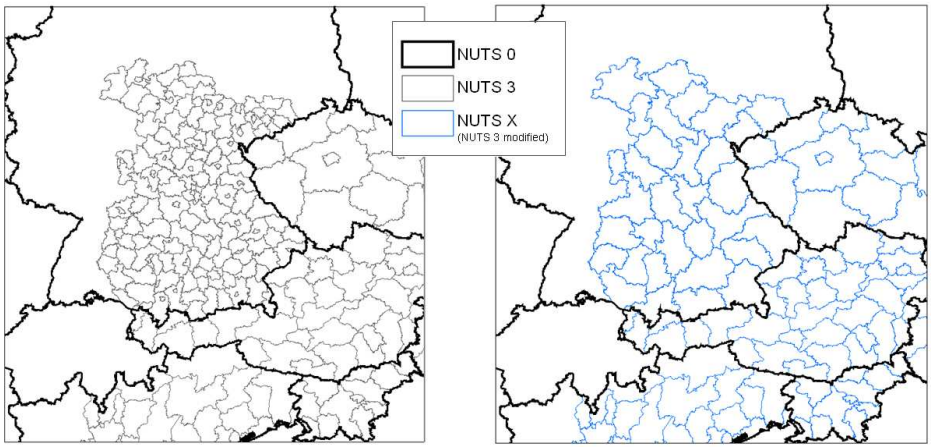


Figure 3: Left: European NUTS 3-regions; right: modified NUTS 3-regions (NUTS X): German spatial planning regions in comparison to other European NUTS 3-regions

The German spatial planning regions show a size between NUTS 2 and 3 – they are aggregated NUTS 3 regions but smaller than NUTS 2. We chose them for two reasons: they are official borders representing functional spatial planning units and they fit better to NUTS 3-regions of the other EU-countries than German NUTS 2 or NUTS 3 regions. The change of borders also meant an adaptation of the data base and a recalculation of the regression.

The second challenge was the contradicting development of population and settlement area in former East Germany and in some cities. Although the population decreased significantly, the settlement area grew between 1990 and 2000 (see figure 4). The reasons for this phenomenon are well-know: after the reunification of West and East Germany many East German regions experienced on the one hand high out migration rates (Heiland 2004) and on the other hand a drastic decline in their birth rate (Lechner 2004). While the population decreased, the settlement area did not shrink, but on the contrary, it was even enlarged. This specific development in East Germany together with suburbanisation trends in some cities caused regression results where change of settlement area negatively correlated to change of population. In other words: the regression said that settlement area grows if population declines. This was a correct statistical conclusion, but for future extrapolations this regression results were not useful.

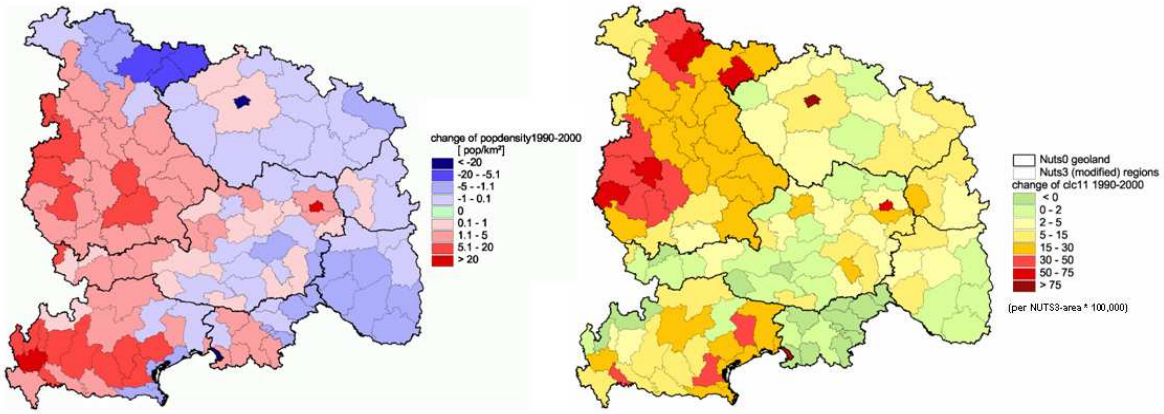


Figure 4: Left: change of population per NUTS 3 (modified) area; right: change of residential area real per NUTS 3 (modified) area

Empirical findings from Austrian studies proved that nowadays the growth of settlement area is not solely caused by growing population numbers but particularly in prosperous and urbanised regions by increasing demand for settlement area per person due to higher living standard and income (Loibl and Tötzer 2003, Tötzer 2006). As the German example illustrated, growth of population and growth of built up area are more and more decoupled. Thus, it was decided to include the demand for settlement area per person into the regression instead of only the number of population. The effect was that even declining population can cause settlement growth due to its higher demand per person. This adaptation appeared to achieve plausible results and was applied for calculating future extrapolations which provided the trend scenario.

6 RESULTS

After this preparatory work the final regression for explaining the development of residential area within the geoland test site was calculated. An R-square of 82% could be achieved. The resulting regression equation delivered the basis for extrapolating historic trends into the future. This trend scenario illustrates the potential future development of residential area under the assumption that historic and current economic and demographic trends will continue linearly (Figure 5, left map). As the aim of our scenarios was not to forecast future development, but to reveal impacts of economy, society and current spatial patterns on future spatial development and to show different pathways of spatial development in Europe based on different demographic and economic trends, scenarios also for extreme forecasts and assumptions on future European trends were calculated. Further scenarios were calculated that result out of alternative assumptions on population development using population projections from Eurostat (baseline variant, high and low population variant, no migrations variant, high fertility variant, younger and older age profile population variant). The right map in figure 5 shows the range of how much the 8 different variants deviate from each other.

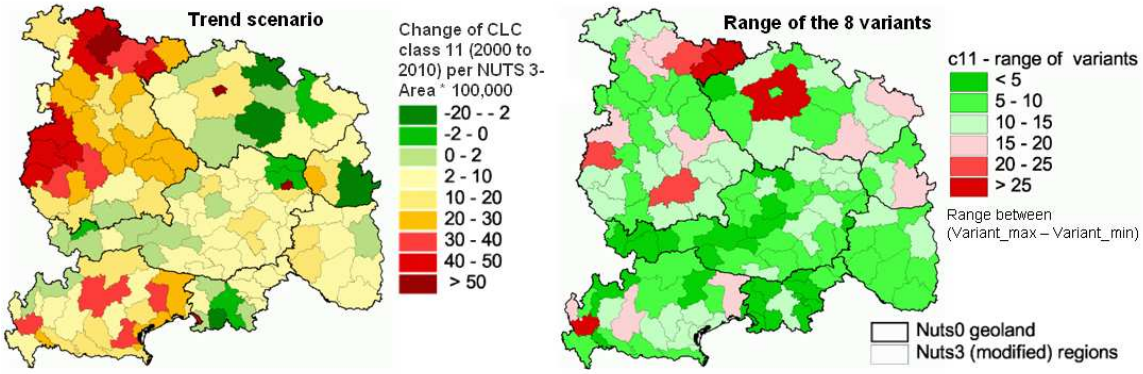


Figure 5: Left: Trend scenario; right: range of the 8 scenario variants

The results were discussed with project partners and practitioners. The following conclusion can be drawn from the scenarios:

As the trend scenario is an extrapolation of current trends from 1990/2000 to 2010, this scenario depicts even extremer land use effects than in the past decade between 1990 and 2000. In particular in the cities Vienna and Prague as well as in former East Germany, in the region around Stuttgart and also in some regions of North Italy the trend scenario shows a continuing growth of residential area. South Germany and North Italy are regions with increasing demand for residential area. In contrast, the district of Nitra in Slovakia and some regions in the Czech Republic, Slovenia, Western Austria and North of Vienna tend to stabilise (or even decrease) their settlement areas. It has to be said that it is very unlikely that settlement area really decreases because even if houses are abandoned vacant buildings often persist. Thus, the statistical extrapolation has to be relativised. However, it can be interpreted that only limited settlement development will take place in these regions.

Comparing the trend scenario with the others reveals to what degree settlement growth depends on population development and on peoples increasing demand for residential area. Furthermore, it points out which regions are especially sensitive to different population trends. As the right map in figure 5 illustrates, in many regions the different variants assuming high or low population growth do not deviate very much from each other. This originates in a) the low deviation between the different population projections and b) in the fact that population itself is not the only driving force for settlement growth (as already discussed previously). As the right map in figure 5 shows, a significant variance between the scenarios can only be observed in a few regions such as the suburban region of Prague, the East Germany part within the geoland test site and the greater urban regions of Munich, Stuttgart and Milan. The development of settlement area in these regions is particularly sensitive to the different population projections.

The scenarios which are based on a very dynamic population development (Eurostat variants: high population, high fertility and younger age) are very similar. The same similarities can be observed between the scenarios that assume only modest or negative population growth (Eurostat variants: low population, no migrations variant and older age profile). In Figure 6 two scenarios from the 8 variants were selected which most clearly point out the differences. Both maps present the deviation from the trend scenario.

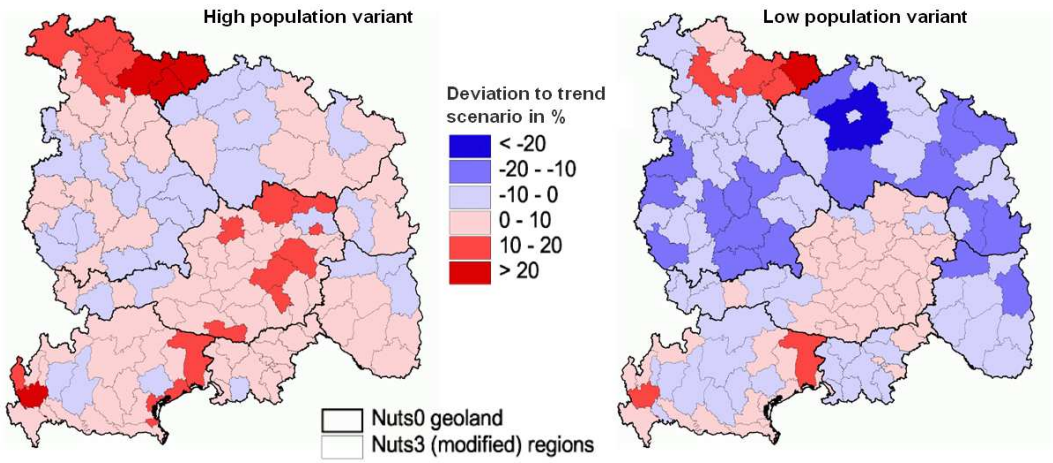


Figure 6: Scenarios with high population (left) and low population (right) forecasts in difference to the trend scenario (in %)

A visual comparison of the two maps already reveals that the East German part of the geoland test site as well as the Milan and Udine regions show high positive deviations from the trend scenario regardless of the different variants. Even in the scenario based on Eurostat´s low population assumption residential area will increase more than in the trend scenario. This originates in the fact that in the Eurostat prognoses population growth is assumed to be higher in the future than it was in the past. Thus, an extrapolation of historic population trends is lower than even the low-population-variant of Eurostat. As population is included into calculations through its demand for residential area, a lower population extrapolation leads in the following to an underestimation of settlement growth.

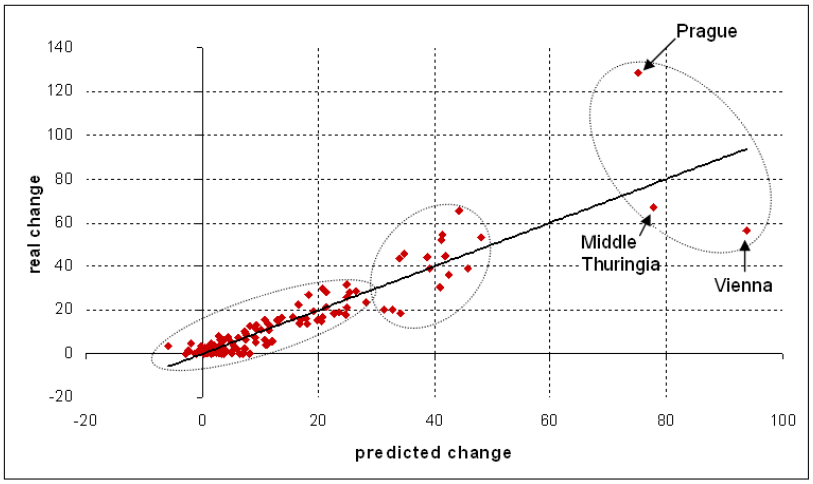
Low population forecasts mainly stunt the development of residential area in Bavaria, Stuttgart, Tuebingen and in the regions of the New Member States which lie within the geoland test site. For most parts of Austria

a higher population growth is forecasted than the trend would predict. The high population scenario shows positive effects in the North and South of Lower Austria, in North Styria, in the region Linz-Wels and in South Carinthia.

7 QUALITY ASSESSMENT

The trend scenario was validated by "control runs" calculating the development of residential areas for the past period 1990-2000 and comparing it with the actually observed development. Graph 1 shows for each NUTS 3 region the real changes of residential area (y-axis) in comparison to the predicted changes extrapolated from linear regression (x-axis). This quantitative comparison of the scenario results on NUTS 3 level allows an indication on the quality of the extrapolation.

As the R-square of the regression is very high (82.3%), most of the dots are very close to the straight line that represents the linear relationship between the real and predicted changes. Particularly in those NUTS 3-regions where the changes from 1990 to 2000 are rather small, the predictions from the regression fit very well. Deviations can primarily be observed for higher values.



Graph 1: Comparison of real and predicted change of residential area (each dot represents a NUTS 3-region)

There are three groups of dots. The first one is the largest group comprising NUTS 3 regions with a decrease or only low increase of residential area between 1990 and 2000. This group fits best with the calculated values from the regression. The second group shows a higher growth of settlement area than the first one and is already more scattered than the first one. The third group contains three outliers which clearly stand out from the others. They represent regions with very high predicted settlement growth: Vienna, Prague and Middle Thuringia. While in Prague the real growth was much higher than predicted by the regression, in Middle Thuringia and Vienna settlement growth was overestimated. Hence, two cities show highest deviations between predicted and really observed settlement growth: the highest positive deviation can be found in the Vienna region and the highest negative deviation in Prague.

Figure 7 integrates the information of Graph 1 in its spatial context. The visualisation in a map allows additional interpreting if regions with high or low deviations from observed growth patterns are spatially related. Regions in blue colour are overestimated by the regression, which means that the real settlement development was lower than the predicted. On the other side of the colour scale, regions displayed in a red colour show that the regression underestimated the regions´ real dynamic settlement growth.

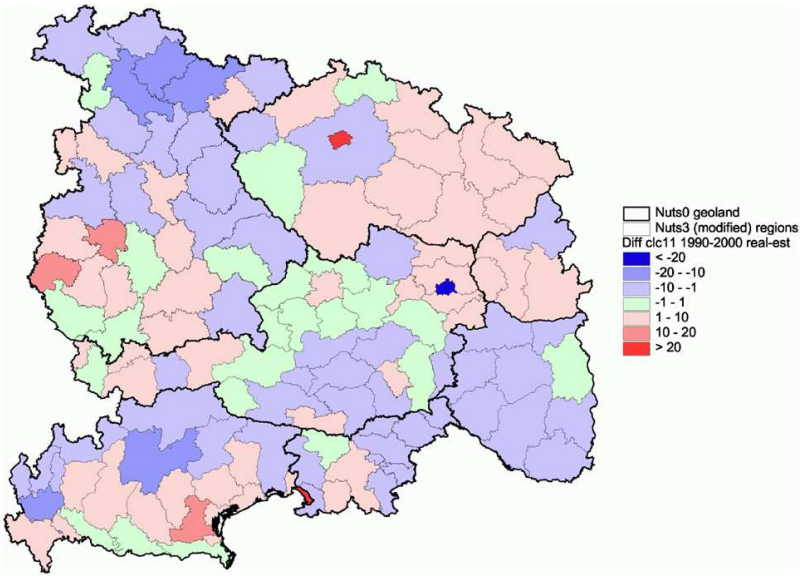


Figure 7: Deviation between predicted and real change of residential area between 1990 and 2000

Figure 7 confirms the previous findings: the Vienna region, where predicted change was much higher than really observed change, is the only one in dark blue colour. This is also the case in the East German part of the geoland test site containing Middle Thuringia. Furthermore, Milan belongs to the regions with the least correspondence between real and predicted growth values. After Vienna, Milan is the region with the second highest overestimation of settlement growth. In the dark red coloured regions – Prague and Trieste at the Italian border to Slovenia – the prediction is much lower than the actually observed growth. However, most of the NUTS 3 regions show a high concordance and only small deviations between real and predicted growth of residential area.

8 CONCLUSION

The scenarios discussed in this paper presented different potential images of future development of residential area based on socio-economic and demographic driving factors. Our approach is based on previous research demonstrating that land use change is driven by human factors such as population and employment development, demand for residential area, GDP and purchasing power. However, integrating statistical, not land use related data combined with current land use patterns posed a specific challenge in the approach applied. For identifying factors determining change of residential area and for exploring the relationship between land use and non-land use factors the methodology of multiple linear regression was used. In order to find the best predictors for land use change, the correlation between the explanatory statistical and land use variables and the dependent variable predicting change of residential area was examined. Regression test runs revealed that population development can not directly be fed into scenario calculations. Only in combination with the continuously rising demand for residential area per person it can reasonably be integrated into statistical regressions. Considering these findings and after adapting the NUTS 3 classification to similar sized regions, regression results could be achieved with a R-square of 82.3%. Thus, for the selected geoland test region a regression equation could be deduced which allows explaining the development of residential area by statistical Eurostat data and CORINE Land Cover data.

The regression delivered the base for extrapolating existing trends into the future. As the aim of the scenarios was to show different pathways of spatial development in Europe, scenarios based on current trends as well as on expert forecasts were calculated. However, European wide forecasts for the demographic or socio-economic development on regional scale are scare. Population projections from Eurostat were the only data available. Limited availability of EU-wide statistical data and of forecasts constrained testing further effects of single variables on scenario results. Thus, the scenarios focused on alternative assumptions on population development using Eurostat´s population projections (baseline variant, high and low population variant, no migrations variant, high fertility variant, younger and older age profile population variant).

The scenarios deliver insights on relationships between demographic, socio-economic and land use variables and on the sensibility of certain regions against varying population projections. Although the scenarios do

not include political measures such as changes in planning system (e.g. zoning restrictions) or immigration politics, they can give a hint, where measures would be needed. By constructing images of the future we can learn to identify the major impacts on future development. It is not necessary to know the future as such, but it already helps to realise what differences certain assumptions or projections would make. In our scenarios only a few regions appeared to be particularly sensitive to different population projections, namely Prague, the East Germany part within the geoland test site and the greater urban regions of Munich, Stuttgart and Milan. Even though the scenarios developed allow drawing some interesting conclusions, it has to be noted that the approach is currently limited by data constraints. Further research could be significantly improved by better statistical data and forecasts on European scale.

9 ACKNOWLEDGEMENTS

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10 REFERENCES

AMARA, R. C.: The futures field: searching for definitions and boundaries; The Futurist 15 (1), 1981, pp. 25–29

BÖRJESON, L., HÖJER, M., DREBORG, K.-H., EKVALLC, T., FINNVEDEN, G.: Scenario types and techniques: Towards a user's guide; Futures 38, 2006, pp. 723-739

EEA (European Environmental Agency): CORINE Land Cover – A key database for European integrated environmental assessment; 1999

[online] URL: http://terrestrial.eionet.europa.eu/CLC2000/docs/publications/corinescreen.pdf

HEILAND, F.: Trends in East-West German Migration from 1989 to 2002; Max Planck Institute for Demographic Research. Demographic Research. Volume 11, Article 7, 2004, pp. 173-194

IPCC (Intergovernmental Panel on Climate Change): Third Assessment Report, Working Group 1 Technical Summary; 2001

[online] URL: http://www.grida.no/climate/ipcc_tar/vol4/english/pdf/wg1ts.pdf

KUHLMAN, T., LE MOUËL, P., WILSON, C.: Baseline scenario storylines; SENSOR Report Series 2006/4, 2006

LECHNER, M.: The Empirical Analysis of East German Fertility after Unification: An Update; European Journal of Population 17 (2001), Nr.1, 2001, pp.61-74.

LOIBL, W., TÖTZER, T.: Modeling Growth and Densification Processes in Sub-urban Regions – Simulation of Landscape Transition with Spatial Agents; Environmental Modelling and Software. Volume 18, Issue 6, 2003, pp. 485-593

STEINNOCHER, K. BANKO, G., KÖSTL, M., PETRINI-MONTEFERRI, F.: European Spatial indicators – temporal development and quality aspects; Schrenk, M. (edt.): CORP 2006, Proceedings, pp. 201-208

[online]URL: http://www.corp.at/Download/CORP2006_CDRom/archiv/papers2006/CORP2006_STEINNOCHER.pdf

TÖTZER, T (2006): Raum im Wandel - Raumordnung im Umbruch? Untersuchung der Steuerungswirkung der Raumordnung zur Umsetzung einer nachhaltigen Siedlungsentwicklung; dissertation, University of Natural Resources and Applied Life Sciences, Vienna

VERWEIJ, P.J.F.M., SIEBER, S., WIEN, J.J.F and MÜLLER, K.: SIAT, a Sustainable Impact Assessment Tool for Understanding the drivers in integrated impact assessment; Summit on Environmental Modelling and Software; iEMSs 2006

VOROS, J.: A generic foresight process framework; 2003

[online]URL:
http://www.swin.edu.au/agse/courses/foresight/attachments/generic%20foresight%20process%20framework%20(voros).pdf

WIEK, A., BINDER, C., SCHOLZ, R.W.: Functions of scenarios in transition processes; Futures 38, 2006, pp.740-766

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Integrative tools for land use and flood risk management

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1 ABSTRACT

The extreme increase of flood events and flood damages during the last decades makes it obvious that an integrated approach is crucial to flood protection. Many issues such as technical measures, aerial and spatial management, retrofitting, raising risk awareness etc. have to be incorporated into the complex field of integrated flood management (IFM). The designed EC framework directive for flood risk management underlines the demand of his comprehensive approach.

As far as spatial management is concerned, aspects of water and flood management are often either badly or too late included into the planning process. Another problem is that flood and planning issues are not regarded and handled on the level of river basins but on administrative boundaries.

At the same time aspects of geodata infrastructure and flood related data and information has to be considered as a crucial interface in a concept for integrated planning.

In the context of a EU Interreg IIIb project which is named FLOWS (www.flows.nu) an interdisciplinary group of the University of Lüneburg, the Technical University of Hamburg-Harburg and the City of Hamburg was developing a planning instrument which integrates water management and flood aspects in spatial and city planning on the scale of a river basin with the aim of reducing flood impacts and improving at the same time the ecological situation. Meanwhile the interfacial requirements to technical and computer based tools like Decision Support Systems (DSS) are considered

The very urban area of City of Hamburg and rural parts of Lower Saxony in Germany serve as project areas. In this scheme a thorough process and structure analysis was accomplished to investigate data and planning structures, planning processes and cooperation between water management and spatial planning and planning deficits. By means of interviews and workshops with practitioners the planning instrument and the DSS were elaborated for an adapted implementation on the operational level for working out mid- and long term planning strategies.

2 INTRODUCTION

Flood risk is a working field with many different responsibilities. Analysing and management of flood risk has to be considered in the scope and natural context of catchment areas. Actually the handling is organised along administrative boundaries and by involving mainly water management, spatial planning and environmental planning apart from another. So no real comprehensive approach can be considered. It is obvious that the management has to be optimised concerning the working area and as well concerning the synergies and coordination of flood concerned objectives.

For an optimal management certain (digital) data and information are crucial. In this field some problems have been discovered like data quantity, data quality and interfaces, implementation different software applications and other more. In urban and rural areas we can state different priorities in flood management but these approaches have to be coordinated too to come to a common and concept.

Within the FLOWS project one research aspect was to deliver recommendations on how to integrate sustainable water management and flood information in the spatial development of a) urban and b) rural areas. For this purpose an appropriate planning instruments should be elaborated for unifying different planning aspects and levels concerning flood management in the scope of catchment areas.

For this complex problem field a Decision Support System (DSS) which combines different data, models and a purpose tailored user interface are extreme helpful. Two DSS (one for rural and one for urban area) were to be developed in the urban region of Hamburg and a rural region of northeast Lower Saxony along the river Elbe. Furthermore the requirements for these DSS are to be identified. For a sophisticated DSS a process analysis of the planning proceedings has to be accomplished.

Based on this process, data and user analyses a best practice concepts on how to integrate a DSS into the decision making process has been developed. For identification and integration of different flood related measures – supported by a DSS – a new planning instrument was intended to be developed.

3 METHODOLOGY

The project team consists of one steering group with representatives of all German FLOWS partners and as well several interdisciplinary sub-project groups which has a continuously and extensive exchange. The represented working fields are water management, city and environmental planning and Informatics. Altogether about twenty institutions and stakeholders were involved in the iterative process of process and requirement analysis and concept development.

To work out a concept which is both, general transferable to other regions and as detailed as possible for a good implementation two representative case study areas in the federal states Hamburg and Lower Saxony were chosen. In the beginning of the project an elaborated study due to literature, jurisdictions and regional information were realised. On this basis a thorough methodology was worked out. In order to build a sustainable and effective support system all flood concerned decision pathways and planning and decision structures must be studied and fully understood. An extensive inclusion of people from practice should guarantee both to include their knowledge and requirements and to improve the implementation phase in a later phase by raising acceptance.

In a first phase planners from different authorities like city planners, landscape planners, et cetera from city districts, ministries, city and county councils were interviewed with the help of a guidance questions. The main goal of the interviews was to find out the pathways of decision making, to identify shortcomings and to get to know what kind of flood related information are in use or are required. In parallel a data structure and quality analysis were accomplished to learn which kind of digital data are accessible and usable in a DSS.

Lots of data were gathered, some were assigned to produce and others were produced by the project itself (like maps about inundation duration along river Elbe). All these data were integrated in the DSS for flood related city and land use planning. The interviews served to draw a process structure for flood related planning proceeding. By doing this it became obvious that a gap of communication exist both between the different working fields and offices and between the different administrative levels (e.g. district-city, county-state). So information about flood risk of planned developments is communicated to a (and sometimes too) late date.

Furthermore it became evident that especially the city planning council is interested in a computer based planning tool for simulation of flood impacts of certain measures while the planners and water managers in the rural region of Lower Saxony were more interested to improve the accessibility of digital information via an appropriated and flexible tool. That had the consequence that for Hamburg a model based DSS was planned and for Lower Saxony a data based DSS was designed.

For a better coordination of flood related planning and measures a new catchment based planning tool was conceived. With this planning tool – the catchment-related development plan which will be portrayed later in detail – the maximum of synergies could be realised and communication across subjects and levels can be assured.

Two specifications of plans were designed: one for the regional level and one for the local level. The plan includes aspects as coordinated measures of water management, environmental planning and city planning. This concept was realised with regards to an interface with the DSS. These flood related DSS can be used as well for realising the catchment-related development plan as for analysing single local planning questions.

4 THE NEW PLANNING INSTRUMENT IN CONTEXT OF ALREADY EXISTING LAW AND ATTENDED LAW

During the last years a respectable range of laws with direct or indirect flood concern were enacted on national and European level.

In Germany a law concerning flood risk prevention has been adopted in 2005. This law is changing several national laws, such as the Federal Building Code and the Water Management Act to mention only the most important ones. A main change is the spatial definition of the expansion of a 100-year-flood for areas with

high damage potential and consequently building restrictions for these areas. Another change is the obligation to develop flood risk management plans.

The European Commission has published the proposal for a directive on the assessment and management of floods in February 2006. One main aim is to establish flood risk management plans (containing flood risk maps), which shall integrate several aspects of flood influencing aspects as spatial planning, nature conservation, agriculture and so on.

"…on the reduction of the probability of flooding and of potential consequences of flooding to human health, the environment and economic activity, and taking into account relevant aspects: water management, soil management, spatial planning, land use and nature conservation"(article 9 para. 2 Proposal for a EC directive on the assessment and management of floods).

Another legal framework which should be mentioned in this context is the "Strategic Environmental Assessment". The purpose of the SEA-Directive which was adopted in 2001 is to ensure that environmental consequences of certain plans and programmes are identified and assessed during their preparation and before their adoption. The public and environmental authorities can give their opinion and all results are integrated and taken into account in the course of the planning procedure.

SEA shall contribute to more transparent planning by involving the public and by integrating environmental considerations. For example for urban development plan a SEA has to be assessed if a SEA has not taken place on a higher planning level (like regional planning). The aspects of flood risk have to be considered in these assessments as a part of environmental protection.

5 CATCHMENT-RELATED DEVELOPMENT PLAN: CATCHMENT-ORIENTED, REGIONAL AND LOCAL

A main problem in working on catchment areas is the scale of delimitation of catchment areas. Catchments areas are defined as rivers from the source to the river mouth with its catchment basin. These catchments are covering lots of hundreds and thousands square kilometres. Working on this scale is not possible with the aims and measures intended by the proposed development plans, but there are still organisations working on it (such as the International Commission for the Protection of the Rhine). Their aim is to coordinate measures of water management whereas the catchment-related development plan shall achieve an integration of both, catchment-related and spatial planning interests for one area. Thus it is necessary to work on a much more detailed scale, such as sub-catchment areas and even a defined settlement area.

To make sure that both scales, with detailed and less detailed information and measures can be covered, it is useful to create a multi-level plan. One plan should be established on a regional level to keep an overview and to coordinate all measures in a sub-catchment area. This plan will respond to the existing national law and can be widened to respond to the needs of the proposed directive of the European Commission, probably voted by the European Parliament by the end of the year 2006. The proposal for the mentioned directive foresees in article 13 paragraph. 2 that if reasonable, the delimitation of catchment areas should be adopt from the reporting areas of the European Water Framework Directive (WFD) (Article 13(7) of Directive 2000/60/EC).

The second plan should be able to cover relevant flood areas as parts of a city or a whole town area for example showing districts with the possibility for new buildings by respecting the water balance and the risks of floods.

5.1 Integration into the planning system (example: Germany)

The proposed plans can be easily integrated into the planning system like in the German system. Both, the regional and the local catchment-related development plan is to be used as an information tools by the administration before starting any planning on a parcel or even for the whole urban development.

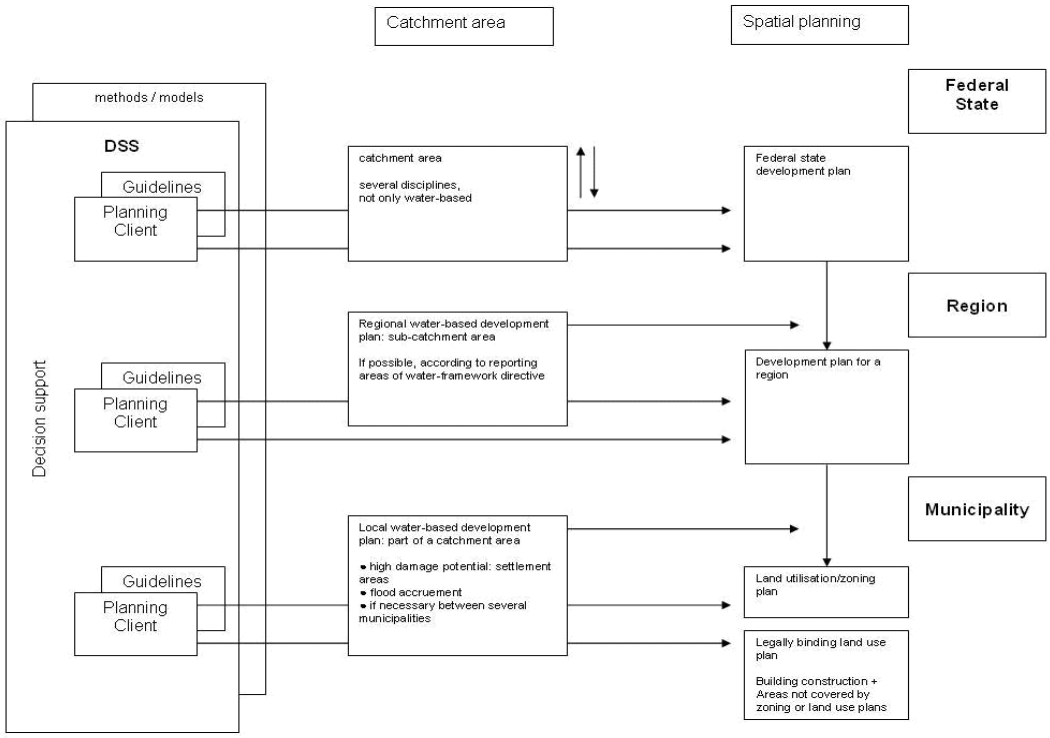

Fig. 1: Structure of existing planning levels, position of regional and local catchment-related development plan and interface with DSS.

The concept of the catchment-related development plan implies two levels of specification: the regional and the local level. Exemplarily the Regional catchment-related development plan will be presented here.

5.2 Regional catchment-related development plan

The regional catchment-related development plan should be elaborated for a sub-catchment area. It should comprise the following information:

According to the proposal of the directive of the European Council (as proposed in article 7):

- Floods with a high probability (likely return period, once in every 10 years); blue zones
- Floods with a medium probability (likely return period, once in every 100 years); blue lines across the rivers)
- Floods with a low probability (extreme events); (violet lines across the river)
- According to national law (e.g. Germany):
- Zones for conservation or defining new water retention areas (yellow lines)
- Water retention areas protected by German federal planning law (green areas)

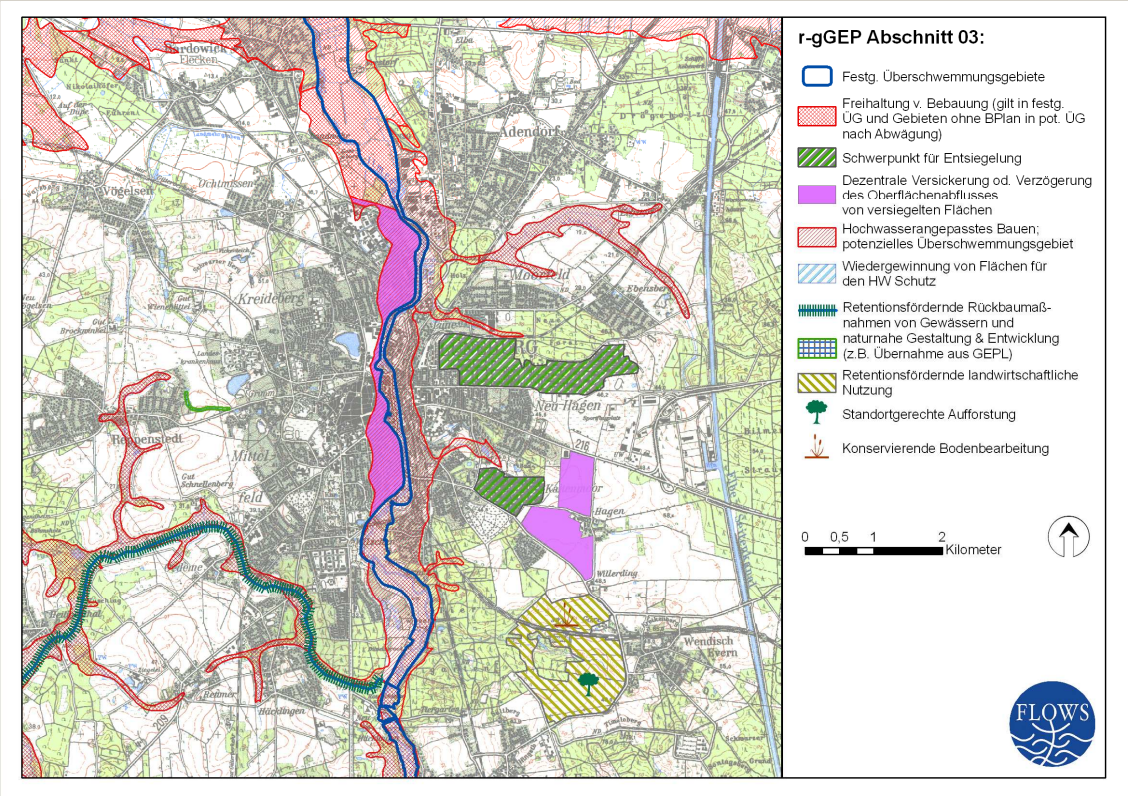

Fig. 2: Example for a regional catchment-related development plan

According to national law (e.g. Germany):

- Zones for conservation or defining new water retention areas (yellow lines)
- Water retention areas protected by German federal planning law (green areas)

Furthermore it could involve following measures, which could be either developed only for the catchment-related development plan or could be generated by other (digital) information for instance measures for restoration of rivers due to planned measures because of environmental impact assessment, eco-accounts, or river development plans:

- Limitations for further development
- Main areas for reduction of sealing
- Decentralised infiltration of surface water
- Flood appropriated constructions / measures for retrofitting
- Restoration of flood retention areas (flood plains, oxbows etc.)
- Restoration of rivers to raise the flood retention potential
- Creation of new retention areas (like polder)
- Land use measures for raising retention potential (land use patterns, plough less agriculture etc.)
- …

6 IMPLEMENTATION OF A DSS TO ASSIST PLANNERS CREATING THE CATCHMENT-RELATED DEVELOPMENT PLANS

As information in analogue plans like the described catchment-related development plan needs to be permanently updated computer based techniques are eligible and dynamic to gather and analyse the numerous data and to keep the plan up to date. Decision Support Systems are especially suitable to provide these functions. The early involvement of multidisciplinary water, spatial and city planners into the conception process of a DSS revealed first and foremost the need of access to interdisciplinary data complemented by hydrologic data and the easy access to them and evaluation of them by DSS techniques. Additional a list of all required and desired data and information was questioned.

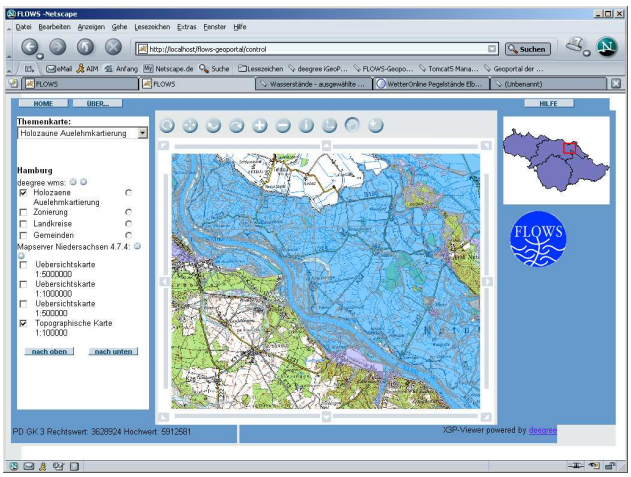

Fig. 3: FLOWS Geodata portal.

The main objective of a computer based DSS is to offer analysis, communication, management and learning functions to the user. These can be worked out by a data-oriented or model-oriented DSS. It is common to both, that there is a user interface, which aids the planner, to solve certain questions in an easy way.

As a matter of fact, the demands in urban and rural regions differ. Flooding in densely populated areas causes higher and different damage than rural and mainly agricultural formed areas. Conflict of aims and interests concerning land use are also higher in urban area which has to be taken into account and assessed by planners. It applies to both kinds of regions that a flood related DSS needs to inform about flooding events at certain return periods, extreme events, damage/risk maps, areas endangered of flooding in case flood protection measures fail.

Furthermore these data are to be opposed to spatial data about land use, land owner, building, and nature conservation and especially to the demands of the WFD. As well as the model feeding data as all others, there has to be an infrastructure which provides and exchanges all the needed information. For that reason both the Hamburg and the Lower Saxony DSS developer where improving the spatial data infrastructure (SDI) by analysing existing services and extending these to the FLOWS-DSS relevant application and data.

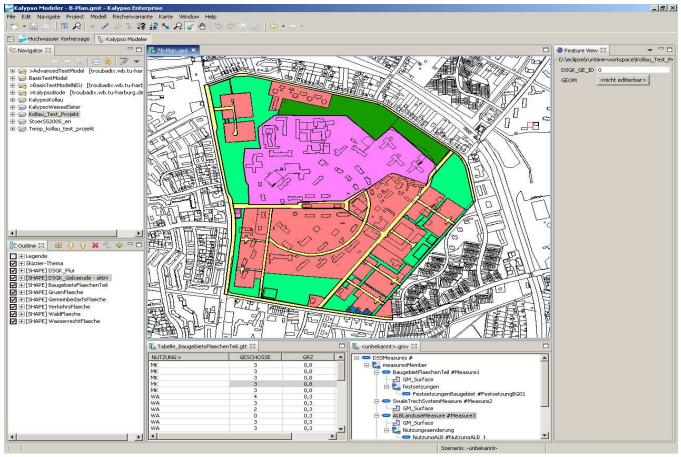

Fig. 4: Kalypso DSS with geodata interface

For the last years spatial data infrastructures are being developed by all administrative levels just to mention the EU-initiative INSPIRE the, “Bundes-“initiative IMAGI to build up the Spatial Data Infrastructure Germany (GDI-DE), SDIs on federal state level as well as for example the “inter federal state” SDI Metropolregion Hamburg (MRH) which includes the FLOWS Germany investigation sites. Especially the MRH was extended through the FLOWS projects which show innovative way of the substantiating philosophy of using OpenGIS techniques.

Thus the DSS in Hamburg (see Fig. 4) will use these available data and will be specified for the end user (town planner) in the Hamburg administration. The DSS Planning Client is able to show changes in the water

run-off situation after a simulation of constructing new buildings or flood defence measures in an investigation site. It is able to include Geodata by Web Mapping or Web Feature Services in model-based DSS for simulations.

Figure 3 shows the Geodata portal and DSS which is used in Lower Saxony where a Web Mapping Service (WMS) is implemented. Further data can be loaded as well as all portal information is accessible via a WMS-URL which gives interested users the opportunity to load all the data to its own GIS. In the case of this DSS flood related information was pre-calculated in FLOWS project as for example flood events at certain recurrent periods, areas endangered of flooding in case of flood defence failure but also data about land use and land management. The infrastructure can be used to manage flood plains but also catchment areas and to set up catchment-related development plans.

With this concept a clear interface between the planning instrument of catchment-related development plan for a whole catchment and the supporting tools like DSS and Planer Client was created. Both can be used on its own as well. But together an innovative, appropriate and dynamic system for implementation of flood related information in spatial planning processes can be delivered.

7 CONCLUSIONS

First of all we have to consider that the FLOWS project created a greater awareness about flood related issues. Furthermore the potentials of collaboration between water management, spatial planning and environmental planning became more obvious. Common and coordinated goal seeking for mitigating flood risk took place and prepared a basis for sustainable flood management.

As well a common data concept was elaborated as the methodology of exchanging of data with agreed standards so that synergies in this field help for the daily work.

The concept of a catchment-related development plan delivers an instrument for Integrated Flood Management for the whole river basin. This comprehensive approach supports an Integrated River Basin Management with coordinated measures, identifies synergies and supports labour and cost efficiency. It combines newest computer tools for analysing and visualising with a sustainable data management concept. Furthermore the latest national and international/European jurisdictions are considered and integrated which helps to meet its objectives in a sophisticated way. It seems to be a sustainable approach because the tools are already implemented in relevant agencies.

8 REFERENCES

AdV (2002) Geodateninfrastruktur in Deutschland (GDI) - Positionspapier der ADV. zfv – Zeitschrift für Geodäsie, Geoinformation und Landmanagement 2/2002

BfG (Bundesanstalt für Gewässerkunde) (2000) Towards a generic tool for river basin management. Problem Definition Report. Phase 1. BfG, Koblenz, Germany

Bundesgesetzblatt Jahrgang (2005) Teil 1, Nr. 26: Gesetz zur Verbesserung des vorbeugenden Hochwasserschutzes vom 3. Mai 2005.

Bunzel, Arno (2005) Umweltprüfung in der Bauleitplanung, Arbeitshilfe Städtebaurecht, Deutsches Institut für Urbanistik, Berlin

El-Najdawi, M. K. & Stylianou, A. C. (1993) Expert Support Systems: Integrating AI Technologies. Commun. ACM 36(12).

Evers, M., Brock, J. Rubach, H. & Urban, B. (2005) Integrated spatial management in floodplain landscapes: development of a DSS to conflate different land use demands in planning processes (iFMH). Integrated Land and Water Resources Management: Towards Sustainable Rural Development (International Commission on Irrigation and Drainage 21st European Regional Conference, Frankfurt/Oder, Germany).

European Commission (2006) INSPIRE. http://www.ec-gis.org/inspire/home.html Stand 20.06.06

European Commission (2006) An EU policy on flood risk management. http://ec.europa.eu/environment/water/flood_risk/index.htm

European Commission (2000) "Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy" The EU Water Framework Directive - integrated river basin management for Europe

European Commission (2006) Strategic Environmental Assessment (SEA) http://ec.europa.eu/environment/eia/sea-legalcontext.htm

Geertman, S. & Stillwell, J. (2003) Planning Support in Practise. Springer Verlag, Berlin, Germany.

GISWIKI (2006): http://en.giswiki.org/wiki/GDI; 20.06.2006

Hahn, B. & Engelen, G. (2000) Decision Support Systems (DSS) for river basin management. International Workshop 6 April 2000, Koblenz, Bundesanstalt für Gewässerkunde, Koblenz-Berlin

IKSE (2001) Aktionsplan Hochwasserschutz Elbe. http://elise.bafg.de/servlet/is/5130/

IUCN (International Union for Conservation of Nature and Natural Recourses) (2005) Wetland Problems. www.iucn.org/themes/wetlands/wedlands.html

Janssen, G. (2004) Rechtliche Grundlagen des vorbeugenden Hochwasserschutzes in der Bundesrepublik Deutschland und in der Tschechischen Republik. In: Leibniz-Institut für ökologische Raumentwicklung e.V. (Hrsg.): Vorbeugender Hochwasserschutz im Einzugsgebiet der Oberen Elbe - eine zentrale Aufgabe der Raumordnung, Bd. 2. Dresden.

Jekel, H. (2005) Das Gesetz zur Verbesserung des vorbeugenden Hochwasserschutzes. Zeitschrift für Umweltrecht, 16. Jg., H. 9, S. 393-400.
LAWA (2003) LAWA-Handlungsempfehlungen zur Aufstellung von Hochwasseraktionsplänen
Malanson, G. P. (1993) Riparian Landscapes. Cambridge University Press, Cambridge, UK.
Tumwesigye, E., Vojinovic, Z., Jonoski, A. & Abbott, M. B. (2005) Towards a new business model in urban drainage modelling and hydroinformatics. 10th International Conference on Urban Drainage, Copenhagen/Denmark, August 2005.
United Nations – Economic and Social Council (2000) Sustainable Flood Prevention. http://www.unece.org/env/water/publications/documents/guidelinesfloode.pdf

reviewed paper

Public-private partnerships approach: A success story in achieving democracy in the home ownership for urban inhabitants in Kuala Lumpur Malaysia

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1 ABSTRACT

It has been argued that public-private partnerships (PPPs) and other forms of cooperation between the private sector and local and national governments are used frequently around the world for a variety of reasons. Underpinning this notion are the facts that neither national nor local governments in most countries have sufficient budgetary resources to extend services and infrastructure or to subsidize inefficient state enterprises or agencies. It is further argued that many goods and services can be delivered more efficiently by involving the private sector. Involving the private sector is perceived as often brings stronger managerial capacity, access to new technology, and specialized skills that governments cannot afford to develop on their own. Most importantly is that forming public-private partnerships to assume functions that were formerly public sector responsibilities has potential benefits for both citizens and governments. Against this background, this paper seeks to examine the public-private partnerships between local authority and private developer in meeting the challenge to fulfill the housing needs of the urban poor in Kuala Lumpur, the capital city of Malaysia. It establishes that for many decades, the governance of city of Kuala Lumpur have formulated and implemented a wide range of policies to provide home ownership to urban poor in the city in the quest of assimilating them to become part of the home owning democracy. Yet, lack of funds has to a great extent posed to be the main barrier in implementing the policy designed to meet this social challenge. Drawing upon a case study of Wangsa Maju, Kuala Lumpur this study demonstrates that public-private partnership (PPPs) has successfully met this challenge. The findings suggest that a public-private partnership has transformed Wangsa Maju into new well-planned sub-centre with complete and organized modern urban facilities. Further insights into the level of satisfaction of households who were given the opportunity to enter into home ownership in this project confirm that this PPPs project is indeed fruitful. The study concludes that this PPPs approach is considered as the best practise in meeting housing needs of the urban poor. It has achieved the necessary balance between commercial and social priorities. The developer is able to reap profits they anticipated and the local authority is able to fulfill their social obligations to achieve democracy in the home ownership for all level of income.

Keywords: Public-private partnership, home ownership, social obligations, urban poor

2 INTRODUCTION

The public-private partnerships (PPPs) and other forms of collaboration between the private sector and local and national governments are widely used around the world for a range of objectives. Underpinning this, is the notion that the adoption of PPPs in urban development policies considerably resulted from the need of local authorities to expedite in the materialization of public services without committing significant funds from the public budget (Spacksman, 2002). It is claimed that neither national nor local governments in most countries have sufficient budgetary resources to extend services and infrastructure or to subsidize inefficient state enterprises or agencies. For instance, Kyvleou (2006) in her study on urban development through PPPs in the Mediterranean region, argued the main incentive of creating PPPs lays in the public sector's desire to bring private financing and managerial skills to public services provision. Furthermore, by using private sector management as a tool, Kyvleou (2006) further argued that PPPs contribute towards achieving better success and more cost-effective outcome. More specifically, local authorities tend to form PPPs due to the nature of urban development projects, which demand particular "know-how" and resources.

Adams and Young (2006) asserted that the introduction of PPPs across a range of sectors and nation at several stages of economic development has increased considerably since the 1980s. It is also perceived that many goods and services can be delivered more efficiently by involving the private sector. Involving the private sector is perceived as often brings stronger managerial capacity, access to new technology, and specialized skills that governments cannot afford to develop on their own. Most importantly is that forming

public-private partnerships to assume functions that were formerly public sector responsibilities has potential benefits for both citizens and governments.

It has been argued that the public-private partnerships are not the same across countries, even within the developed countries, in the context of their formation and operation (Xie, 2002). For example, Keating (1998) contended that there are marked differences in PPPs between the United States and European countries. In particular, these differences illustrate that national political, socio-economic, cultural and institutional contexts should be taken into consideration in analysing PPPs. Most importantly, is the understanding of international trends and commonalities.

Against this background, this paper seeks to examine the public-private partnerships (PPPs) between local authority and private developer in meeting the challenge to fulfil the housing needs of the urban poor in Kuala Lumpur, the capital city of Malaysia. It first establishes that for many decades, the governance of city of Kuala Lumpur have formulated and implemented a wide range of policies to provide home ownership to urban poor in the city in the quest of assimilating them to become part of the home owning democracy. Yet, lack of funds has to a great extent posed to be the main barrier in implementing the policy designed to meet this social challenge. Secondly, drawing upon a case study of the development Wangsa Maju Township, Kuala Lumpur this study demonstrates that public-private partnership (PPPs) has successfully met this challenge.

A case study capitulate deep but narrow outcome (Fellows and Liu, 1997). Yin (1984) noted that the single case study method is an appropriate application where the case in question represents an extreme or unique case or that situation has not previously been the subject of detailed scientific investigation. This research draws on a large amount of documentary evidence gathered from case study of the local authority of Kuala Lumpur and structures interviews with 200 low income households given the opportunity to enter home ownership within Wangsa Maju Township. No specific criteria were outlined in choosing the households, rather they were chosen because of their willingness to participate in this study.

3 PUBLIC-PRIVATE PARTNERSHIPS (PPPS)

A partnership refers to collaboration for a specific purpose or purposes between the two or more parties. It requires commitments from all the parties involves in achieving common goals. Thus, PPPs in urban economic development can be defined as an arrangement between the public and private sectors in providing urban services and promotion of urban economic development (Xie, 2002).

The study by Jeneleniewski (1997) defined the characteristics of PPPs as:-

- Involving one of more public authorities ; and
- One of more private partners;
- Working together to fulfil a mutually agrees objective, though
- A specific organizational framework set up by the parties involved.
- Each party retains its own identity.
- There is an input of resources by the parties concerned; and
- Parties bear the risk of the project together and share profits, according to their possibilities.

Recent researches suggest that PPPs have entered into the mainstream of urban development practise and that many variations on this are evolving to respond to different conditions and needs (Payne (2003). Indeed, many authors argued that formal partnerships have so far made only a limited impact in both scale and their ability to benefit low-income people. In contrast, informal partnerships appear to have been operating at a large scale and are perceive more successful in meeting the needs of the poor. This scenario however does not portray in the context of Malaysia (Wan, 2006).

The essential quality of successful partnerships is that of complementarity, in which the strengths and weaknesses of each partner are offset against those of the other in generating developments that merge the best quality of each. This could be seen as developments that are economically resourceful, socially responsive and environmentally sustainable. Partnerships do not require the parties involves to subordinate self interest. In fact, they provide a wider and longer term framework within which such interests can be

protected and promoted. Thus, it should be seen as providing each party benefits that cannot be realized when operating independently.

This study will explore the success story of PPPs in Kuala Lumpur which has not only successful in meeting the housing needs of the urban poor in Kuala Lumpur but at the same time accomplished the private sector partner to reap profits from the development. However, the following section will first discuss the wide range of policies designed to provide home ownership opportunity to the urban poor in the city in the quest of assimilating them to become part of the home owning democracy.

4 LOCAL POLICIES TO ASSIST THE URBAN POOR TO ENTER HOME OWNERSHIP IN KUALA LUMPUR

City Hall of Kuala Lumpur (CHKL) as the local authority responsible for the administration of the capital city of Kuala Lumpur, Malaysia has established a wide range of low-income housing programs in meeting the challenge to provide housing for low-income households. The role of CHKL in assisting low-income households to enter home ownership evolved from being an enabler during the early post independence to a distinctive provider role after the establishment of the New Economic Policy (NEP) in 1970s. The shift of role to state provider, as practised by Singapore and Hong Kong (Doling, 2002), was part of the social agenda to create political stability amongst a mixed ethnic population. In terms of housing provision, direct participation by the state as provider as exemplified by Singapore and Hong Kong is perceived to be more successful (Castells et al, 1990; Mitlin, 2001) in meeting the needs of the low-income group.

CHKL began to relinquish this role as provider and instead shifted the role to the market, when the country's economy was considered relatively mature. This radical shift in the role of the state mirrors the experience in a number of Europe countries recently (Edgar et al., 2002). Hence in the mid-1980s, almost thirty years after self-government, the private sector was required to actively participate in providing low-cost housing to enable the low-income group to become part of the homeowners' democracy. This role of the market however, received a good response from private developers, accepting that the profit made by them in a political and economically stable country should be equally enjoyed by all levels of income regardless of race. The state maintains its role as enabler but continues to monitor the performance of private developers. Legislation was introduced to ensure private developers fulfilled the target outlined by the state in meeting the housing needs of low-income group.

Low cost housing in Malaysia context refers to the houses with selling prices fixed by the government as range from RM25,000 to RM42,0001 per unit depending on the location of the development (Wan and Noor, 2005). The price guideline introduced by the state to replace the original price which was fixed at ceiling price at RM25,000 regardless of the location is to improve the quality of low cost houses. These prices have been argued as an indicative of the financial capabilities of prospective buyers within the low-income group. The target group is stipulated as those household earning an income of between RM750 to RM1, 5002 per month (MHLG, 1998). The state has also specified that effective from June 1998 each low cost housing unit must have a minimum built-up area of between 48 to 60 square metres accommodating minimum three bedrooms, a living and dining area, a kitchen and separate bathroom and w.c. (MHLG, 1999). It is perceived that this concept is able to accommodate an average household of five members.

The evolution of the role of the state has affected the programmes established by CHKL. The establishment of a policy mix in meeting the housing needs of the low-income households has been driven by the experiences as both provider and enabler. Broadly, the programmes can be categorised into three key groups (see table 1).

Type of low-cost housing programs	Government's own projects	Joint-venture projects	Project imposed on private developers through planning permission
Housing program for hard core poor (for rent)	x		
Housing provided by developer through planning permission (for sale)			x
Privatisation and joint venture project (for sale)		x	
Joint venture project with Employees Provident Fund (EPF) (for sale)		x	
National Housing Company (SPNB) (for rent and sale)		x	x
Program using City Hall of Kuala Lumpur's own housing fund (for sale)	x		
Public housing program (for rent)	x		
Integrated public housing program (for rent)	x		

Table 1: Category of low cost housing programmes in Kuala Lumpur (Wan, 2006)

This broad classification indicates that more than half of the programmes outlined by the authority were projects designed to provide entry to home ownership for the low-income group. It also illustrates that fifty percent of the programmes represent projects initiated by both the federal state and local authority. Through this heavy state intervention, the state intervenes obviously by using the state's own funds to construct, deliver and distribute low-cost housing to lower income households, themselves driven by the objective to accomplish both the economic and social goal of the nation. Additionally, through regulation the private sector contributes to supplement the housing supply to low-income households. CHKL through the planning system, as suggested by Barlow and Duncan (1994), influenced the market by imposing a certain percentage of low cost housing to be built by private developers in any proposed residential development. This form of intervention to some extent portrays the housing enabling role leaving the market to construct and deliver (Doling, 1999), but revert to the state to distribute. Most importantly, is that this joint-venture project or more widely known as PPPs aimed to release the financial burden of the state but at the same time demonstrated serious commitment by the state in providing entry to homeownership for low-income groups. Certainly, this mode of development not only portrays a public-private partnership but also a joint effort between public-public organisations to expedite the supply to the market.

5 THE CASE STUDY: WANGSA MAJU TOWNSHIP

Wangsa Maju, is a major township in Kuala Lumpur developed by a private-public partnerships of CHKL and Landmarks Land and Properties Sdn Bhd, (formerly known as PGK Sdn Bhd). This matured 2,000-acre township, is located close to the Kuala Lumpur city centre. The township is well-networked by both rail and road connection. In terms of rail, two LRT stations are provided in this township, while by road, it takes the form of the Middle Ring Road II, a free-flow expressway connecting the area to the south and north of KL; the Ampang Elevated Highway; and the soon-to-be-built KL North Eastern Expressway, also called the Damansara-Ulu Klang Expressway or "Duke".

The site is a former rubber plantation estate covering an area of 1,301 hectares (3,211 acres). Designed to accommodate a population of 120,000 people, a total 25,970 dwelling units comprising various types of housing varying from 5-storey walk-up flats, medium and low-cost integrated houses in addition to linked and condominium houses were constructed in phases commencing from mid 1980s (UPU, 1992).

Wangsa Maju township was launched in 1987 as an ambitious PPPs. Wan (2006) record that the township has grown from a housing estate with medium-density flats to an established and self-contained area which boasts of commercial centres, Alpha Angle, Jaya Jusco shopping complex, Carrefour, affluent semi-detached houses, luxurious apartments and some of the most "happening" places in the city. The township now has an estimated population of 400,000 within its 4km radius from Setapak, Taman Melawati, Taman Setiawangsa, Ukay Heights and Bukit Antarabangsa.

Wangsa Maju was primarily developed as a new township to accommodate the increasing demand for housing in Kuala Lumpur. The Wangsa Maju project is considered as the first well-planned new township to meet the housing needs of all levels of income (PGK, 1992). The private partner, PGK Bhd owned by Paremba Group (The State of Selangor own part of shares of this group), is known as one of the reputable housing developers in Malaysia.

A total number of 7,791 units of low cost housing were developed in this well-planned township of Wangsa Maju (UPU, 1992). Providing low-cost housing as part of fulfilling the public-private partnerships development's requirement is in fact part of social obligation since low-cost housing involved a considerable element of subsidy that has to be absorbed by private developer. Thus, the developer has to have sound technical and financial capacity to be able to meet the obligation imposed on them.

This PPPs project witnessed the unique arrangement between the CHKL and private partner. In materialising this project, CHKL has to acquire the former rubber plantation estate at market value. The site was then made available for PPPs project as a form of equity for CHKL. The developer is responsible to plan a new township which is sustainable. All the cost incurred in developing this new township is borne solely by the developer. In return, CHKL provides assistances in expediting the necessary development approvals required from relevant authorities. With this arrangement, the guaranteed return to CHKL is the form of 7,791 units of low cost housing. This is significant in meeting the needs or housing shortage for the acute problems of rural-urban migration which prevails at that time. Additionally, CHKL is also offered a substantial number of medium cost houses as staff quarters. The developer is even allowed to sell certain acreage of vacant land within this township in generating the capital outlay for the project. To a certain degree, it can be concluded that the rest of the development after taking into account the return in kind to CHKL, is left entirely to the developer to optimise development profit in accordance to the master plan of the area.

6 THE PROUD HOME OWNERS AMONGST THE URBAN POOR

The dominant percentage of low-income households interviewed is Malays. About two third (66%) of households surveyed declared they were ethnic Malays followed by 18.5% ethnic Chinese and 14% ethnic Indian. The ethnic composition in this PPPs project corresponds to the rough percentage of ethnicity at the national level. A large majority of respondents (91%) were families with children.

A clear majority of the respondents do not wish to move out from the present address. This suggests that they are indeed pleased with their present residence. To some extent, this confirms the success of PPPs to assist the low income people to enter home ownership. The findings indicate that the dominant reasons for feeling very pleased was that they have made decision to purchase due to likely the only chance to afford to own a home. This suggests that majority of these low-cost house owners were indeed those who warrant assistance from the state to enable them to enter home ownership. Since this is likely to be the only opportunity to enter home ownership, together with the fact that majority of their households' head are at their active age, which means they are in employment or have their own source of income explains why they are able to sustain the ownership.

The study also demonstrates that majority of them were very pleased with their decision to purchase their current dwellings, and none of them claimed they regretted purchasing the low-cost housing. This suggested that the policy of providing housing to the low-income group through PPPs have assisted them to become homeowners, an aspiration desired by most Malaysian regardless of race and income group. Nevertheless, about 16% of them declared they have mixed feelings on their decision to purchase. Most of this group of 16% stated their reason for not feeling absolutely pleased with their decision to purchase is due to the condition of the low-cost housing. A small percentage claimed they now face difficulties to commute to their work place. Although none declared they face difficulties to access to basic amenities such as schools or

market, some of them blamed their neighbours for not feeling absolutely pleased with their decision to purchase low-cost housing.

Most significant is the introduction of subsidised housing made available to the low-income to enter home ownership would seem to have provided an opportunity for home ownership to a wide variety of households who would otherwise never have bought. More than half stated their reason for buying as this is likely to be the only chance to afford to own a home. About 30 per cent claimed their reason for buying as good financial investment as well as it gives a sense of security. The desire to give something to leave for their family and gives them a sense of belonging as citizens of Kuala Lumpur were the next important factors stated by respondents in this owner occupied group. There also exist a small percentage of 5 percent who professed they have spare money to purchase these units. There are those who do not qualify to be low-cost owners but loopholes of the implementation system have enabled them to become home owners of subsidised unit.

The study suggests that buying a low-cost housing is indeed a significant commitment made by these low-income people. Despite that only two thirds of the owner occupied households interviewed declared they would continue living at the current address. Another one third professed they were keen to move to new address. Majority of the one-third group who expressed to move out were not satisfied with the current low-cost housing owned by them. They claimed that the size of rooms (which refers to bedroom size) is too small to accommodate their family. This may be due to the fact that majority of the households interviewed were family of 4-6 members cramped in a unit of built up area of 650 square feet. Thus, this suggests that the size of family should be taken into account when designing a low cost unit rather that remain to the rigid built area of 500 to 650 square feet as outlined by the central government.

In particular, the above findings on household's experience in low cost home ownership indicated that two third of those who now become homeowners feel that PPPs has provide the low-income households a mean of entry to home ownership. This suggests PPPs has significantly assists low income people to enter homeownership is significant. Without this assistance they would not have the opportunity to become home owners of which a wide range of benefits were derived (see Steele, 1990: Steele, 1993)

Further findings also indicate that PPPs is a successful initiative by the government to assist them to become part of home owning democracy. Despite that, a small number argued that becoming homeowner of these subsidised units has created financial problem to the poor.

Above all, the evidence from the survey shows clearly that whilst a high proportion of the owner occupied household feels proud being part of the owning democracy group, a handful wish to move to other type of housing due to a number of reasons, some wish for bigger space and better quality and some could no longer tolerate their neighbours behaviours. Perhaps the objective to achieve social cohesion amongst multi ethnic society is not fully met. However, most important is the low cost housing policy has successfully assisted them to enter home ownership earlier than they would.

7 CONCLUSIONS

Housing for low-income group has important features that make it a unique and highly sensitive area of urban policy, both economically and politically. The PPPs programme between the state and the private sector has demonstrated a satisfactory achievement. It could be argued that the success of key actors in negotiating some of the realised profits from the partnership development for the benefit of home ownership entrants of low income households should be considered as the best practise in meeting housing needs of low income people. Rather than accepting the profit in cash, it has instead turned into more low cost housing units.

The first lesson derived from this study is that the PPPs have successfully met the housing needs of low income people in Malaysia. Implicitly this has led to successfulness of social cohesion amongst not only the multiethnic society but also between different levels of income groups. This is made possible because the state persists in providing a wide range of opportunity for low income people to become home owners and thus created 'a great sense of belonging' to the country.

In this regard, the empirical findings of this study provide up-to-date evidence from Malaysia. The study demonstrates that the provision of housing for low-income group in Malaysia is a matter of both the public and the private sector. PPPs have been a tool in encouraging private sector to participate in fulfilling this social obligation. Most importantly the study has illustrated that PPPs proved to be successful. The private

sector to a great extent understands the role to be played in meeting the housing needs of low income people, and the public sector understands the implication of subsidised cost to be borne by the market. Thus, a win-win situation prevails where the private sector is able to reap its profit and the public sector to fulfil the obligations to achieve democracy in the home ownership particularly t for the urban poor in the context of Kuala Lumpur, Malaysia.

8 REFERENCES:

ADAMS, J.and Young, A.: Public private partenrships in China; Sstem, constraints and future prospects., International Journmal of Public Sector Managment, Vol 19, No.4, 2006.

CASTELLS, M.: The city and the Grassroots. London: Edward Arnold, 1983

DOLING, J.:Comparative Housing Policy .London: MacMillan Press., 1997

DOLING, J.: Housing Policies and the Little Tigers: how do they compare with other industrialized countries? Housing Studies, Vol. 14, No. 2; 229-250 .London: Carfax Publishing, 1999

EDGAR, B., Doherty, J. and Meert, H.: Access to Housing. Bristol, UK: The Policy Press, 2002.

FELLOWS, R. and Liu, A.: Research Method for Construction; Blackwell Sciences, London, 1997.

YIN, R.K.: Case Study Research Design and Methods; Sage Publication, Newbury Park,C.A. 1984.

JENELENIEWSKI, M. Public-private partnership: Who is afraid of public private partnerwships? Paper presented at a workshop on Inner city development in transitional economies, Rotterdam, Netherland, 1997.

KYVLEOU, S.: Urban development through PPPs in the Euro-Mediterranean region, Managment of Envireom,ent Quality: An Intetrnational Jpournal, Vol 17, No. 2, 2006

MINISTRY OF HOUSING AND LOCAL GOVERNMENT: Guidelines on new selling prices
for low cost housing, Kuala Lumpur: Ministry of Housing and Local Government, 1998.

MITLIN , D.:Housing and Urban Poverty: A consideration of the Criteria of Affordability, Diversity and Inclusion, Housing Studies, Vol.16. No.4 pp 509-522, 2001

PAYNE, G.: Building Bridges: The experience of public-private partnerships in urban land development, Conference paper presented at the Lincoln Institute od Land Policy, 2003

PGK: Unpublished report on 'A township of Wangsa Maju' prepared for submission to Economic Planning Unit, Prime Minister Department, 1992

STEELE, M.:"Homeownership and Low-income Housing Policy in Canada", in Housing Affordability in Canada: Are we addressing the problem?, Occasional Paper 24, Institute of Urban Studies, Winnipeg, 1990.

STEELE, M.: "The Demand for Home Ownership," in Miron, J., (ed.) House, Home and Community: Progress in Housing Canadians, 1945-1986. McGill-Queen's University Press and CMHC, Montreal, Canada, 1993.

UNIT PENSWASTAAN DAN USAHASAMA UPU): Unpublished working paper prepared for Lord Mayor of Kuala Lump, 1992.

WAN, N. A.: Low cost housing policy in Malaysia: A challenge in delivery, Unpublished PhD thesis, University of Dundee, Scotland, 2006.

WAN, N.A. and Noor, R.: Business partnership in meting housing needs of the urban poor in Kuala Lumpur, Malaysia, Global Built Environment Review, Vol.5, 2005.

XIE, Q.: Public-private partnerships in urban economic development and prospects of their application in China, Paper presented at the International Conference of" Transition in public administration and governance, Beijing, June 15-19, 2002.

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Crucial parameters for PPP projects successful planning and implementation

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1 INTRODUCTION

Within the INTERCO-PPP (Interreg IIIC/East) project (www.intercoppp.net), PPP success factors are identified and analyzed, based on the experience of the partners and of local stakeholders. Lead Partner is the Region of West Macedonia (Greece), while the rest partners are the WIBAG-Business Service Burgenland (Austria), the Energy Agency for South East Sweden (Sweden), the Klaipeda Regional Development Agency (Lithuania) and the Economic Development Agency of La Rioja (Spain). A set of factors were proposed, stating their applicability/significance and determining the importance of each of them to a successful PPP project. This comparative approach, while considering the regional and institutional context of the partners, identifies the common ground in five EU countries and thus offers a valuable navigation tool for EU regions.

2 WHY THE PUBLIC SECTOR IS TURNING TO PPP PROJECTS?

The main reason is that state usually has limited funds or has other priorities. At the same time the private sector is thought to 'produce' better work or the same work cheaper; is a better manager and takes better account of the risks involved. Also PSP & PFI are utilized; public sector risk is reduced by transferring to the private partner those risks that he can better manage; provided services are improved; and assets are better utilized. Finally, by taking advantage of private sector innovation, experience and flexibility, PPPs can often deliver services more cost-effectively than other traditional approaches. The resulting savings can then be used to fund other needed public services. The basic motives for PPP implementation are the need to secure state budget allocations; quality improvement of public infrastructure and provided services; mobilization of private sector's know-how in project planning/implementation; limitation of the project/service operational cost; and finally sharing of financial risks. The expected results of PPPs are: better exploitation of existing public funds; differentiation of the way public infrastructure projects and services are being implemented, in order to advance innovation; increased competition and know-how transfer from the private to the public sector; and the need to guarantee the desirable level of projects' social benefit and the quality of provided services on a constant basis. The public sector should examine the possibility of PPP when the provided service/project is new and cannot be implemented through public funding and/or the public sector's know-how; and when the private sector can reduce the cost, improve the quality of the service provided and deliver the outcome faster.

2.1 The basic requirements for a PPP project successful planning and implementation

The basic presuppositions are the formation of strong «partnerships», the Public acceptance, the management transfer from public to private sector and finally the guaranty of meritocracy and the performance evaluation during the contracting procedures. The main contribution of the public sector in the achievement of PPP goals is in the planning process, in the financial preparation of the partnership, and in the political and legislative preparation of the partnership. Additionally the public sector acts as the coordinator that ensures the social benefits of PPP projects. The governments ought not to consider PPPs as «easy solutions» on difficult matters. A lot of efforts should be made to ensure a cooperation context that will lead to success. In the past a lot of efforts have been made for the promotion of PPP in big projects. The challenge of tomorrow is the promotion of PPP in medium-scale projects, of questionable viability at regional or sub-regional level.

2.2 Benefits and risks related to PPP projects implementation

The potential benefits from implementing PPP are: cost reduction; risk management and risk assessment; improvement of provided services; and generation of revenue or other indirect financial benefits (economic development reinforcement, employment growth, etc.). The potential risks for PPP are: loss of control by the public sector; political risks; accountability question matters; ill defined and thus unreliable services; lack of competition; and the blurriness in the partners' selection procedure.

3 IDENTIFICATION OF THE PPP SUCCESS FACTORS

PPP has attracted a lot of attention in the national and EU context. Changes and reallocations in the national and EU budget underline the necessity of increased engagement of private funds. Although EU Member States have different levels of experience and legislation, the general tendency is the increased importance of PPP. Several factors such as public acceptance and strong partners are considered as essential for success. In the near future, the ability of the administrations to create regional capacity for the implementation of PPP at a regional and local level will define the broad-scale success of PPPs. It becomes evident that PPP should become a mainstream option in EU countries with a heavy public sector legacy. However PPPs are not a panacea. Central and regional public bodies must develop the abilities to assess a PPP concept, calculate risks and benefits and decide for the most viable solution.

3.1 Set of PPP-SSF identified by the INTERCO-PPP Project Partners

The INTERCO-PPP project presents the necessary link between theory and praxis of the project partners. The project among others aims to the identification of the basic PPP success factors. This identification is based on the accumulated experience of the project partners and the local stakeholders, who transferred their know-how and experiences in the INTERCO-PPP network through the interregional Meetings & Study Tours organized. The successful (or not) PPP Case Studies (projects) of the project partners, which have been thoroughly analyzed, constitute the basic element of this identification procedure (Table 1).

	Region of West Macedonia (Greece)	WIBAG-Business Service Burgenland (Austria)	Energy Agency for South East Sweden (Sweden)	Klaipeda Regional Development Agency (Lithuania)	Economic Development Agency of La Rioja (Spain)
Urban development	A new town project - ZEP (ZAUP - Zone of Alternate Urban Planning) Kozani				
Renewable energy sources		Güssing Municipality			
Tourism	XKKB S.A. – The Kozani-Velvendo Ski Center	Kurbad AG - Bad Tatzmannsdorf			
Technology & business development/innovation		WIBAG Business Service			La Rioja Digital Park
Energy service implementation			- Nyköping Municipality - Regionfastigheter I Skåne		
Entertainment & sports infrastructures	XKKB S.A. – The Kozani-Velvendo Ski Center				
District heating				The Vilnius City Heating Supply Project	
Waste management	DIADYMA S.A. - The Integrated Waste Management System of West Macedonia Region				
Public parking				The Vilnius City Car Parking Project	

Table 1: The PPP projects analyzed within the INTERCO-PPP Project

This knowledge exchange process has led to the identification of the following set of twenty (20) factors:

- Formation of “Strong” Partnership Schemes
- Full Understanding / Acknowledgement of the Social Character of PPP
- Public / Community Acceptance
- Political Backing
- Public Interest Observance
- Focusing on MIRR and not on IRR (Private Actor)
- Profit Assurance for the Private Sector
- Management Transfer from Public to Private Sector
- Public Initiative

- Knowledge Transfer
- Public Guarantees for Loans
- Quality & Product Standards Definition
- Delimitation of Competence Fields (for the Public and the Private Sector)
- Maturity of Technology / Project Concept
- The Guaranty of Meritocracy and Performance Evaluation During the Contracting Procedures
- Legislative Framework and Empowerment
- Capacity Development at National and Regional Level (Public Officials)
- Compatibility with Structural Funds and National Co-financing
- Establishment of an Independent Authority for Conflict Resolution
- Assistance in the PPP Drafting Phase.

Of course, the above mentioned set of factors doesn't cover all possible factors. It only represents the most crucial ones identified throughout the implementation of their respective PPP projects by the INTERCO-PPP project partners. For a successful PPP approach certain additional conditions have to be considered, such as:

- Distinct regulations are laid down concerning the responsibilities of the parties regarding costs/risks
- Project implementability
- Favourable economic conditions & available financial market
- Appropriate Risk Allocation
- Effective procurement

Following this identification procedure, the critics of the project partners are presented regarding the applicability & significance of the suggested factors. These critics / points of view will help determine the level of importance and contribution of each factor to a successful PPP project implementation. The whole process described above is of great importance as it identifies the common ground that is applicable in all EU countries and thus offers a valuable navigation tool for all EU regions. The lessons learned -in terms of PPP structures, national and EU regulatory frameworks and PPP Case Studies for selected sectors- should and will be disseminated to the benefit of other regions

4 COMMENTING THE SUGGESTED FACTORS

At this point the INTERCO-PPP project partners' points of view regarding the applicability & significance of the suggested PPP-SSF, based on their experiences, are being presented.

4.1 Formation of "Strong" Partnership Schemes

The partners could not decide on a common position and the meaning of strong partnership. Whereas the the long-term character (20-30 years) of many PPPs underlined the need for "durable" partners and partnerships, there where hesitations about the binding character and the intensity of PPP schemes. There is a certain deviation from contractual provisions towards a partnership culture that still has to be adapted in the national and regional contexts of the EU Member States and regions.

- **(Greece):** The role of the public sector in the achievement of PPP results is in the planning process, in the financial preparation of the partnership, and in the political and legislative preparation of the partnership. The public and the private sector work together on basis of clear, contractual agreements. Every partner keeps its own identity and responsibility. The respect of the needs of each partner (public and private) forms a crucial PPP success factor.
- **(Austria):** Experiences in Burgenland showed that strong partnerships in PPP did not work on a sustainable basis. Therefore it is recommended that partnership schemes should be formed in a way to be able to work within the foreseen timescale sufficiently but not to construct "strong" partnerships that fix the partners in their role like into a corset. Especially the private partner usually doesn't feel comfortable within "strong" partnership schemes.

- **(Sweeden):** The successive formulation of strong partnership schemes has been an important success factor, but not only in a contractual perspective, the spirit of co-operation and a mutual interest and commitment in the project has been equally important.
- **(Lithuania):** Dialogue, trust, long-term focus and reciprocal understanding constitute essential characteristics of the partnership culture that is crucial to the success of the PPP process. However, the PPP situation in Lithuania demonstrates the lack of such partnership culture. On the one hand, private sector partners often seek to maximise their short-term profits from the PPP contracts. On the other hand, public sector institutions are often unable to understand commercial interests of the private sector in the PPP process. It is difficult to establish "strong" partnership schemes due to the underdevelopment of partnership culture, differing interests of the private and public sectors and possible allegations of corruption from the media or other sources. There is some evidence in Lithuania that a long-term PPP partnership can evolve into corrupt relations between the private and public partners. Therefore, competition between different private partners needs to be promoted in the PPP market.
- **(Spain):** One of the pillars on which the success of these initiatives lies is that during the drafting phase of the projects the following steps are perfectly defined: the actions to develop, the objectives and goals to reach, the technical, legal and financial implications, etc. There should not be loose ends that lead towards misunderstandings among different organizations. It is absolutely necessary that each organization, both public and private, understand their obligations and rights, and agree to carry them out as well as other organizations. At the same time, they must have the capacity to carry out the fixed task.

4.2 Full Understanding / Acknowledgement of the Social Character of PPP

PPP projects are clearly Public Projects, thus their social character is integral. During the planning and drafting phase this dimension should be clearly communicated to the involved partners and the interested public. A sound approach is to break each project/concept down to its components and decide which parts can be implemented in a PPP scheme, thus sketching the roles of the involved partners.

- **(Greece):** The full understanding and acknowledgement of the social character of PPP is of great importance for the success of a PPP project. It is essential that all involved parties be constantly clarified on this issue. A common misunderstanding regarding PPPs is the nature of the service or product to be provided. Thus many endeavors of private character are usually interpreted as PPPs because the private sector is entering as a partner, e.g. recreation centers. PPPs focus on core tasks of the pubic sector and examines whether this tasks can be broken down in components, which can be object of a PPP. A typical case can be educational facilities. Whereas the construction and management of buildings can be easily reallocated to the private sector, however operational issues are a much more complex matter. A reduction in input/output relations should thus be avoided.
- **(Austria):** In this case the interests of the public and private partners differ. Usually the public partners have social interests and the private economic interests. It is therefore necessary for the private partner to be aware of the social character of the project and vice versa. The public partner must accept the economic interests of the private partner. Both, social and economic interests (and their defined frameworks and borders) should be defined before starting the PPP in order to avoid problems.
- **(Sweeden):** The project was mainly an energy efficiency and O&M (operation and maintenance) improvement project. The issue of providing better services to the tenants of the city and secured indoor climate were nevertheless important social components that strengthen the project.
- **(Lithuania):** As indicated above, the private partners are often unable or unwilling to understand the social character of PPP because their behaviour is often driven by profit-maximisation on the short-term or long-term basis. There is a need to impose certain social responsibilities onto the private sector in a legally-binding way. Also, increasing competition in

the PPP market and higher publicity can enhance orientation of the private sector towards social aspects of PPP. The concept of corporate social responsibility, which is promoted in Lithuania and other countries in the private sector, can be useful in the PPP context.

- **(Spain):** With the implementation of a public private partnership, economic as much as social benefits are hoped to be obtained. When the private sector decides to carry out a project of this nature the main aim is to achieve a predetermined economic benefit. On the other hand, in order that the public sector enters a partnership, it is essential that a social benefit is achieved. One of the circumstances that determine that both sectors develop their practices separately is the social rejection that the initiative may cause. For this reason it is important to put necessary measures into action so that the citizens understand the intrinsic social benefits of the project.

4.3 Public / Community Acceptance

Public acceptance is crucial to PPP success taking in account the political dimension and private interests safeguarding towards political changes. At the initial phases the public might be hesitant. Thus the focus of the public debate should be set on the objectives and gains of the PPP and not on contractual details. It is very important to emphasize on the alternatives and especially on the zero potion of non-implementation.

- **(Greece):** A common issue arising in public discussions on PPP in Greece is the accusation of disguised privatization. Where this fear might be unjustified in many cases it could easily lead to a deadlock. Thus the efforts for community acceptance should follow three directions: a) Clarification on the PPP context (in a manner that can be accepted by the public and not become another factor of suspicion); b) Transparency of the risk allocations, expected benefits and role definition (though respecting the potential demand of the private sector for confidentiality, especially in now-how matters); and c) Promotion of PPP cases that might cause smaller suspicion or disapproval, e.g. waste management instead of real estate development. Especially in projects that are subject to EIA or SEA, or any other form of compulsory public consultation provisions should be made at the earliest possible stage.
- **(Austria):** The acceptance of the community is important at least for the political success of a PPP project as it should demonstrate, that the public partner is looking for modern solutions for the benefit of the community. To achieve as much community acceptance as possible it is necessary to make the community getting involved by informing them about the project, in order to create identification with the PPP project.
- **(Sweeden):** A PPP in form of Energy Services was not the first alternative that was discussed in the municipality when aiming at increased energy savings and operational efficiency in the public premises. However, facing the fact that the financial resources for the project were limited, the municipality and its civil servants had to opt for an alternative model that gave the most value for the available money. Despite the fact that there was some hesitance regarding the business model as such, the PPP Energy Service idea was eventually accepted and approved by the political body. Over the time of the contract the community acceptance raised significantly.
- **(Lithuania):** Acceptance from the public is important for the political success of PPP-like projects. The acceptance of PPP arrangements in the Lithuanian public is limited (because of corruption allegations under several previous or ongoing PPP projects). However, the public usually favours better public infrastructure and/or services developed with the application of PPP arrangements in Lithuania. It would be useful to promote awareness of the public about PPP (e.g. by disseminating examples of good practice).
- **(Spain):** The project's acceptance by the community is vital for its future success. In order to achieve this it is essential that the citizens understand the benefits that they will gain by putting this action in practice. Therefore, through its political representatives, the public sector is responsible for informing the community about the actions to be executed with transparency and clarity. The administration must be able to make the citizens understand the benefits that this initiative will bring them. All the information should be provided from the first moment to avoid initial rejection and suspicion. The citizens must understand that the process does not

imply a disguised privatisation of goods and services, because the final responsibility of the initiative falls on the public authorities.

4.4 Political Backing

The landscape of the available Structural Funds in the 2007-13 period is changed for many NUTS 2 regions. Hence the PPP tool has a clear role in the production of public projects and services. It is crucial to have the "right" political bodies positively involved at the early stages, while citizens support (§4.3.) can be regarded as a guarantee for political backing. Finally common suspicion of corruption and privatization, derived by the novel features of PPPs are clearly political and not administrative matters.

- **(Greece):** Greece, as other Objective 1 countries will experience a serious decrease in EU funding in the next programming period 2007-13. Hence whereas PPPs have been an option among others so far, they will rise in importance and necessity. This will be especially the case for the Region of West Macedonia, which will join the "phasing out" regions. Thus PPP will inevitable enter the political agenda, especially at the regional and local level, since the support at the central level can be taken as granted. It is important for PPPs to acquire a broad political consensus based on their necessity. It will be crucial to transfer the focus on the details instead of the suitability of the medium itself and avoid close affiliation with specific politicians or parties.
- **(Austria):** Without any political backing and active involvement of policy makers most of PPP projects are convicted to failure. Depending on the kind of PPP it is crucial to have the "right" political bodies positively involved in order to have the necessary political backing. This is important especially if troubles or problems arise and political support is needed to be able to continue the project and also to have opportunities to overcome these problems. In general it is important to be able to concentrate on the work within the PPP project instead of permanently reacting on criticism from political bodies that are just waiting for the next mistake or problem.
- **(Sweeden):** The political backing was not a success factor in this particular case, as Swedish politicians, and in particular local politicians, generally have a limited understanding of and interest in PPP. The project was however initiated and developed by senior civil servants, whereas the politicians were involved only in the later stage of the project development. Eventually they turned up to be positive, but lessons learned are that the political level must be involved in the process much earlier than in this case.
- **(Lithuania):** Political backing for PPP is mixed in Lithuania, depending on many reasons. The current mayor of the Vilnius city municipality, A. Zuokas, is particularly supportive to the application of PPP. But some critics pointed to the lack of transparency in his relations with the Rubicon group, the largest operator of PPP-like projects in Lithuania. Also, it is important to note that there is no political backing for PPP projects from the central government. Some Lithuanian politicians and top officials are suspicious about the transparency of PPP and its value added.
- **(Spain):** The political risks that can be generated as a consequence of Spain's inexperience in PPP (rejection on behalf of the trade unions, the administrative staff or the society who associates PPP with privatisation), may lead to the political power showing reticence to develop these projects. However, by the current necessity to collaborate with the private sector to implement some initiatives, the political backing is evident. In implemented initiatives, once the uncertainty of the first stage of the development has been overcome, a total political backing is given when it obtains signs of support from the citizens.

4.5 Public Interest Observance

Public Interest observance has to be visualised and be exposed to public debate at all possible opportunities. Understandably at the initial stage of the introduction of PPPs as a mean of public policy, projects should be chosen that show clear benefits of the Public Interest, not only on the results level, but also impact oriented. The general regional context will decide if an Ex-ante (as in Sweden) or Ex-post approach (as in Lithuania) or a certain mix is most suitable.

- **(Greece):** It is imperative that the public sector acts as the coordinator that ensures the social benefits of PPP projects. Social goals have to be met at all times. In relation to the former success factors, the Observance of Public Interested has to be visualised and be exposed to public debate at all possible opportunities. Understandably at the initial stage of the introduction of PPPs as a mean of public policy, projects should be chosen that show clear benefits of the Public Interest , ot only on the results level, but also impact oriented.
- **(Austria):** PPP project should be developed in such a way that it will be possible to observe the results regularly to prove that public interest is fulfilled as contracted in the beginning of the partnership.
- **(Sweeden):** In the initial phase of the project development a lot of questions were raised by the public and the media about the project and its character. The media followed the project closely and once the upgrading of buildings as well as a higher level of service to the tenants had become visible, the response from the general public was very positive. When noticing that cost savings could generate better conditions for the tenants without raising costs or taxes, a win-win situation had occurred for more or less all parties involved.
- **(Lithuania):** There is limited observance of public interest under Lithuanian PPP-like projects. The design of PPP projects is often not conducive to such observance (with the exception of a few cases). A high level of transparency in the public and private sector and the effective exercise of accountability and control from the public is required in Lithuania. An increasing role of the State Control (the Supreme Audit Institution of Lithuania) and the audit committee of the Lithuanian parliament is a positive step in this respect. Based on previous or ongoing PPP-like projects in Lithuania, these institutions made a number of appropriate conclusions and recommendations.
- **(Spain):** PPPs are currently awaking an outstanding interest among the population and companies of the region. The citizens show a high degree of interest in the programmes aimed to reinforce the innovation implemented jointly by the public and private sectors because they can provide benefits for the region.

4.6 Focusing on MIRR and not on IRR (Private Actor)

The introduction of the MIRR element clearly signals the departure from a “traditional” contract-fulfillment approach to the point where the private partner is actively engaged in the success of the PPP. In general when expectations are met the demand for MIRR is possible, however, when unexpected failures are encountered, the Public partner is expected to offer solutions. Some partners considered the IRR approach to be more suitable when starting with PPPs. In any case the MIRR concept underlines the importance of the long-term commitment and the clear definition of the standard of services to be provided.

- **(Greece):** In accordance to the above-mentioned issues, the long-term reinvestment of the private sector must be motivated and facilitated. This element has a strong capacity building element in it. The partners should be able to renegotiate and extend their partnerships focusing on the objectives of the PPP and deviating from the “traditional” contract-fulfillment approach.
- **(Austria):** The welfare of the PPP project should have first priority. As long as the PPP project is developing in the foreseen way in case of rates of return, the focus on MIRR is possible. But in case of problems the internal rate of return has first priority.
- **(Sweeden):** These issues had not been discussed in detail with the contractor. But since this project was considered as a bridgehead into the municipal sector to create confidence for the business model, is lightly the contractor internally used the IRR model, and not the somewhat lower return rate that normally become the result of when using the MIRR model. However, MIRR model calculations are rare.
- **(Lithuania):** No information is available whether the private actors focus on MIRR rather than on IRR. Usually IRR is applied during the project design stage. However, the nature of PPP-like projects implemented in Lithuania underlines the long-term commitment and the

clear definition of the standard of services to be provided (more prominent in VCHS, less in the Vilnius parking system). Thus the focus on MIRR has been part of the contract, although not explicitly stated. In future projects this element should be more prominent.

- **(Spain):** No comments.

4.7 Profit Assurance for the Private Sector

A profit assurance for the private sector could prove to be contra productive. The level of profit for the private sector cannot be contractually guaranteed, but determined by a combination of competition during the tendering stage and operational efficiency of the private partner during the implementation stage. As an example the maturity of the concept and the comparability with other projects can be regarded as a profitability indicator.

- **(Greece):** Commercial goals have to be met at all times. The private sector can additionally provide some useful concepts such as minimal turnover guarantee etc. However, these approaches might be a political liability and offer ground for debates beyond the scope of the PPP project. The profit assurance can be only reached through thorough preparations in the drafting stage.
- **(Austria):** In many PPP projects it is not possible to assure profits in long term. Therefore it is necessary to discuss and clarify between public and private partners before the start of the PPP project what to do in the case of less or no profit or even in the case of loss of capital. Usually the risk is shared among the partners depending on the shares of investment and expected profit of the PPP project.
- **(Sweeden):** Since being an EPC (Energy Performance Contracting) project the contractor did not have any guaranteed profit assured in the contract. But with a thorough and good analysis, the risk for the contractor was in reality limited. The third party financer had however its revenues and profits assured due to separated EPC and financial contracts.
- **(Lithuania):** Since all contractual provisions are not fully available, it is difficult to determine any profit assurance for the private sector. However, such provisions are unlikely to be found under most PPP-like projects in Lithuania. Nevertheless, there is an example when one private partner required the public partner a certain level of profit during the implementation of a PPP-like project, when certain initial assumptions failed to materialise. According to the Lithuanian experience, the level of profit for the private sector should not be guaranteed, but determined by a combination of competition during the tendering stage and operational efficiency of the private partner during the implementation stage. However, in view of protecting the public interest the European Commission argues in favour of "acceptable" levels of profit to the private sector under PPP projects co-financed from the EU budget.
- **(Spain):** The agreement between public and private organizations is established to cooperate in the rendering of a service, to distribute risks and responsibilities fairly, to contribute joint resources (time, financing, knowledge) and to achieve mutual benefits. While the private sector pursues financial profitability, the public sector wishes for social success. However, it is not possible in the initial phase of the project to ensure that the private sector will finally obtain benefits by putting the PPP in practice. The public private partnership can usually offer positive results but they are not a general solution because in certain cases they are not advisable. It is necessary to analyse carefully in what circumstances the PPPs are appropriate. A key element at the time of forming a PPP, due to the initial uncertainty of these projects, is the transfer of risks to the private sector. The distribution of risks, together with the way to cover them, should be defined and decided during the first stages.

4.8 Management Transfer from Public to Private Sector

There is no general rule defining to which extent the management of the PPP will be transferred to the private sector. However, the management unit should be public initiative, e.g. setting up "private" units

within public administrations. In any case the public sector should seek to acquire managerial know-how form the private partner and incorporate it in its structures.

- **(Greece):** One of the main reasons for PPP is the management transfer to the private sector. Even if the management remains in the public sector, it is beneficial to the project to set up "private" units. This model has been reproduced several times in Greece and has been proved to be successful in most cases and through different scales.
- **(Austria):** In most cases the management of PPP projects is done by the private sector. In some cases of smaller PPP projects there are positive experiences with a "privatised" management which means that the management is installed by the public partner but with a private contract, that is the management is not part of the public body.
- **(Sweeden):** The management transfer from the public to the private sector was not a key issue for success in this case, as the municipality clearly stated their intention to keep the Energy Management and O&M staff within their own organisation. However, the substantial training efforts and close co-operation between the municipality's personnel and the contractor's Key Account Managers boosted the management competence, and strongly supported the success of the project.
- **(Lithuania):** The transfer of management occurred under both the Vilnius city heating supply and city car parking projects. The relative success of the Vilnius city heating supply project is associated with strong performance of the experienced private operator, including good strategic and operational management of district heating services. After canceling the Vilnius city heating supply project, the Vilnius city authority needed to re-establish the public company for the provision of car parking services. It is interesting to note that this public company showed more efficient operation (collecting 2,6 times more revenue than the private partner) possibly because of alleged shirking of the private company to generate more unaccounted profit.
- **(Spain):** The partnership benefits from the experience that the private sector has in management techniques. The PPP takes advantage of the strong points of the private sector in order to improve the efficiency and to achieve savings through the economic management. At the same time, to maximize the welfare state of the society, the task of obtaining the balance between the social and economic interest is assigned to the state.

4.9 Public Initiative

All PPPs are based on a public initiative. However the public initiative should focus on the goals to be met and not the implementation methodology which should be the task of the private sector.

- **(Greece):** There are a few cases, where initiative came from the private sector. However, the need for political support and the social character of PPPs, it is beneficial to present any PPP as a product of Public Initiative.
- **(Austria):** Experiences show that most of the PPP projects came out from a public initiative - in many cases because of lack of capital, lack of management know how or lack of personal capacities. Therefore, public bodies are recommended to screen PPP possibilities that reside within their tasks.
- **(Sweeden):** There was no main public initiative behind the success of the project and its PPP business model. Nevertheless there was a public initiative initiating the project, as the municipality had to reduce the costs for energy and O&M by 10%, which in turn triggered the civil servants to seek creative solutions due to the lack of financing.
- **(Lithuania):** Main PPP-like projects are launched at the initiative of public sector institutions (primarily larger municipalities rather than the government). International financial institutions supported the preparation of the Vilnius city heating supply project. However, often potential private partners are standing behind public PPP initiatives, attempting to generate more PPP supply or create more favourable conditions for their later

activities. Proposals of the EU institutions to use the form of PPP in Lithuania remain so far not addressed by the Lithuanian government. Nevertheless, there are plans to combine the application of PPP in the management of the EU structural funds.

- **(Spain):** The main promoter of these cooperation formulas is the public administration, due to the gradually growing necessity to cooperate with the private sector in order to develop projects with social profitability, to render services and to provide public infrastructure in the most efficient way. The private initiative states that the main disadvantage to participate in a PPP is the deficit in the financial profitability that most of the projects have, and the uncertainty generated by the risks associated. However, as in other cases of PPP, the Digital Park of La Rioja - Spain was promoted by the private sector.

4.10 Knowledge Transfer

As in §4.8, the public sector should be able to adopt some of the business models from the private sector, nevertheless the objective should not be the development of private sector skills. The public sector should focus on the know-how necessary to train the municipal staff during the project life cycle and not in entirely replacing the private partner.

- **(Greece):** A common argument in favor of PPPs is the envisaged know-how transfer from the private to the public sector. However, this element has certain limits. While the public sector should be able to adopt some of the business models from the private sector, the objective should not be the development of private sector skills. Since the general tendency in public administration is the formation of slim public organizations, the main focus should be in the creation of competent and efficient units mainly in the fields of contracting and in the formulation of usable terms of references for the complicated domain of PPPs.
- **(Austria):** Organized knowledge transfer from private to public partners makes sense only if the public partner is willing and able to overtake at least parts of the private partner. If this is not the case knowledge transfer is making less sense. The same is true the other way round. But of course a minimum mutual understanding and therefore know how transfer is necessary in order to run the PPP project successfully.
- **(Sweeden):** As described in 'Management transfer from public to private sector' the capacity to manage both complex technical systems as well as organisational processes developed further in both the municipality and in the energy service company. By clearly pointing out the intention to keep and train the municipal staff during the project life cycle, a solid platform for own specialised know-how was achieved and hence also limited vulnerability once the energy service company has left the organisation.
- **(Lithuania):** The transfer of knowledge among public sector partners, private sector partners or between them is limited. Private sector partners are competing in the PPP market, which is dominated by one group of companies. There is some learning by doing during the PPP process in several public sector institutions. There is no dissemination of knowledge on PPP, which could be promoted by the central government. It is important to make the transfer of knowledge more extensive and intensive in Lithuania..
- **(Spain):** A moderate level of knowledge transfer is necessary from the private to the public sector in order to establish an atmosphere of mutual agreement, to reach the best potential of the initiative and to have good relations between the agents of the partnership. PPPs have a learning curve because the knowledge is acquired throughout their implementation. At the beginning of the projects the investments can be very high but they are gradually reduced when the partnership gather experience.

4.11 Public Guarantees for Loans

Here a departure from the role of the state in "traditional" contracts is necessary. The role of the public could be either as a lever for competitive interest rates, either on the banking market or through special funds. The new regulation on the Structural Funds mentions new financial engineering approaches which could be

employed. Finally the Public Sector can "guarantee" the demand for the produced services, by choosing the PPP tool wisely.

- **(Greece):** Public bodies should use their creditability for achieving competitive interest rates and not for the provision of guarantees. Otherwise the balance between public and private will be seriously distorted. A public guarantee will remove certain risks from the private sector. Should this not be reflected in the ownership and exclusivity relations of the PPP, a market and competition distortion will occur which, apart from any ethical reservations, could encounter the objections of the government and the EU.
- **(Austria):** More and more public bodies avoid taking guarantees for projects, even for PPP projects. For guarantees more and more funds are responsible. If the public body gives guarantees the influence and the ownership should be divided in favour of the public body. But the risk exists that the private partner is taking less care of the PPP project if there is no risk for him in the project. In this case the private partner turns from a partner into a contractor.
- **(Sweeden):** No comments.
- **(Lithuania):** There are no public guarantees for loans linked with PPP projects. The public sector (through the INVEGA) provides guarantees for SME loans under certain conditions. The willingness of the financial sector to lend the private partners, which are engaged in PPP projects, depends on a particular situation. The private partner should be in a strong financial situation to borrow from the financial sector for financing the implementation of PPP projects. For instance, one request for a loan was only approved after making the decision of the Vilnius city municipality to procure additional services from the private operator.
- **(Spain):** In certain PPPs the public administration may put a group of measures like the following ones in practice, but it is always necessary that the potential investors commit firmly to develop the project. It is essential that a firm and real agreement exists among the potential agents. Subsidies to the investment for job creation. Repayable loans: they are similar to the subsidies with the difference that they must be reimbursed at some time. Endorsements, insurances of change and guarantees on loans. Structurally subordinate loans, the amortization of which can be postponed until a certain amount of commercial debt has been reimbursed

4.12 Quality & Product Standards Definition

One of the first steps in each PPP is to define as accurate as possible the objective and outcome, not the procedure to achieve it. In this context quality standards are essential. However not all services and sectors might possess such standards (or they might be indefinable), hence it should be considered if such a service or sector is PPP-suitable. Where possible existing standards should be used from international and industrial/private experience, taking in account existing norms and systems, even if they are not legal binding in the respective countries of the PPP implementation.

- **(Greece):** Where possible, existing standards should be used from international and industrial/private experience, taking in account existing norms and systems, even if they are not legal binding in the respective countries of the PPP implementation. This factor should be considered early in the PPP design, since it can help avoid disputes at a later stage and help concentrate resources on more delicate aspects of the PPP.
- **(Austria):** Quality & product standards definition is important and should be done at the very beginning of the project to avoid misunderstandings and to ensure the outputs of the projects in that quality and standard as it is contracted. If there is no contract and quality standard agreed between the partners problems and discussion will raise at the operating time at latest.
- **(Sweeden):** No comments.
- **(Lithuania):** In general, there is a weak orientation towards performance during the PPP

process in Lithuania. Quality and product standards are underdeveloped in Lithuania, although this is one of the main PPP characteristics. The capacity of the private company to deliver services of good standards contributed to the relative success of the Vilnius city heating supply project. It is important to ensure higher emphasis on performance during the PPP projects (both for the infrastructure and service-based projects).

- **(Spain):** At the beginning of the initiative it is necessary to prepare an effective plan in order to appoint the appropriate people to represent the public and private sectors, to establish the roles, responsibilities and the aims to reach, to be aware of risks, to clarify the necessary measures and the parameters of the quality of the service. A framework of strategic policy and a set of common principles will facilitate the task of planning. In order to avoid misunderstandings in later phases, the PPP must have a simple structure and clear responsibilities. During the drafting phase it is necessary to predict the risks and benefits of the project. Mainly it is essential to identify the potential financial, administrative and staff management risks

4.13 Delimitation of Competence Fields (for both Sectors)

Based on sound project design principles, tasks, roles and responsibilities should be clearly designed and assigned to the partners involved. Delimitation of competence fields is important among partners and especially in presenting the project to the public.

- **(Greece):** Delimitation of competence fields is important before and during the operation. Based on sound project design principles, tasks, roles and responsibilities should be clearly designed and assigned to the partners involved. Nevertheless, it should be ensured that the description of tasks and roles can be modified during the project operation, according to the needs and requests from the project. Disputes can mainly arise in questions in the higher management level, arising from possible disagreements between the way operational and strategic objectives are conceived by the private and public sector respectively.
- **(Austria):** Delimitation of competence fields is important to clarify between the partner to ensure for all partner for which parts of the tasks they are in charge of especially to avoid problems by operating the project and in representing the project to the public. But it may be possible that fields of competence may change between the partners during the operating time. For this case possibilities of changes should be foreseen in the contract.
- **(Sweeden):** The delimitation of competences and responsibilities has been a key success factor for the project out of two perspectives. Primarily a clear delimitation of roles and responsibilities is essential in order to create a basis for savings guarantees like the ones applied in EPC's. In a wider perspective the delimitation of competence is the very core of this PPP approach. Since a municipality by no means can have the variety of competences and follow up resources necessary to successfully carry out this type of project, the municipality has its main field of competence and focus in the societal service to its inhabitants.
- **(Lithuania):** Frequently there is no clear delimitation of competence fields for the public and private sectors in Lithuania. The Vilnius city car parking project is an example, where vaguely defined liabilities and responsibilities of the partners in the contract contributed to its failure. As it was mentioned, there is a credibility problem on the local PPP market: a few private partners failed to meet their commitments under the previous or ingoing PPP-like contracts. Therefore, the public partners are often called to undertake more responsibilities during the project implementation.
- **(Spain):** In the joint-ventures, the role to carry out by the public and the private sector must be clearly defined from the beginning of the process. The tasks will be distributed optimally between the agents with the aim that each organization fulfils those responsibilities. The responsibility to develop each task will be assigned to the organization that is better prepared

for putting it in practice. In the initial phase, the identification, analysis, quantification and distribution of tasks will be carried out. At the beginning of the project it is essential that all the agents agree to and approve of the measures decreed

4.14 Maturity of Technology / Project Concept

In order to safeguard the public interest and to attract private funds it is advisable to choose "easy" and mature projects. Should this not be possible or desirable exit strategies should be defined.

- **(Greece):** Especially at the introduction of the PPP concept in the administrative context, It would be essential to choose "easy projects". At the beginning the PPP will face suspicion and rejection especially from the public sector, lacking capacity and in some cases reluctant public opinion. There is no point in adding technical uncertainties in that constellation.
- **(Austria):** Depending on how new the PPP project is it may be useful to start the project before the technology or the concept has its full maturity. In this case the risk for both partners has to be considered carefully and well defined milestones for taking financial risks have to be worked out in order to ensure that the risk is calculated and to give possibilities to stop or to change the project.
- **(Sweeden):** The maturity of the technology and the project concept was not a success factor during the planning and implementation of this project, as the business model was relatively unfamiliar to the municipality. So even though the municipality knew what they wanted, the lack of internal experience led to the fact that a lot of routines and practices had to be developed successively as the project emerged.
- **(Lithuania):** The maturity of the technology and the project concept was somewhat related to the relative success or failure of the Vilnius city heating supply and city car parking projects. This factor should be acknowledged during the PPP process.
- **(Spain):** In the case of the Digital Pak of La Rioja, the project to implement is absolutely innovative both on regional and national level. For this reason it is understood that the risks to assume are remarkable and the benefit to reach is uncertain. However, studies carried out during the drafting phase of the project predict that the digital park will be a successful initiative

4.15 Guaranty of Meritocracy and Performance Evaluation During the Contracting Procedures

All Member States legal systems will guarantee the mentioned requirements. The PPP novel approach will however cause suspicion in many cases. Thus, tools ensuring evaluation and transparency are recommended, such as: neutral advisory board, performance evaluation measures, performance indicators, quality standards.

- **(Greece):** The legal framework guarantees the meritocracy. The proper project design, the definition of roles and the delimitation of competences should assist in this direction. Considering the definition of evaluation criteria and indicators and the subsequent performance evaluation procedures a clear definition and delimitation of strategic and operational objectives is essential.
- **(Austria):** In this case all the laws have to be observed. In addition, a neutral advisory board should be installed to ensure that the guaranty of meritocracy and the performance evaluation is done in a correct way.
- **(Sweeden):** Performance evaluation must be considered as a key success factor in this particular project. This issue was first addressed in the pre-qualification phase when the municipality put a lot of effort in scanning the different companies' references and performance before moving on into real contract discussions. The existence of firm and reliable saving guarantees was hence a main success factor when anchoring the project with the initially hesitant politicians. In addition to this pure cost saving perspective, it was essential to firmly integrate the project in the municipality's organisational/administrative as well as technical/operational structures. By evaluating the company's organisational and

human development approach, together with e.g. its compatibility strategies for the control systems the most successful company was appointed. Moreover, the selected company's experience and know-how in PPP-financing structures and their compliance with public accounting rules was important success factors. The main success factors in the negotiation process were the mutual ambition to reach a win-win agreement, together with the ability to adapting and finding constructive solutions to contractual or practical problems.

- **(Lithuania):** As it was mentioned, there is a weak orientation towards performance during the PPP process in Lithuania. Only larger and international PPP tenders are subject to performance evaluation during the contracting procedures. For instance, private advisory services were used during the procurement of the Vilnius city heating supply project. However, external advice primarily concerns legal compliance during the design or tendering stages rather than performance management during the implementation process. It is important to ensure higher emphasis on performance during the PPP projects (both for the infrastructure and service-based projects).
- **(Spain):** The management team of the project has the responsibility to evaluate the offers of the agents. The team should evaluate the technical and financial capacity that every organization has in order to develop the project according to the original memorandum. The process of negotiation with each agent is usually joint with the aim that the administration explains its conditions directly and that the private organizations express their points of view with respect to the aspects discussed. The fact that the public sector is directly involved in the process is a guarantee due to the regulations it must follow according to the administrative procedure

4.16 Legislative Framework and Empowerment

Existing legal frameworks considering public procurement, concessions etc. provide enough provisions and various interpretation possibilities for implementing PPPs. However there are extensive thresholds to be overcome, thus making only large projects suitable for PPPs. If PPPs are to be adopted at a regional or local level a purpose made national PPP law or even a European legislative framework for PPPs is advisable.

- **(Greece):** The Greek Government has repeatedly expressed its support for PPP. In the past, legislation was developed on an ad-hoc basis, since it addressed large, multi-annual projects in the billion EUR range. The Greek Framework-law for PPP (New Law 3389/2005 for PPPs) has just recently been set into force and it is a valuable effort to provide a coherent construction for the implementation of PPP on a broader basis. Nevertheless, this attempt must be accompanied by a coordinated authorisation for regional and local authorities to enter PPP arrangements and transparently transfer public tasks in these schemes. In this direction, the Local Administration THISEAS programme, the Law on Public Real Estate and other regulations on Spatial Planning can be regarded as complementary.
- **(Austria):** It often depends on the size of the PPP projects which kind of legislative framework or empowerment is more practicable in order to run the project. In addition, the legislative framework differs from state to state. It is recommended to install a European legislative framework for PPPs.
- **(Sweeden):** The current Swedish legislative framework has not facilitated the project's implementation, basically since it misses real PPP objectives. The legislative framework and its various interpretation possibilities was in fact a major disadvantage along the lines of project development as well as implementation and follow-up. Due to the fact that there is limited experience in administratively handling PPP's in Sweden, the uncertainty followed by this opens up for many different ways of interpreting the laws and practices on e.g. public procurement, accounting and taxation. However, the relatively large portion of operative empowerment that the senior civil servants had in this case, helped the project moving forward even with an insufficient legal framework.
- **(Lithuania):** Most PPP-like projects are established on the basis of lease contracts.

Although a new concession law was passed by the parliament, it has not been applied in practice yet (it is likely that this law will be applied very soon). However, the concession law is not fully compatible with several sectoral laws as well as the public procurement law, which should be applied during the concession process. Although the existing legal framework is complex and insufficiently "user-friendly", there is no sufficient information or advice from the central government for potential PPP partners. Failure of the Vilnius city car parking project is partly attributable to insufficient elaboration of the contract. The presence of a well-elaborated legal framework would allow for the better design of PPP projects in a legal sense.

- **(Spain):** The private sector is requesting the administration to create an appropriate legislative frame in order to guarantee the transparency (which allows control) and the quality of the service. Due to the extremely complex procedures of regulation and contracting of these projects, it is necessary to carry out a process of homogenisation, clarification, simplification and setting of concepts. The Law of Public Work Concessions approved on the 23rd of May in 2003 meant the first step to approach the application of principles that govern the authentic PPPs. These principles are: to share out the risk in a balanced way, to add indicators that evaluate the quality of the service and to increase the influence of the private sector in the decision making

4.17 Capacity Development at National and Regional Level

Some Member States have decided to create Central PPP Units. Whereas this solution provides several advantages at the initial level, a decentralisation is essential later on. Capacity at the partner level (e.g. municipal administrations) should be regarded as a mid term goal. In-house expertise must be developed e.g. through "easy" and mature projects.

- **(Greece):** Most countries choose the formation of a Central PPP Unit, usually at the Ministry for Finance (or the respective equivalent body). Whereas this solution provides several advantages at the initial level, a decentralisation is essential. In Greece several programmes have encountered serious delays through the over-centralisation of functions and authorisations at the central level. The complexity and unique character of most PPP makes local management indispensable. Furthermore, the concentration in the Ministry of Finance might cause sectoral distortions; e.g. in Greece the Ministry for Regional Planning, Environment and Public Works plays an important role in this field and should be actively considered in the decision making process. Furthermore, regional and local authorities will be confronted with novel and complex appraisal, procurement and operating conditions. Incomplete transfer of know-how will lead to cumbersome implementation, idleness and in some cases serious damage to the public interest. Thus the Central Unit and its regional departments should assume a facilitator role as a knowledge node, departing from the usual purely administrative model.
- **(Austria):** It is a crucial element for the public partner to ensure the needed capacity by mass as well as by quality to be able to co-operate with the private partner during all the lifetime of the PPP project. Otherwise, the PPP project may suffer from insufficient capacity which -in the worst case- will lead to the failure of the PPP project.
- **(Sweeden):** At the time of developing this particular project the general knowledge and experience at national and regional level was limited. The situation is currently improving, but in the development phase of the Nyköping project the lack of knowledge and capacity was a great drawback creating a lot of scepticism and hesitance.
- **(Lithuania):** Potential PPP partners from the public sector have limited knowledge and skills about the PPP. Only one exception is the Vilnius city municipality, where some in-house expertise was developed. This creates pre-conditions for more successful management of PPP in this municipality. There are no "good practice" manuals available, nor training services or the exchange of experience are organized to increase PPP capacity in the public sector. Some ad hoc training and exchange of good practice occurred with the

support of international donors. It would be important to undertake various capacity building measures at all levels and ensure their sustainability. **(**

- **Spain):** The existence of an institutional unity, that has previously acquired knowledge through the experience of numerous implemented PPPs, as well as the capacity to advise the participating agents that could regulate the process, would facilitate the implementation of a common program that, as a consequence, would increase the number of PPP projects developed

4.18 Compatibility with Structural Funds Regulations and National Co-financing Procedures

Flexible accommodation of PPP in the Regional Operational Programmes is recommended, since most –if not all- PPPs are operating with European or national funds. The goal should be two fold: a) Improved ROP performance at the regional level; b) Observance of the Maastricht criteria at national level. This combination of course will no be an easy one, and should be considered especially during drafting for the 2007-13 period.

- **(Greece):** Socio-economic developments and the evolving EU Structural Framework will demand additional National Co-financing. Private funds will in many cases be indispensable. While the remaining time in the 2000-2006 period is most probably insufficient for a significant PPP generation, it is essential to provide the required provisions in the national legislative framework for the next period. In compliance with the issues mentioned above, the provision for the flexible accommodation of PPP in the Regional Operational Programmes of the Regions should be regarded as essential.
- **(Austria):** Compatibility with Structural Funds Regulation and National Co-financing Procedures has to be ensured in every PPP because most –if not all- PPPs are operating with European or national funds.
- **(Sweeden):** In a theoretical perspective compatibility with Structural Funds and national co-financing could be a success factor. This project did however not receive any additional funding from the EU. Furthermore, in an emerging market it would be a bit risky to carry out a PPP-EPC with additional grants etc., since it can give the impression that this type of PPP needs Structural Funds or national co-financing to be feasible. On the other hand already feasible projects can be extended by means of Structural Funds and national co-financing, and thereby give added value to all parties involved as well as to the EU on the whole.
- **(Lithuania):** There is no compatibility of PPP with EU the structural funds and national co-financing Lithuania. Therefore, the structural funds are provided to the public or even private partners on a separate basis, which implement a certain stage or part of the larger PPP project. Also, the majority of the PPP-like projects do not involve payments from the public sector to the private sector. It is important to establish such compatibility in the next programming period of 2007-2013, when a large share of resources will be available from the EU budget.
- **(Spain):** The compliance with the convergence criteria, previously fixed in Maastricht, together with the fact that the public projects have a significant effect on the state deficit, make two steps necessary. First of all to analyse the process that the national accountancy procedures have on the public-private methods of financing and of management of public services, and secondly, to know the economic consequences that the procedures mentioned have with respect to the fulfilment of the principle of budgetary stability. In the Spanish local administrations, unlike in the British programme, uniformity to establish the financing and management of a public service through the private initiative does not exist. This fact confirms the absence of a global program or an institutional unit with the capacity to regulate and foster the public private partnership in accordance with common criteria

4.19 Establishment of an Independent Authority for Conflict Resolution

Along with Central PPP Units, an Independent Authority for Conflict Resolution is advisable, instead of ad-hoc solutions among the partners. As a general rule however, It is better to invest more resources into the drafting phase instead.

- **(Greece):** The new legal framework, the complexity and plethora of PPP arrangements and the implications on the legal agreements between public and private sector require the creation of an Independent Authority for Conflict Resolution on PPP issues, independent of the usual legal procedures. Such an instrument will provide rapid assistance in the different PPP stages (procurement, selection, negotiations, contracting) and will offer the necessary security to the private sector.
- **(Austria):** It is important to clarify at the beginning of the PPP project the rules by which conflicts will be solved. If there are already existing bodies new authorities are not necessary. The establishment of an independent authority should only be done in case of a conflict.
- **(Sweeden):** This project did not establish any formally independent conflict resolution body. But a progressive approach was the agreement on an "escalation ladder" where different type of issues and problems were solved on a successively higher management level. By applying this approach, high management meetings solved a few of the issues that representatives on lower levels on both side had difficult to handle, since they where in the middle of the operation.
- **(Lithuania):** In Lithuania there is no independent authority for conflict resolution. Therefore, conflicting parties should use bilateral negotiations during the PPP process or refer to the courts. For instance, the Vilnius city car parking project is under the arbitration process at the moment. It could be useful to establish an independent authority for conflict resolution together with a closer involvement of the central government in the PPP process. Also, procedures for conflict resolution should be described in PPP contracts.
- **(Spain):** The public administration takes the final responsibility on the operations of PPPs. It must always establish control and provide information about the operations when there are assets and funds of public dominion involved. As these are relatively new operations, it is necessary that they have a suitable book-keeping method with the aim to equip the processes with transparency. This method must show the economic reality both of PPPs and their partner agents

4.20 Assistance in the PPP Drafting Phase

As already mentioned a certain "suspicion" among public and private sector must be overcome. Projects showed that the public bodies develop skills in preparing PPPs but the procurement of consulting services is on an ad-hoc basis. A programme approach (e.g. as in the THISEAS programme in Greece) approach as part of capacity building steps is reasonable. The Central PPP Unit and its regional counterparts should promote the PPP concepts maturation through aimed reallocation of funds to the preparation (appraisal, financing generation/guarantees, risk assessment, etc.), rather than implementation.

- **(Greece):** The Novelty And Complexity Of PPP Established Patterns Of Operation And A Potential "Suspicion" Among Public And Private Sector. Thus In The Initial Phases A Considerable Inertia Must Be Overwhelmed. The Central PPP Unit And Its Regional Counterparts Should Promote The Maturation Of PPP Concepts Through Aimed Reallocation Of Funds To The Preparation (Appraisal, Financing Generation And Guarantees, Risk Assessment, Etc.), Rather Than Implementation. The THISEAS Programme On Local Self-Government clearly goes in that direction.
- **(Austria):** Every available assistance for PPP which is useful to create an efficient and successful project should be used. It is better to invest more resources into the drafting phase instead of solving problems and misunderstandings during the project time.
- **(Sweeden):** At this point in time there was no possibility for the municipalities to have

independent assistance in drafting the PPP structures. However, one success factor was the municipality's progressive approach in scanning the market, carrying our early pre-qualification and listening to many actors before finalising their final request for tender. Hereby they got certain assistance in defining and describing the project.

- **(Lithuania):** There is no assistance in the PPP drafting phase from the central government. Larger local authorities (in particular the Vilnius city municipality) procure consulting services from the private market (local and sometimes international expertise for larger PPP projects). This contributed to the relative success of the Vilnius city heating supply project. Therefore, it is obvious that more assistance is needed during the PPP drafting stage. However, many smaller municipalities and other public administration institutions lack sufficient funding for the procurement of such services.
- **(Spain):** In order to avoid possible disagreements in the later phases of the project it is essential that the management team of the project is advised by outside professionals with respect to legal, technical, financial areas, etc. during the drafting phase of the project

5 CONCLUSIONS

The INTERCO-PPP project partners had the opportunity to describe their experiences and reflect on the commonly defined set of Success factors. While different institutional backgrounds and operating frameworks make each project a comprehensive case study, certain common points could be defined:

- The social character of the PPPs, public acceptance, related political support should be considered,
- Technical / administrative issues should always be separated from the omnipresent political aspects,
- The projects selected should safeguard the interests of all parties, while making clear that success or failure is related to their engagement and risks management,
- PPPs are based on partnerships of equal partners, hence roles, duties, standards and outputs must be clearly defined,
- Legal and institution support at the regional level is essential and last but not least,
- Programme support in the drafting phase could solve numerous problems at later stages.

While the mentioned factors' list is not exhaustive and reflects only the experiences of the INTERCO-PPP project partners, it forms a useful starting point for public debate for PPPs at a regional level

6 REFERENCES

1. V. KANAKOUDIS, A. PAPOTIS, A. SANOPOULOS, V. GKOUTZIOS, J. BINDER, M. SWARD, S. BIELINIS and A. FERNANDEZ VILLAMANDOS. "PPP success and suitability factors (PPP-SSF)", OPEN DAYS 2006–European Week of Regions & Cities, International Conference, EC – DG Regional Policy, CD-proceedings, Brussels, Belgium, 2006
2. KANAKOUDIS V., SANOPOULOS A. AND PAPOTIS A. "The progress of the legislative framework ruling PPPs in EU", OPEN DAYS 2005–European Week of Regions & Cities, International Conference, EC – DG Regional Policy, CD-proceedings, Brussels, Belgium, 2005
3. INTERREG IIIC/East, INTERCO-PPP project report: 'Study on PPP structures', August 2005.
4. INTERREG IIIC/East, INTERCO-PPP project report: 'PPP Success and Suitability Factors', June 2006.
5. EC: "Report on the Public Consultation on the Green Paper on PPPs & Community Law on Public Contracts and Concessions" [SEC(2005) 629]
6. EC: "Green Paper on PPPs and Community Law on Public Contracts and Concessions" [COM (2004) 327 final May 2004]
7. Eurostat proposals on accounting treatment of PPPs [CMFB and Eurostat news release (STAT/04/18) February 2004]
8. Richard Abadie and Adrian Howcroft (PricewaterhouseCoopers): "Developing PPPs in New Europe", May 2004
9. British Columbia (Ministry of Finance): "An Introduction to PPPs", June 2003
10. Heiko Abel and Martin Ruesch: BESTUFS (Best Urban Freight Solutions) – Deliverable D2.4 Best Practice Handbook Year 4 (2003) Part I, "PPPs in urban freight transport", 2003
11. Ceri Davies and Phil Jones: "Infrastructure Projects Financing through PPP in Greece", EDEXY (Hellenic Municipal Financial Services Company SA), 2001
12. EC: Guidelines for successful Public – Private – Partnerships, March 2003
13. Department of the Environment, Heritage and Local Government: Policy Framework for Public Private Partnership (PPP) in Ireland, November 2003

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Building performance evaluation on "dynamical building" model – towards strategy for sustainable planning

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1 ABSTRACT

This paper presents the strategy for building performance evaluation according to principles of sustainability; based on interdisciplinary, life-cycle oriented planning process.

The issue of sustainability is one of the crucial issues the building industry is dealing with today - buildings count to the one of the main consumers of energy and primary resources.

However, in architecture and construction engineering, the terminus sustainability is still seen within sentimental context.

The application of the strategy enables the rationalisation of the sustainability potential, since the final result is expressed as an absolute value.

Keywords: sustainability, life-cycle approach, interdisciplinary planning

2 PROBLEM IDENTIFICATION

The new economic conditions, caused mainly by the rapid development of ICT (information and communication technology), seem to have set our world enterprise in the state of constant acceleration. Another important characteristic of our world is the scarceness of resources, where next to energy and material, time and space have also become tight resources. The acceleration of life brings the phenomena of constant change, and therefore of instability.

Our build environment, as one of the greatest resource-consumers, also underlies to process of constant change, due to economically technological development. The buildings, that used to referre to long duration once, therefore to constancy, stability, and in front of all to duration, are mutating in structures in persistent change.

The need for closer research of this change is urgent, since it is in close connection with saving of resources for future generations – sustainable development.

Architecture and construction: building industry of the new millennium has to fulfil new requirements – sustainability policy and regulations on the one hand as well as adaptability and flexibility on the other. However, the traditional planning process, that is phase oriented and with final horizon being completion of the building, cannot provide for such new requirements.

3 AIM

This paper is introducing a building performance evaluation strategy for support of decision-making process in planning and management of sustainable buildings throughout the lifecycle. The implementation of the strategy enables the quantification of the sustainability potential of a building or a project, the still rather vague and "irrational" term – sustainability - becomes tangible and easy to grasp, expressed through an absolute value.

This strategy will be applied to a conceptual model of a building; so called dynamoBsd model (dynamical building – under sustainable development) and should enable designing, planning and management of flexible, dynamical buildings, which are capable of absorbing different changes, guaranteeing social, economical and ecological optimum throughout the life cycle.

4 NECESSITY FOR SUSTAINABLE BUILDING

The buildings count to the one of the largest energy and material consumers of our society. The building process itself uses nature. During the last 40 years, it has been more built worldwide than in the past thousand years. Alone in Germany 100-120 ha of land is built over daily. 11 t of sand, gravel, stones and

clay, 0,2 t of steel and steel products are used per capita inhabitant yearly for construction (Bomhard, 1998). Construction waste, building rubble and road decampment cause 1,2 t/per capita/year.

But not only are natural resources used for the manufacturing of buildings.

In the EU, 40% of total energy and material consumption is used for manufacturing and operation of the buildings. The ratio between the manufacturing-energy and building operation and maintenance energy consumption betrays 20% :80% - meaning that the largest consumption falls during the operation phase of the building life-path. Interestingly, the same ratio applies to the manufacturing vs. operation cost.

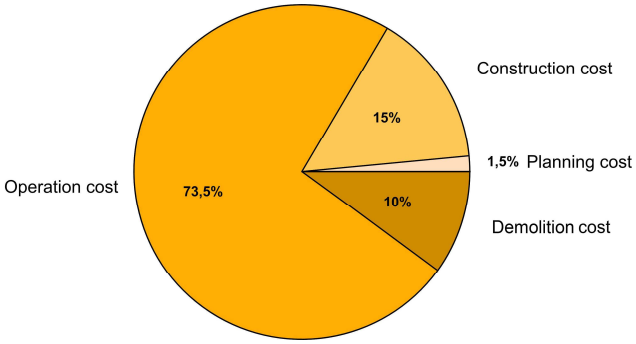

Figure 1: Cost development throughout life phases

5 SUSTAINABILITY IN BUILDING INDUSTRY

The terminus sustainability is often mistaken by solemnly satisfying the ecological issues. AGENDA 21 defines "triangle of sustainability" that coordinates the actions towards the sustainable development that lie upon satisfaction of economical, ecological and social issues (Renn et al, 1999), where Valentin (1999) introduces the fourth dimension of supervising institution. This concept corresponds to the holistic approach towards architecture, where buildings must not only fulfil the economical premises and ecological optimum; but also the original function of the shelter; further on as the container for certain social use (school, housing, etc.), representing the cultural expression of the society.

The rapid development of "new economy" and related so called "investor architecture" do not contribute to sustainable development – investors are interested in possibly lowest manufacturing/planning cost, and highest possible return of investment – future tenants will be coping with enormous operation costs and environmental load through out many years of building's life duration.

The traditional planning process, with linear work flows on the time line: architectural concept first, then structural concept as the reaction to architecture and in the end the engineering as reaction to both previous concepts; results with over-installed buildings with illogical construction, wrong orientation, and an interior climate that is difficult to handle. As consequence: unsatisfied users, high life cycle costs, high environmental impact; all the factors that eventually lead to short economical life duration, soon vacation and demolishment; or in better scenario elaborate redevelopment and refurbishment – all again resulting in high following costs as well as environmental burden through resources consumption and waste production.

"The essence of sustainable building is thinking ahead" (RIDA, 2003), – therefore the life-cycle oriented interdisciplinary planning process from cradle to grave – from project development till demolition or reuse, is a precondition of actual sustainability.

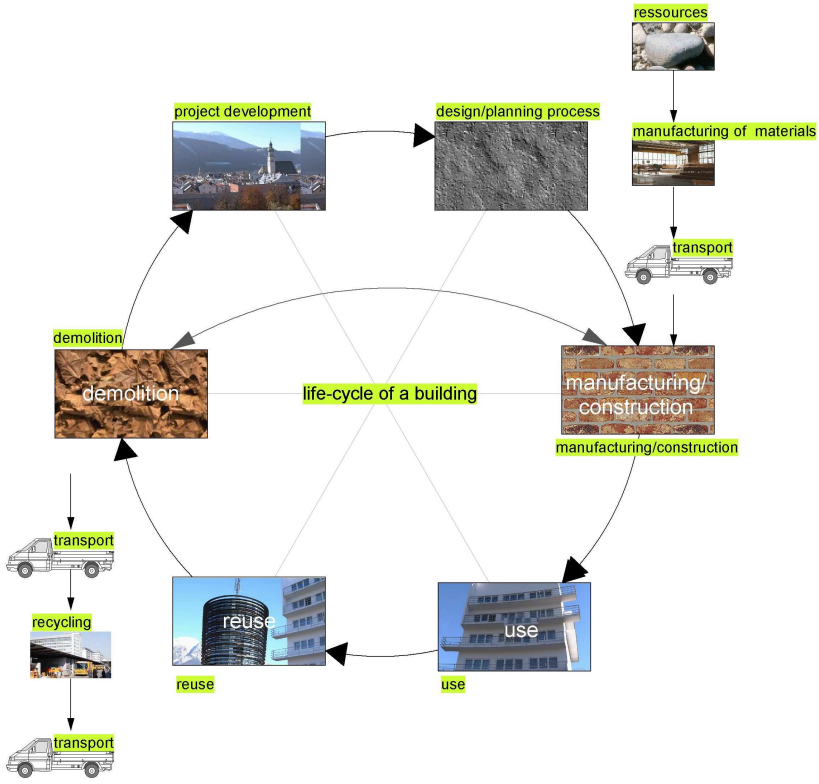

Figure 2: Life-cycle of a building

6 HYPOTHESIS

The basic hypothesis states, that building itself is not a stabile, static object but rather a dynamical system.

The current life duration of commercial real estates has been predicted by real estate investment management companies to lay somewhere around 50 years.(Schulte, 2002) Buildings change their original use two to three times throughout their lifecycle. The consumption of energy and resources is constantly progressing through building's lifecycle with its multiple changes and mutations. Therefore, the hypothesis develops a conceptual model of a building as permanent "project": as dynamical process – dynamoBsd model (dynamical building – under sustainable development).

6.1 dynamoBsd Model

dynamoBsd model is based upon the modernist approach of architecture as composition of form, function and construction. However, the modernist approach is expanded by:

- systemic concept – building as a system, set of micro and macro building elements
- temporal concept – building changing in time throughout its life cycle: dynamical system with life cycle approach
- sustainable concept – building interacting with its economical, social and finally natural environment: where eco-system represents the final system boundary, and is container of all sub-systems

The strategy for sustainable planning will be carried out upon dynamoBsd model .

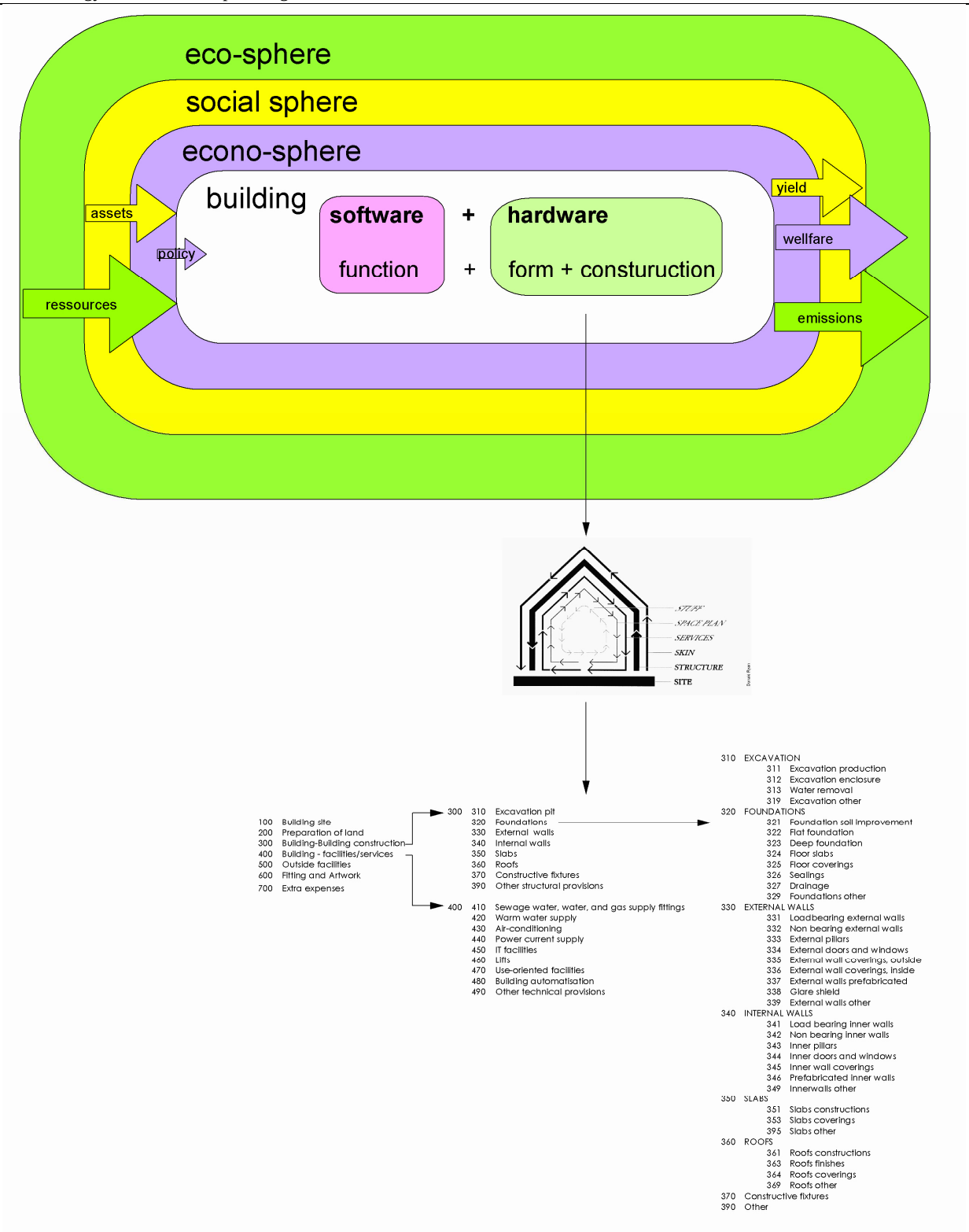

Figure 3: dynamBsd model

6.2 Flow analysis concept

To demonstrate the changes of building in time, the flow analysis concept developed by Kohler (1998) - to be referred to as Kohler Model - will be used. A building is represented through superposition of different flows taking place throughout its life-cycle: materials, energy, capital and information (Kohler, 1999). Moreover, different layers of building can be identified, according to their life-duration; which again experience different temporal changes: rhythms, cycles and phases. Brand (1994) proposes a “6s” building model, consisting of slow and long-lasting layers like site (eternal) and primary structure (50 - 60 yrs.), and

fast and changing elements of short life duration such as skin (20 yrs.), services (7-15 yrs.), space plan (3 yrs.) and stuff-mobilia (monthly).

6.3 Tangible and intangible data

The ambivalent nature of a building as composition of "rationale" and "irrational" aspects brings problems for development of an evaluation strategy.

The tangible data are building's qualitative characteristics:

- ecological (consumption of resources and energy, emissions) and
- economic data (investments, life cycle cost),

The intangible data is expressed through quantitative characteristics:

- formal,
- cultural and
- functional aspects.

Both tangibles and intangibles have to be evaluated upon the same scheme.

For representation of tangible (qualitative) data the Kohler Model implemented in existing sirAdos-LEGEP (Hermann, 2000) Software is used – geometry and masses (materials) are calculated. Monetary flows, as well as inputs of energy and resources and outputs of emissions are modelled.

The intangible data will be represented using the method of sustainability indicators, that are adapted from the existing indicators of large scale-urban and regional planning (Steinhauer 2001) to the architectural scale of a single building (BVMBW 2001), and partially project-specifically defined.

7 THE EVALUATION STRATEGY

The building performace evaluation in terms of sustainability will be carried out upon the dynamoBsd through application of following STRATEGY:

1. Generation of project related indicators for sustainability indicator tables; which consist of ecological, economic and social aspects represented through relevant referential values
2. Building modelling through LEGEP-Software and developer calculation
3. Generation of data
4. Evaluation: Enrolment of the data into the indicator tables, relation to the referential values

7.1 Generation of indicator tables

The sustainability indicator parametric model is based on existing BMVBW (2001) model.

The parametric table reflects the "prism of sustainability" – containing aspects of: ecology, economy, and socio-cultural aspects; which are to be evaluated separately in own evaluation tables.

Some of typical aspect-indicators are:

a) Economy:

- economic competitiveness and sustainable management (yield, costs),
- economical aspect of ecology (water consumption cost in €/anno, heating kWh/m², maintenance cost inspection cost and operating cost €/m²),
- soft facts such as fungibility and flexibility, maintenance and creation of branch/business diversity

b) Ecology:

- Protection of natural resources (construction demand, land consumption)
- Protection of bio-diversity
- Protection of pollution rate/constraint of emissions: greenhouse gasses emissions (CO2 equivalent, Ethane equivalent), soil pollution
- Long life duration and easy dismantling (recycling of building materials)

- Rational energy consumption (U-Value, Substitution of fossil energy sources through regenerative energy sources),
- Water consumption, cleaning effort, maintenance effort (material flow in kg/anno), sewage water and waste (kg/anno)

c) Socio-cultural aspects:

- Social and spatial fairness: outer/inner appearance, barrier free building
- Creation of liveable urban identity
- Fulfilment of individual needs (Adequate provision of housing and living space, Accessibility of workplace, Accessibility of infrastructure and free time facilities of the higher level centre)
- Protection of social stability (Residence quality for all ages, Consideration of balanced income structure regarding working places, Integration foreign co-citizens)

The existing indicators have to be examined project specifically on their project relevance; new indicators have to be generated throughout careful basic research of a project.

The project-specific indicators are mostly complex interactions of different tangible and intangible aspects. In order to determine their project relevance, a tool of sustainablity cob-web diagram is used: the importance of the specific indicator-interaction is represented as an area within diagram.

Typical real-estate related indicator-interactions are e.g.:

- real estate image, sustainable rental incomes, higher yields depending on building easthetics
- cost-efficient and low maintenance, long life duration depending on construction-typology
- higher construction cost for lower life cycle cost, efficient energetic building performance
- urban identity, landmark charcter depending on formal aspects
- longer economic life duration depending on flexibility and fungibility

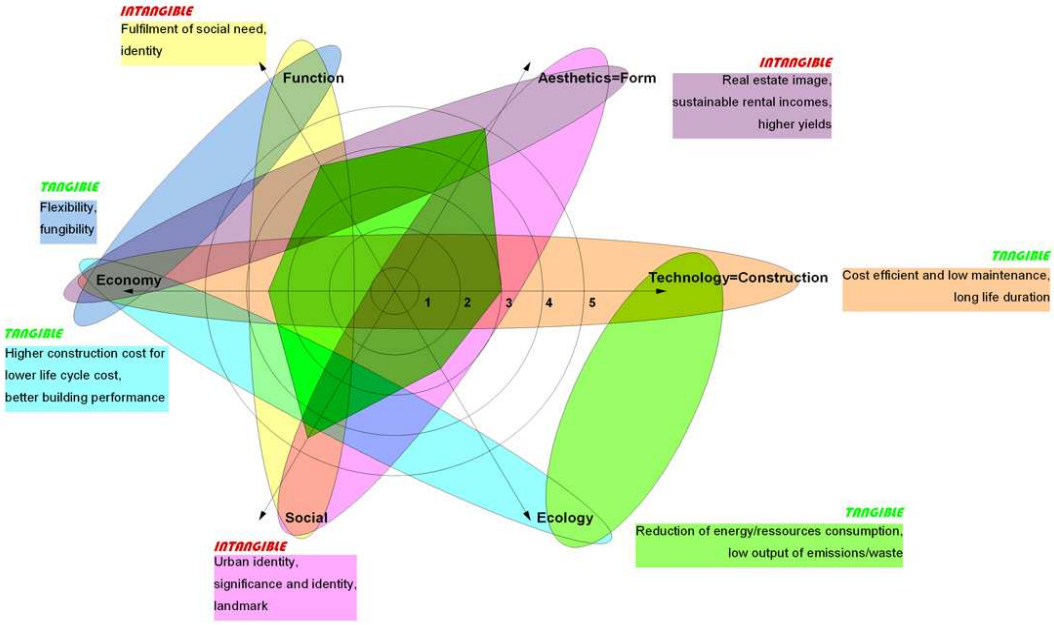

Figure 4: Cob-web diagram of interactions between tangible and intangible indicators

7.2 Data-generation:

Quantitative data will be modelled by the means of sirAdos-LEGEP-Software (2006) and developer calculation method (Achammer, 2003).

Qualitative data is legible from the plans, graphical representations, project specification, interviews etc. It will be evaluated by means of scale or simply yes/no answers.

7.2.1 The sirAdos-LEGEP

The sirAdos-LEGEP software performs a cost calculation by the means of macro-, gross- or fine building elements that define building construction. Each element is linked to its life cycle cost (consisting of maintenance, service, cleaning and demolishing cost) as well as to mass flow, emissions and energy consumption throughout its life cycle.

Following evaluation is carried out by LEGEP:

- Construction costs according to DIN 276 (1993):

100 – Building site

200 – Preparation of land

300 – Building construction

400 – Building facilities/services

500 – External facilities

600 – Fitting and artwork

700 – Extra expenses

Construction cost = ∑(200 – 600)

- Total price €/m² GFA (gross floor area) and Total price €/m³ GV (gross volume)
- Life cycle cost:
- cleaning, service/inspection, maintenance, operating cost, demolition: in total and €/m² GFA
- Energy consumption - U-Value calculation, transmission heath losses, energy costs for heating and warm water, electricity costs €/anno, water consumption in m³/anno and costs €/anno
- Ecology: mass flows and balances for life cycle or for single life cycle phase (construction, cleaning, maintenance): CO2 emissions, primary energy consumption, acidification, summer smog potential etc; waste mass flows (landfill, hazardous waste, underground landfill in kg)

7.2.2 Developer calculation method

The developer calculation method is employed to evaluate and/or to guarantee sustainable yields and incoming profits. It is basically based on cost calculation on the first cost group of building elements of DIN 276 (1993) Standard.

7.3 Evaluation

Both qualitative and quantitative data will be enrolled in the evaluation tables and compared to target values (quantitative data), graded on scale 1-5; and weighted by the factor of relevance for the project.

The target values are obtained from: referential projects, facility management companies, authorities or suppliers, LEGEP-Database.

Therefore, the determination of relevant indicators and their weighting should only be done upon well documented basic research in sense of project development, and remains in the realm of experience of evaluator.

Each aspect: ecology, economy, and socio-cultural is evaluated separately in own evaluation table, and becomes a grade – absolute value. The final result, so called factor of sustainability (Sd) is a mean value of the values of three aspects.

7.4 The factor of sustainability

The factor expresses the sustainability potential of a building or a project at given point in time (life cycle phase), and points out the weaknesses and potential future problems. Moreover, the concrete issues such as:

- identification of large cost originators throughout the lifecycle concerning cleaning, maintenance and demolition;
- peak years of expected great investments and reinvestments;
- development of following costs
- yields and revenues through alternative uses; etc.
- can be outlined.

8 CONCLUSION

The implementation of building performance evaluation tool dynamoBsd enables determination of the possible planning consequences already in the earliest stages of life cycle of the building: at the beginning of the planning process; in the pre-design phase.

This planning phase is crucial for the entire life cycle of the building; since at that early point the change potential is still almost infinite. This relatively short and fast phase determines however the future building features such as energy consumption; flexibility etc.; that will last over long period of time and will be hardly possible to correct in latter phases.

The evaluation tool can also be implemented at any later point in time: either in planning or operation, as the means of control or as means for redirecting of undesirable future developments – it serves as indicator of weaknesses but also strengths of a building; expressed in an absolute value.

The tool itself deals very well with tangible data that are clearly quantifiable, and can also be modelled for the future. However, more problematic are the intangible data because of their partially "irrational" and extreme temporal character.

To such data count in front of all the parameters of socio-cultural component; but of economical component as well – sustainable rents depend on future market developments or the future image of the site; these factors can hardly be foreseen and are extremely dependable on outer influences and indeterminist forces.

Therefore the implementation of the tool in the early phase of pre-design can only be seen as an indicator of sustainability; the re-evaluation and corrections in latter planning as well as in life cycle phases is necessary.

Some decisions concerning the potential user- or general public acceptance and image of the project within the urban context as well as the security of final economic success will always be escaping the rational evaluation methods, and will remain in the "irrational" judgement realm of experience, instinct, foreboding and talent of planner and developer.

The tool can find concrete and immediate application in the field of architectural competitions: in the EU-wide competitions the concepts and adherence of sustainable development gain increasingly on importance, however these concepts could hardly be objectively evaluated. The building performance evaluation strategy dynamoBsd gives a tool that enables the competition jury comparing of the projects based on tangible results – factors of sustainable development.

9 REFERENCES

ACHAMMER, C., 2003. Skriptum zu Vorlesung Projektentwicklung, Wien: TU Wien, Industriebau und interdisziplinäre Bauplanung

BMBW - Bundesministerium für Verkehr, Bau- und Wohnungswesen, 2001. Leitfaden für nachhaltiges Bauen, Bundesamt für Bauwesen und Raumordnung (Publ.)

BOMHARD, H., 1998. Bauen im Wandel?, Betonwerk+Fertigteil-Technik, Wiesbaden: Bauverlag GmbH, 8/1998

BRAND, S., 1994. How Buildings Learn. USA: Penguin Books USA

HERMANN, M. et al, 2000. Legoe – a complex design and evaluation tool. Universität Karlsruhe: Institut für Industrielle Bauproduktion

DIN 276, 1993. Deutsches Institut für Normung. DIN Taschenbuch

KOHLER, N. et al, 1998. Stand der ökobilanzierung von Gebäuden und Gebäudebeständen. Universität Karlsuhe: ifib – Institut für Industrielle Bauproduktion

KOHLER, N. et al, 1999. Stoffströme und Kosten in den Bereichen Bauen und Wohnen. Berlin, Heidelberg, New York, Barcelona…: Springerverlag

RENN, O. et al, 1998. Wege in eine nachhaltige Zukunft. in Breuel, B. 1999 (Publisher) Agenda 21. Frankfurt an Main, New York: Campus Verlag

RIDA, 2003. Royal Institute of Dutch Architects, Vital Architecture. Amsterdam. www.bna.nl

SCHULTE, K.-W. et al, 2002. Grundlagen der Projektentwicklung aus immobilienwirtschaftlicher Sicht. in Schulte, K.-W. und Bone-Winkel S. (Publisher). Handbuch Immobilien-Projektentwicklung. Köln: Immobilien Informationsverlag, Rudolf Müller GmbH

sirAdos LEGEP 2006. Aum Edition. http://www.sirados.de/

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Learning the public preferences for living environment characteristics: the experimental approach

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1 ABSTRACT

The goal of the research presented in this paper is to propose, test, document and evaluate the application of preference models in the field of urban planning and design. The preference models simulate the human decision making in various hypothetical situations.

The preference model used in the research is created in experimental way by using the conjoint analysis. It is demonstrated how the complex characteristics of the environment can be transformed into operational form that can be consequently used for preference analysis and modelling. The preference model assembly phases are demonstrated.

Once the preference model is created, it provides with the predictions of preferences for alternative scenarios (combinations of environment characteristics) and other information that supports the interpretation of the factors influencing the identified preferences. The paper presents concrete outputs that can be directly applied to everyday practice of urban planners and designers.

With the help of conjoint analysis several preference models are constructed that represent the preference structure of individual respondents or groups of respondents. The preference structures of various groups of respondents are compared and significant differences are identified.

It is also demonstrated how the preference model can serve as a planning support system for simulation of inhabitants' responses to proposed changes in the urban environment. For those purposes the outputs of the preference models are projected onto real environment characteristics represented by GIS model. Areas of Prague have been selected as cases.

The effective use of preference models is encouraged by the use of information technology that offers many advantages including the experimental stimulation of respondents, data collection and analysis. At the end of the paper the implications for further research are presented.

2 INTRODUCTION

Preference model simulates human evaluation of various hypothetical situations. Any imaginable characteristic of urban environment can serve as an input into the model. The paper presents the experimental approach to preference analysis: the conjoint analysis is used to distil the preferences out of respondent's evaluation and the preference model provides with predictions of preferences for alternative scenarios. In this way the effects of various urban environment aspects on human behaviour can be explored:

- accessibility of facilities, services and workplaces and their relative localization [24, 10]
- density, amount and accessibility of open spaces in the urban environment [3, 4, 5, 10, 16, 17]
- quality and diversity of services [24]
- fit of urban environment for chosen leisure activity of its habitants [1]
- factors influencing the mobility of habitants and their choice of transportation mode [11]
- effects of social environment [18]
- effects of various land-uses adjacencies [10, 17, 7, 11]
- effects of environmental stress factors [14]
- visual qualities of urban environment [15]

The public preferences for living environment are the main focus of this research. It is assumed that the habitants' preferences have the major impact on the choice of living environment. The examined characteristics are adjacency, accessibility and land uses.

3 PREFERENCE ANALYSIS APPROACHES, METHODS AND PRINCIPLES

Two general approaches are used for preference measurement: “Revealed preferences” methods and “Stated preferences” methods. The revealed preferences are derived from data or an observation of human behaviour in a real environment. Prices of land, data on habitants’ migration in urban environment and other socio-economic data can serve as the sources of data [11]

The Stated preferences experimentally stimulate the subject by means of hypothetical scenarios.

The paper describes the use of “Conjoint analysis” to derive the model of preferences in experimental way.

First the evaluated object is represented by finite number of characteristics [14, 11]. Each characteristic is in turn explicitly defined by finite number of states (Conjoint analysis belongs to “Discrete choice methods”). Description entering the method is therefore abstract and formal and consists of attributes and their states. By combination of attribute states we receive large, but finite set of all possible alternative scenarios that is called “Experimental Set of Data” (ESD).

Scenario is carefully and purposely given description of certain object or environment that can be real or purely hypothetical. The scenarios can represent a physical object as well as a mental construct. For example it is possible to test the preferences to not yet existing objects or environments.

The scenarios are used for stimulation of the subject and as an element to which the evaluations are attributed. The CA belongs to decompositional methods as it automatically breaks the evaluation of whole scenarios down to its constitutive elements: individual attributes and their states [14]. Decomposed values are referred to as partial preferences or partial utilities.

Partial preferences enter the preference model as its parameters. The task of the preference model is to recompose the partial preferences into preferences of the whole scenario. Decomposition of global preferences to partial preferences and their consequent recomposition is modelled assuming certain principals of human evaluation and mental processes of decision: the additive and the multiplicative models represent two main alternatives [14, 11].

4 THE PREFERENCE MODEL ASSEMBLY PHASES

The preference model assembly phases are demonstrated step by step.

4.1 The choice of the critical characteristics

Extensive literature exploration was completed to identify the attributes of the environment that are important for the habitants’ choice of the living environment. Only the characteristics that are expected to involve the choice of a subject and/or that are relevant for the research objective were chosen.

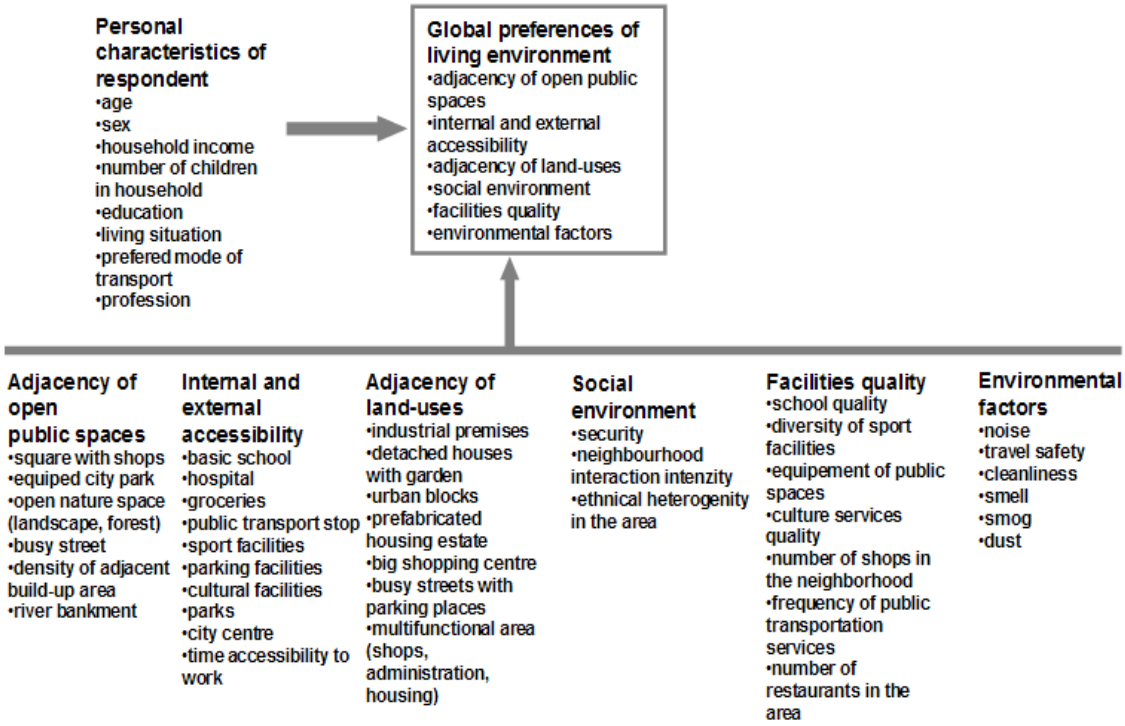

Figure 1: The hierarchical model of the attributes critical for evaluation and choice of living environment

The method of preference analysis has some limits concerning the number of characteristics that can be evaluated in one application of the method. The number of characteristics (size of ESD) that can be concurrently evaluated is limited by maximum number of scenarios that can be evaluated by one subject. The limiting factor is the subject fatigue during the evaluation procedure. It is strongly recommended that the number of evaluation acts in one procedure does not exceed the number of 30 [14].

Not only the number of scenarios, but also its complexity (number of attributes in one scenario) must respect the respondents' cognitive capacity. The size of scenario should not exceed the number of 15 attributes given that each attribute has no more than 10 states. The optimal size of scenarios is 7 attributes, each with 3 states.

It is obvious that the limits of the method are in contrast to the complexity of the phenomena that we intend to study. In this case the complexity of the environment description is managed by dividing the environment characteristics into themes that are commonly accepted. The ESD takes form of hierarchical structure. This enables to build a partial preference model for each theme separately and finally to integrate the partial preference models and to assemble them into single preference model [14].

4.2 The attribute states definition

Seven attributes were included into the preference model presented. The attributes where not defined with regards to the theme but rather with the intention to test various forms of environment characteristics description. The intention was to involve the categorical as well as continuous variables into the experiment.

In the case of categorical variables each category represents some discreet state of real environment characteristics. The categories presented to the subject should correspond to the subject's perception of the characteristics.

The characteristics that have continuous character must be defined by several discreet states. Because only some of the values of the characteristics can be selected to be presented to the respondents, it is important to select the values that best describe the respondents' perception of the characteristics. However the subjective perception does not always simply correspond to objective states of perceived characteristic. For example the relation between the proximity and preference is not always monotonous, but it can rather include a threshold, which the increasing preference suddenly starts to decrease. If this is the case, there should be at least 3 attribute states defined: 2 states defining the outlying values and one or more states should indicate the points of expected change of the preference trend [14, 11].

In the experiment questions the categorical variables were used for description of three types of objects adjacencies: urban park, open landscape and busy street. There are three types of proximity zones defined with regards to the respondents' dwelling:

- „Vista zone" represents topological adjacency of object/activity/use to subject's dwelling. To this type of adjacency strong visual effects are related.
- "Local-displacement zone" represents the space of walking distance. It is assumed that objects, activities and uses in this zone have a strong social and psychological effects stemming out of the intensive social interaction, personal contacts, the sense of belongingness and identity.
- "Enlarged-displacement zone" represents the space outside of "Vista" and "Enlarged-displacement" space. The Enlarged-displacement space is characterized as a space of extended mobility, where movement in this space is contingent on the use of transport technology. Our use and knowledge of this space depends on the mode of transport. It is consequently discontinuous, fragmented. The habitant's emotional attachment to this space is weaker.

Additionally, categorical attribute "character of adjacent residential buildings" describes three distinctive types of residential buildings in the experiment: detached houses with garden, compact blocks of flats and prefabricated panel housing estate.

The experiment includes two continuous characteristics: time accessibility of a shop and public transport stop by walking and time accessibility of the city centre by any mode of transport.

Name of attribute	**Attribute state**
the proximity of an urban park with facilities (benches, children and sport playgrounds)	the object is adjacent and visible from your dwelling
the proximity of an open countryside (forest, meadows)	the object is located in the walking distance (less than 5 minutes)
the proximity of a busy road (600 cars in one hour)	the object is located beyond the walking distance
the pedestrian accessibility of a shop with the basic range of goods in minutes	3 minutes 7 minutes
the walking accessibility of public transport stop (bus, tram) in minutes	15 minutes
the accessibility of city centre by any transportation means in minutes	15 minutes 30 minutes 45 minutes
the type of adjacent residential buildings	detached houses with garden compact residential blocks with inner courtyards panel housing estate without clean distinction between public and private/semi-public open space

Table 1: Attribute states description

4.3 The assembly of scenarios

The attributes defined are combined into scenarios. In the experiment the fractional factorial design was used to create the set of scenarios (ESD). Fractional factorial design is based on fraction of all attribute states combinations. The selection of a subset of combinations is possible only under the condition of preserving the orthogonality of ESD: the states of attributes being varied with the same frequency across all the presented scenarios. Only in this way the preferences attributed to each scenario can be decomposed to individual states of attributes.

The advantage of using only relatively small number of scenarios (32) is that scenarios can be evaluated be single respondent during one session. That enables the researcher to build preference model for each respondent.

The weakness of the fractional design is that only main affects can be estimated while higher-order (interaction) effects are ignored.

4.4 The stimulation of the respondents and evaluation of scenarios

The scenarios in this experiment are presented in textual form. The main reason of using the textual form is that attributes are too abstract to be presented in visual form. (There are some convincing attempts to use visual stimulation of respondent in the "Green space" project [25]).

The subject can attribute the preferences to scenarios in three ways [14, 11]: ranking, rating or discreet choice. While discreet choice most closely imitates the way of decision-making in real life, the combination of ranking and rating was used in this experiment mainly because of the efficiency of both techniques (minimum number of evaluation acts in one evaluative session) [11].

4.5 The choice and formal definition of preference model

The additive or multiplicative rule represents two hypotheses about the way human beings compose the overall preferences and decisions from the partial preferences referring to individual characteristics of their environment.

The additive model assumes that any attribute state of low preference can be compensated by another attribute state of high preference. The multiplicative model assumes that compensations are impossible because the partial preference of one attribute state is dependent on the presence or absence of another attribute. Therefore the individual attributes cannot be each other substitutes [14, 11].

For this experiment the additive model was chosen. The formal notation of additive model that uses the categorical attributes is:

$$Y\mathrm{i} = ß0 + ß\mathrm{i}1 * A\mathrm{i}1 + ß\mathrm{i}2 * A\mathrm{i}2 + \ldots + ß\mathrm{i}y * A\mathrm{i}y$$

where $Y\mathrm{i}$ means global preference to i-th scenario that is composed of attribute i having attribute states *1..y*: $A\mathrm{i}1$ .. $A\mathrm{i}y$ with partial preferences (utilities) of each attribute state $ß\mathrm{i}1$ .. $ß\mathrm{i}y$.

4.6 The application of information technology

One of the goals was to exploit all opportunities that the new information technology offers. To attain the goal, the virtual laboratory was to created that enables to elicit the evaluation out of respondent being anywhere in the world at whatever time and to reward respondents' participation with immediate (on fly) presentation of the preference models based on his/her evaluation. The intention was not only to collect data from a respondent, but to attract the respondent to the topic and the method of the research itself. It could be one way the information technology could help people to be aware of some seldom perceived aspects of their interaction with the environment.

Advantages of the use of ICT are:

- smooth data distribution and collection;
- attractive graphic stimulation;
- immediate feedback given to the user;

The use of ICT is accompanied with the following disadvantages:

- respondents can pretend fake identity and consequently degrade the results of experiment [12];
- non-uniform access to internet across the population.

Visually attractive, user-friendly, easily accessible and highly interactive web application was created.

The application enables evaluation of scenarios, creation and presentation of preference model. The Java applet technology was used to create client interface, but it was recently changed into html pages on client side and Java Servlet Pages on server side. Data persistence is maintained by database server MySQL server 4.1. The statistical toolkit: „Michael Thomas Flanagan´s Java Library" was used for the creation of the preference model, JFreeChart library was used for rendering the charts. Whole application was assembled and debugged in the development environment NetBeans 4.1. All used technology is distributed under GNU

licence (General Public Licence). The only professional software used was the package of statistical tools: is SPSS 12.0.1. [22].

5 THE PREFERENCE MODEL FROM THE USER POINT OF VIEW

5.1 Getting the information on respondent

The respondent first inputs his/her personal characteristics later used for the creation of group preference models that represent the preferences of selected respondents only.

The respondent states his/her age, sex, personal status, number of children in household, monthly household income rank, size of city inhabited, type of residential building inhabited and most frequently used transportation means for local movement. The respondent is not requested to uncover his/her real identity.

5.2 Instructing the respondent

The personal data questionnaire is followed by two instruction pages informing the respondent about the goals of the experiment and steps of the procedure. Three types of adjacency (Vista space and Local / Enlarged displacement space) are explained and illustrated on the example of several distinct aerial photos of urban tissue. The aim is to sensitize the respondent to the scale of each type of adjacency.

5.3 The elicitation of respondent's preferences

The evaluation procedure lasts about 20 minutes. The respondent evaluates each of the presented scenarios on the scale <0; 100>. Whenever the respondent presses the "sort" button, the program automatically sorts the scenarios according to the scores attributed. This combination of rating and ranking enables the respondent to fine-tune the evaluation by comparing the most similarly evaluated scenarios side by side.

Figure 2: The evaluation panel eliciting the respondent's preferences

When the respondent feels comfortable with own evaluation of scenarios, he/she submits the evaluation and the program redirects the respondent to the interfaces that provide the interaction with preference models.

5.4 The interaction with the preference model

The application offers three main user interfaces, each designed for learning other aspects of the preference models: Compare, Analyze, and Project.

5.4.1 Interface "Compare"

Two default preference models were created: the general preference model that represents the preferences of all respondents taking part in the research and the personal model presents preferences of an individual respondent. Further, a respondent can create a number of group preference models that represent the preferences of selected respondents.

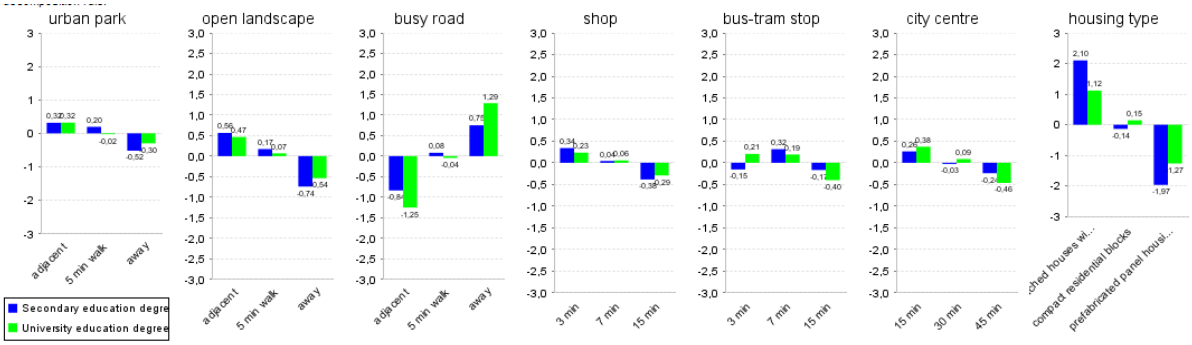

Figure 3: The comparison of partial preferences of two selected preference models representing the respondents with the secondary education degree and with the college or university education degree.

The interface 'Compare' enables side-by-side visualization of the selected model parameters. For a respondent it is possible to compare the differences between the partial preferences of two chosen preference models.

Apart from the partial preferences the interface offers the comparison of importance that each attribute had for a respondent or group of respondents when evaluating the scenarios.

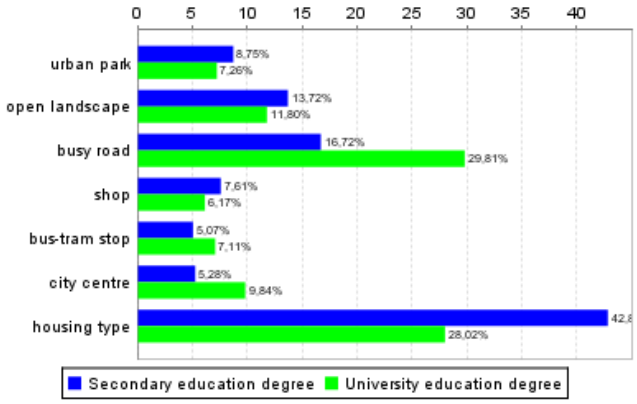

Figure 4: The comparison of attribute importance of two preference models representing the respondents with the secondary education degree and with the college or university education degree.

The interface ‘Compare’ presents other two important model parameters: the intercept of regression line and the coefficient of determination.

The intercept of regression line represents the average evaluation of all scenarios. Intercept is relatively low when the respondents were rather displeased by offered scenarios during the evaluation. The value of the intercept has no impact on the value of partial preferences for individual attribute states presented above. Therefore the partial preferences are comparable across all preference models.

The coefficient of determination shows how big portion of total preference variability is explained by the preference model. The coefficient of determination represents the quality of the preference model; it is high when the respondent's evaluation was consistent. A low value of the coefficient of determination usually indicates the respondent‘s fatigue during the evaluation procedure or a premature interruption of evaluation procedure.

Each preference model represents the preferences of particular group of respondents. The interface ‘Compare’ offers description of respondents using the personal characteristics that each respondent entered at the start of evaluating procedure. Following graphs describe the characteristics of selected respondent groups.

5.4.2 Interface “Analyze”

Interface 'Analyze' provides with a tool for deeper analysis of the characteristics of respondent groups’ evaluations. Respondents are sorted into groups according to their personal characteristics; charts present the parameters of each group evaluation.
First box chart presents the distribution of partial preferences that each group of respondents expresses for

the selected attribute. Each box shows how much one of the respondent's group prefers one of the state an attribute. The partial preferences can be read on the vertical axis.

The second box chart shows the distribution of the attribute importance for each group of respondents.

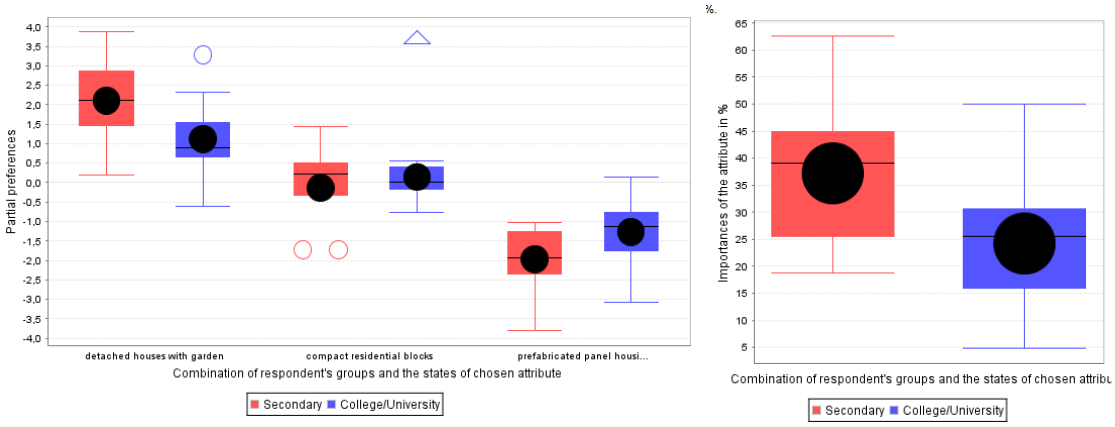

Figure 6: Distribution of partial preferences and the importance of chosen attribute for two groups of respondents: with the secondary education degree and with the college or university education degree.

5.4.3 Interface "Project"

The preference models can be used to evaluate any real or imaginary environment. Several areas in Prague were used as the cases. Each case area was described with the use of the attributes of a selected preference model. The spatial analysis was employed for the creation of raster layers representing the characteristics to be evaluated by the preference model. Each raster layer is evaluated by selected preference model and resulting value-map is created.

The pictures bellow shows the evaluation of Dejvice-Vokovice-Střešovice area (3,6 x 2,5 km). Blue and red colours scale from low (0 points) to high (up to 9 points) evaluation. There are differences noticeable in the negatively evaluated areas adjacent to the capacity roads (blue strips), red-yellow spots covering the areas of highly prestigious garden suburbs and blue spots covering the areas of housing estates built up in the post-war period. Public transport stops and shops are distributed in the area quite evenly and as such they do not have a strong impact on the evaluation. These factors may, however, play significant role in some other, more peripheral parts of Prague.

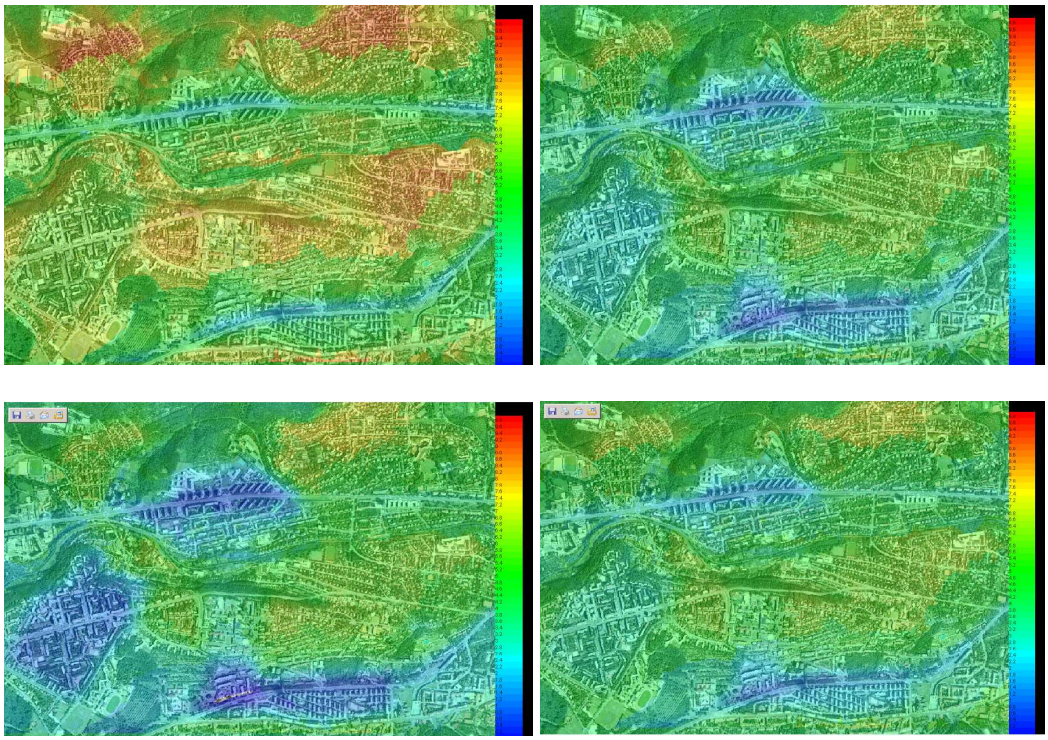

Figure 7: The evaluation of the same area by four different preference models: personal, general preference models and two Groups' models: one is representing the respondents with the secondary education degree and another one respondents with the college or university education degree.

The preference models created to represent the preferences of various groups of respondents have something in common. Majority of them express low preferences for areas adjacent to busy road and post-war housing estates. On the other hand they highly valuate the adjacency to open landscape and low density housing areas. While the conclusions are trivial and just verify the common sense, it should be stressed that the added value of preference models consists in their ability to uncover much more subtle phenomena. They give us information on the marginal changes of preferences as the function of the change of one or more environmental factors or respondents' personal characteristics.

The interface 'Project' enables to assess the comparative attractiveness of different areas too. The projection is also useful for the evaluation of the areas that we do not know or we are not able to evaluate using the common sense. It is the case of more abstract characteristics of the areas such as accessibility of services and transportation infrastructure.

Each presented interface has its own purpose. Interfaces 'Compare' and 'Analyze' are useful for the study of respondents' preference structures, while the interface 'Project' is more useful for the geographical analysis of different areas.

6 THE OUTPUTS OF PREFERENCE MODELS AND THEIR USE

Even though the experiment is not yet finished and there is still more respondents needed to reach the sample balanced in terms of equal distribution of respondents' personal characteristics, the preliminary conclusions have been done with the intention to demonstrate what kind of information it is possible to get out of the analysis.

6.1 Partial preferences

The partial preferences (utilities) for each state of the attributes with regard to the importance of particular attribute are the most important outputs of the analyses. The partial preferences represent the positive or negative contribution that each state of the attribute has for the evaluation of whole scenarios. The preliminary results of the experiment indicate the following conclusions:

- The adjacency of open landscape brings much bigger benefit than the adjacency of urban park. The benefit relies to large extend on a direct adjacency. By removing a park or open landscape out of visual connection to the walking distance, it looses much of its value.
- The negative effects of busy road adjacency (direct visual connection) are so important that they can be compensated for only by joint effects of direct adjacency of urban park and open landscape.
- There are differences in the preferences of the time accessibility of a shop with the basic range of goods and a public transport stop. The highest partial preference for the accessibility of a shop is 3 minutes and with the increasing accessibility the preference diminishes. A public transport stop has the highest partial preference in 7 minute time accessibility. With decreasing or increasing time accessibility for the "peak" value the preferences diminish. In this case the curve of preference is not in direct proportion with the objective amount of the characteristics; therefore it would be reasonable to extend the number of attribute states presented to respondents and to test the exact distribution of partial preferences.
- As expected, the partial preferences for time accessibility of city centre diminish with the increasing distance of the city centre in linear manner. It would be interesting to test the preferences for direct adjacency of a city centre. We could assume an existence of negative effects coming form the high-density and intensive use of public space that would slow down the marginal increase of partial preferences of the increasing city centre accessibility.
- The partial preferences of the housing estate adjacency proved to be the most negative of all the attributes. The preferences of compact residential blocks are slightly positive and the preferences of detached houses with garden show the most positive partial preferences of all the attributes. The respondents with university degree have less strong positive or negative preferences to the respective

types of residential environments than the respondents' having attained the secondary education degree only.

- Apart from the level of attained education also the factor of the size of the city in which respondent lives influences the partial preferences of 3 minutes accessibility of public transport stop. Bigger is the city size, higher are the partial preferences of close proximity of public transport stop.

6.2 Compensatory or noncompensatory preference structures

The experiment uses the additive model that assumes the compensatory nature of respondent's preference structure. It is assumed that respondents can compensate for an attribute state of low preference with another attribute state of high preference. Under this assumption the preference model can indicate the mutual compensations (trade-offs) between the attributes which would indicate how big change of one characteristic would compensate the change of another characteristic. It is possible to identify very different combinations of attribute states that will be indifferent with respect to the respondent's evaluation. The impact of one change compared to the impact of other change on the respondent's preferences can be calculated. Such information can be very useful for estimation of public acceptance of various changes in the environment. Using the price as one environmental variable enables us to evaluate the compensations also in monetary terms.

The assumption of the compensatory preference structure is very strong and does not reflect the complex interference between the effects of several attributes when taking joint effect. There are indications that many characteristics of the environment function in this way. The joint effects of environmental characteristics are called interaction effects. The interaction effects identified are for example the perception of safety and the preferences for urban parks. In case of public transport it is very possible to identify the interaction effect between the time accessibility of public transport stop and the frequency of the transport service, total time of transport, comfort and safety of the transport. Interaction effects also could be expected between the density of built-up area and the preferences of public open spaces.

The measurement of the interaction effects requires collecting much more information than in the case of main effects measurement. Therefore it is usually impossible to constitute the preference structure on the individual base. This factor was decisive for the selection of the additive model for the experiment as the goal was to create the preference model that would represent the preference structure of individual respondents.

6.3 Attribute importance

The importance of attributes indicates the respondents' sensitivity to the respective environmental effects. When evaluating the scenarios, a respondent is required to evaluate simultaneously large number of information. When the number of information exceeds the cognitive capacity of a respondent, the selective approach to the evaluation of the scenarios is applied, when only some of the attributes are employed as the criteria of the scenario evaluation and other - less important - attributes are used only if there are some resources left for fine-tuning of the evaluation. The selective strategy is perfectly valid even for real life situations. This is the strength of decompositional methods where the whole scenarios are evaluated.

The experiment revealed that the most important criteria for the scenario evaluation are the type of adjacent residential buildings (30,59%) and the proximity of a busy road (25,12%). The attributes of average importance are the proximity of open countryside (11,72%) and the accessibility of city centre (10,60%). At this moment we can only speculate whether the low importance of the accessibility of an urban park is caused by having the attribute of open landscape as the substitute for the urban park.

The experiment indicates that each group of respondents applies different strategic selection of evaluative criteria.

6.4 Validity of experiment outputs

The validity of the preference measurement is usually measured using the "hold-out" that are evaluated by a respondent but not used for derivation of partial preferences. Instead they are used to compare the predictions of the preference model with the evaluation of the respondents to assess the validity of the model. This experiment does not use the "hold-out" scenarios because of already high number of scenarios in single evaluative session. Instead the subjective evaluation of personal preference model by respondents was

introduced. Each respondent when being confronted with her/his personal preference model was asked the following question:

"Does your personal preference model fit to your preferences as you reflect them?"

The answers were scaled between the 1 – agree completely and 7 – does not agree at all. The respondents indicated strong agreement with the preference model that was presented to them. The mean of the answers was 2,73 (standard deviation was 0,88).

7 CONCLUSION AND IMPLICATIONS FOR FURTHER RESEARCH

The partial results already indicate what could be the expected outcomes of the experiment. To confirm the partial results much more respondents is needed. Today's 32 respondents must be multiplied at least ten times. At present the results are valid only on the level of individual respondent.

So far the method of preference analysis and simulation proved to be valid and useful. For further development and application of the method the following ideas are proposed:

- use other, less subjective techniques of preference model validity measurement, for example the „hold-out" scenarios;
- test the reliability of the measurement by test-retest procedure;
- create more robust preference model that would include most of the attributes presented in the hierarchical model of the attributes (see figure 1).
- precise the spatial model, more precise spatial model would enable valid evaluation of the small scale areas.
- test the correlation between the preferences projected into the spatial model and other indicators of area attraction, for example the land prices or the price of rent.
- use the types of models that would enable an evaluation of the interactive effects. The disadvantage of this change would be the loss of the opportunity to evaluate the preferences on the individual bases.

8 REFERENCES

[1] Arnberger, Arne: Soziale Tragfahigkeitsgrenzen fur Freizeitaktivitaten in stadtischen Erholungsgebieten: Proceedings CORP2005 conference in Vienna, str. 525 – 532.

[2] Bryan Orme: Which Conjoint Method Should I Use?, Sawtooth Software research paper series: Sawtooth Software, Inc: 2003

[3] Coolen, Henny, van Montfort, Xandra: Meaning-based Representation of Preferences for Housing Attributes: OTB Research Institute for Housing, Urban and Mobility Studies, Delft University of Technology, 1998

[4] Coolen, Henny; Hoekstra Joris: Values as determinants of preferences for housing attributes: Journal of Housing and Built Environment 16: 285-306, 2001: Kluwer Academic Publishers: 2001.

[5] Coolen, Henny; Boelhouwer, Peter; Driel, Kees van: Values and goals as determinants of intended tenure choice: Journal of Housing and Built Environment 17: 215-236, 2002: Kluwer Academic Publishers: 2002.

[6] Golledge, G. Reginald, Timmermans, Harry: Application of behavioural research on spatial probleme I: Progress in Human Geography 42:3, 57-99: 1990

[7] Hazel, A. Morrkow-Jones, Elena G. Irwin, Brian Roe: Consumer Preference for Neotraditional Neighborhood Characteristics: The Ohio State University, Fannie Mae Foundation 2004

[8] Heft, Harry; Nasar, Jack; Evaluating Environmental Scenes Using Dynamic Versus Static Displays; Environment and Behavior, Vol. 32, No. 3, May 2000; Sage Publications, Inc., 2000.

[9] Hoekstra, Joris: Different housing systems, different values, different housing outcomes?: OTB Research Institute, Delft University, Netherlands, ENHR Conference in Cambridge, UK: 2004

[10] Kestens, Yan: Utilisation du sol, accessibilité et profil des ménages: effets sur le choix résidentiel et la valeur des propriétés: Faculté d'architecture, d'aménagement et des arts visuel: 2004

[11] Louviere, Jordan J.: Stated choice methods: Cambridge University Press: 2000.

[12] Melles Torsten, Laumann Ralf, Holling Heinz: Validity and Reliability of Online Conjoint Analysis, Sawtooth Software research paper series: Sawtooth Software, Inc.

[13] Molin, Eric, Oppenwal, Harmen, Timmermans, Harry: Predicting consumer response to new housing: a stated choice experiment: Department of Architecture and Urban Planning, Eindhoven University of Technology, Eindhoven, The Netherlands: Housing and the Built Environment, Vol. 11, No. 3.: 1996

[14] Molin, Eric: Conjoint modeling approaches for residential group preferences: Technische Universitet Eindhoven, Faculteit Bouwkunde: 1999

[15] Nasar, Jack L.: The evaluative image of the city: Sage Publications Inc.: 1998.

[16] Orzechowski, M. A.; Arentze, T.A.; Borgers, A.W.J.: Alternate methods of conjoint analysis for estimating housing preference functions: Effects of presentation style: Journal of Housing and the Built Envirnment (2005) 20, 349-362: Springer: 2005
[17] Poll, Ric: The Perceived Quality of the Urban Residential Environment, A Multi-Attribute Evaluation, PhD Thesis, Rijksuniversitet Groningen: 1997
[18] Rapoport, Amos.: Human aspects of urban form: Pergamon Press: 1977.
[19] Reginster, Isabele, Edwards, Geoffrey: The Concept and Implementation of Perceptual Regions as Hierarchical Spatial Units for Evaluating Environmental Sensitivity: URISA Journal, vol. 13, No. 1: 2001.
[20] Sawtooth Software: www.sawtoothsoftware.com
[21] Sommer, Robert: A practical guide to behavioral research: tools and techniques: Oxford University Press: 2002.
[22] SPSS ConjointTM 8.0: SPSS Inc: 1997
[23] Timmermans H. J. P, Veldhuisen K. J.: Behavioral models and spatial planning: some methodological consideration and empirical tests: Environment and Planning A, vol 13, p. 1485 - 1498: 1981
[24] Timmermans, Harry, Van Der Heiden, Rob, Westerveld, Hans: The identification of factors influencing destination choice: an application of the repertory grid methodology: Transportation 11, p 189 – 203, Elsevier Scientific Publishing Company, Amsterdam: 1982
[25] Green space project http://www.green-space.org/

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Earth, Landscape, Biotope, Plant. Interactive visualisation with Biosphere3D

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1 ABSTRACT

In this paper, we discuss the Digital Earth concept and scale issues regarding landscape planning visualisation, and we present the interactive visualisation system Biosphere3D. The visualisation system supports multiple scales on a virtual globe, and is focussing on real-time rendering of vegetation, similar to the predecessor Lenné3D-Player. In this paper we describe the visualisation system from a user's perspective. We provide detailed information about the available import and export data formats, the rendering capabilities and the required hardware. Additionally we will give a quick overview over the interfaces that allow the creation of custom software modules and possible applications.

2 THE GEO BROWSER IS NOT ENOUGH

AL GORE (1998) said in his legendary speech on 'The Digital Earth: Understanding our planet in the 21st Century': "I believe we need (...) a multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of geo-referenced data." As early as in 1995, Art+Com anticipated somewhat of Al Gore's foresight presenting TerraVision (MAYER et al. 1995, 1996). The figures show examples of TerraVision's graphical user-interface (1), the tangible globe interface (2), and interactive terrain rendering (3). Long before of hardware-accelerated consumer graphics cards, and broadband Internet access, the world was not ready for this prototyp requiring a SGI graphics super computer. Meanwhile, the rapid development of hard- and software for interactive visualisation has been triggered by the fast growing market of computer games and paid by millions of enthusiastic computer game players.

Figure 1-3: TerraVision (http://www.artcom.de)

Since the advent of Google Earth, 'geo browser', 3D GIS and digital globes have become popular tools and topics in both consumer and professional world. Many other software vendors, and open source projects offer such programs, e.g. ESRI ArcGlobe, and ArcGIS Explorer, NASA World Wind, Viewtec TerrainView-Globe, SkylineGlobe, Microsoft Windows Live Local (Virtual Earth), vWorld vieWTerra, and Virtual Terrain Project Enviro.

Geo browsers have in common that they focus on geographic, especially remote sensor data, and cartographic data, i.e. predominantly 2D or 2 ½ D map data draped on the terrain. Some products support 3D city models but none of the digital globes are currently focussing on the visualisation (visual simulation) of landscape scenery, forests or gardens. Do landscape architects, and environmental planners need specialised 3D real-time and 'global' landscape visualisation solutions? Or should we just rely on established geo browsers?

3 VERTICAL RESOLUTION

ORLAND (1992) claims that visualisation techniques for environmental management must include analysis and modelling tools, and should support multiple scales, i.e. detailed change at the local level within the framework of coarse-grained data sets. TerraVision already supported level-of-detail rendering of large terrain with draped image data, and 3D objects.

Tools like Google Earth and a fast Internet connection enable smooth zooms from 15,000 kilometres down to the ground surface. While resolution of orthophotos and satellite imagery is still increasing, this progress is

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of limited advantage when it comes into the local level, e.g. at "tree-by-tree scale" (ORLAND 1992), first- or third-person-view. In 2006, Microsoft announced a 16 times increase in terrain detail of Flight Simulator X compared to the previous version. In Flight Simulator 2004, 256 x 256 pixel covered 1 square kilometre of terrain, i.e. a resolution of roughly 4 meters per pixel. In a blog [6] the difference is described as the difference between "wearing glasses and not wearing glasses". Nevertheless, the blogger concludes "… that the future doesn't lay in increased texture resolution, but rather in increased 3D res: Rather than making the flat have more pixels, lets see more 'vertical' polygons". These 'vertical' or truly 3D objects are especially landscape elements (ERVIN 2001) like structures (including architecture and infrastructure), animals and people, and vegetation but also waterfalls, and atmosphere.

Nonetheless, Microsoft's Virtual Earth initiative aims to establish an aerial photo based geo database of the global land area with 144 m km2 and a resolution of 15 cm, which will require about 22 PetaBytes of storage (Franz Leberl, Microsoft-Vexcel, pers. comm. March 28, 2007). This number is still beyond our imagination. Anyhow it is an (very large, delayed) aerial photography of the world. It will neither show a forest's understorey nor permit a glimpse of the future.

In a survey of APPLETON and LOVETT (2003), searching for a level of realism for visualisations of rural landscapes that is "sufficient" for environmental decision-making, one respondent suggested that there might be a "lowest common denominator" effect, whereby the low-detail elements distract from or appear inconsistent to the rest of the image. Their findings do not show evidence of a sufficient level of realism, but they do reveal that, depending on the scenery, some elements are more important than others, e.g. foreground vegetation and the appearance of the ground surface have a significant effect on the ratings for realism of landscape visualisations.

A greater degree of detail can call into question the accuracy and validity of the basic data and the assumed planning scale of e.g. 1:10,000 (PAAR et al. 2004, PAAR and REKITTKE, 2005). In particular, photo-realistic visualisations from eye-level view, that are based on typical environmental and planning data, are coming into conflict with conventional scales used for representation of community landscaping. ERVIN (2001, p. 62) writing about abstraction, states that "(...) we landscape modelers must also remember the valuable roles of abstraction in both cognition and communication, and not believe that 'photo-realism' – or even 'physical realism' – is the be-all, end-all of digital modeling. We make models to make explorations or to convey messages, and the infinite variety of explorations and messages will surely yield an equally boundless variety of digital landscape models".

4 LANDSCAPE VISUALISATION ON LOCAL AND GLOBAL SCALE

While architects, landscape architects and urban planners construct 3D models as a matter of routine, landscape and environmental planners in practice have relied on abstract, two-dimensional representations (LANGE 1999). In the history of landscape architecture, REPTON (1803) may be regarded as an exception and early pioneer in the area of landscape visualisation (LANGE, 2001). In his 'Red Books', he invented a technique of perspective representation for landscape designs that is not dissimilar to current digital methods.

In landscape and urban planning, public participation, interactivity, and virtual reality become more and more an issue. At present, landscape visualisations seem to have been widely adopted for use in the assessment of controversial or large-scale projects, for simulating landscape changes, and for research purposes (PAAR, 2006). HAKLAY (2002) surveyed the number of research projects worldwide in the field of GIS and virtual reality (VR) between 1993 an 1998. He found that there was a rapid increase in 1994 and a steady increase through to 1998, after which there was a sharp decrease. Haklay attributed this decline to the integration of VR into standard software, which reduced the justification for specialized research projects. Conventional VR models and infrastructure have been too expensive to use in ordinary planning processes. In practice, landscape visualisations have, up until now, primarily been used to present, explain and market landscape planning scenarios, rather than being used to provide a meaningful contribution towards improving final results (ORLAND, 1992, LANGE, 1999, PAAR, 2006).

[6] http://blogs.technet.com/pixelpoke/archive/2006/01/21/417847.aspx [site visited on March 19, 2007]

Real-time virtual 3D landscapes represent communication tools that allow experts as well as non-experts to use, explore, analyse, and understand landscape information (V. HAAREN and WARREN-KRETZSCHMAR, 2006).

TRESS and TRESS (2003), summarising a case study of scenario visualisation for participatory landscape planning, point out: "It would be ideal to have a powerful and photo-realistic GIS-based visualization tool with dynamic characteristics that would show landscape from the perspective of a moving observer" (p. 173). APPLETON et al. (2002) conclude that there is no "universal landscape visualisation solution", and that current technology forces users to make trade-offs in detail and interactivity. They see a market gap for a visualisation tool that can be used in combination with GIS, and predict that future visualisation technology will move towards the combined goals of availability, geographic detail, realism and interactivity. ERVIN (2001) remarks that digital landscape models are often homogenized to a degree that was once necessary due to technical limitations but is no longer required.

Two years ago, we asked ourselves what would be the maximum extent of a landscape and therefore the basic terrain model? To the horizon? But what if free navigation is permited? Then the user will somewhere arrive to finis terrae. The curvature of the earth is usually irrelevant from first person (eye level) view landscape perception apart from application in visibility analyses, e.g. for (off-shore) wind turbines. However, what if I like to navigate from one landscape to the neighbouring? It is the notion of spatial context, the surrounding of a site, which is essential for orientation, and assessment of a project.

Specialised landscape software such as E-on Software Vue, Planetside Software Terragen 2 or 3D Nature Visual Nature Studio (VNS) enable 3D modelling of existent or non-existent landscapes aiming to provide photorealism, rendered offline both as still images or animations. VNS supports GIS data, and even the curvature of the earth but lacks real-time rendering. 3D Nature's NatureView Express viewer offers real-time capability on a lower level of detail.

As most landscapes are covered with vegetation, the representation of plants and vegetation is a prerequisite for realistic visual simulations of landscape sceneries. In 2000, German practice of landscape architecture and environmental planning was dissatisfied with the quality of visualisation of plants and habitats provided by the available software and convincing representations of plants and habitats were the feature most demanded from the next generation of landscape visualisation systems (PAAR, 2003, 2006).

REKITTKE and PAAR (2006) emphasise on the unique, fascinating and complex potential of vegetation as a landscape design element. It "(…) becomes overwhelmingly apparent as soon as one tries to create digital models of vegetation, especially when the aim is to replicate as nearly as possible the mosaic structure, distribution and forms of actual natural herb vegetation communities."

5 BIOSPHERE3D

The interactive landscape visualisation system Biosphere3D is focussing on real-time rendering of vegetation in different scales. Main target scale of the predecessor Lenné3D-Player was visualizing landscape from an eye-level perspective enabling to wander through the planned or predicted landscape (WERNER et al. 2005). Biosphere3D supports multiple scales on a virtual globe reflecting our thoughts on the maximum extent of a landscape. Unlimited terrain can be visualized due to the spherical terrain model and the efficient data management (CLASEN and HEGE 2007, 2006). Satellite images (fig. 4), raster digital elevation models (DEM), and aerial views (fig. 6) of multiple terabyte can be combined with vegetation plots based on vector shapes (fig. 7) and biological sample data to create photorealistic views, e.g. of planned scenarios and reconstructed historical gardens (fig. 8, rendered with Lenné3D-Player). Since no pre-calculation is required, the data can be edited and reloaded to enable quick development cycles and semi-interactive participation processes. Biosphere3D is compatible to Lenné3D's plant models, permitting access to one of the largest databases of realistic 3D plants (REKITTKE and PAAR, 2006).

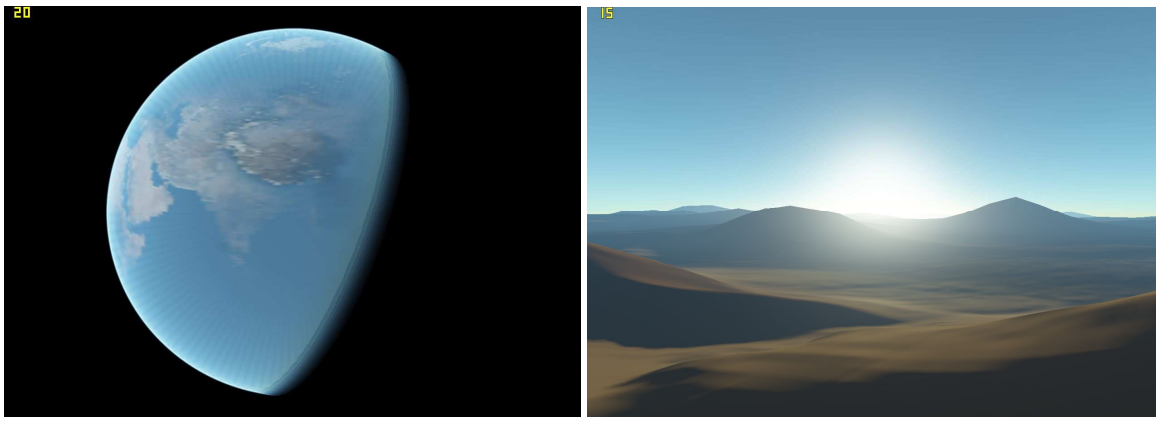

Figure 4+5: Planet Earth from outer space at sunset in Asia; virtual sunrise over the Andes (screenshots: Biosphere3D, 2006; data: NASA SRTM and Blue-Marble)

Figure 6+7: Landscape in Germany; at eye-level planting trees (screenshots: Biosphere3D, 2006; data: NASA SRTM and Blue-Marble, LGN orthophoto, Lenné3D Flora3D trees)

Figure 8: Pot Marigold (Calendula officinalis) in a garden (screenshot: Lenné3D-Player, Flora3D plant models, 2006)

Habitat and land-use data provide the basis for Lenné3D's vegetation modelling; the input of further geographical data allows automatic generation of plant distribution maps (RÖHRICHT 2005). Three-dimensional plant models are assigned to the distribution map and positioned on the terrain model.

The current alpha version supports the following import formats:

- ERMapper Compressed Wavelets Raster (.ecw)
- ESRI Shapefile (.shp)
- Lenné3D ASCII Ecofile (.eco)
- Lenné3D Flora3D plant files (.flora3d)

Support for 3D objects in COLLADA format (.dae), and KML file format (.kml/.kmz), best known as the geographic interchange and XML based format of the client component of Google Earth, are scheduled for the first beta release in June 2007.

Hardware requirements are moderate: a standard dual core PC with 1-2 GB of RAM and a consumer GPU supporting OpenGL 2.0 are adequate to run the system. Graphics quality and performance will benefit from more cores, more RAM, and faster GPUs.

5.1 LINKING WITH SIMULATION SYSTEMS

Biosphere3D itself is a pure visualisation system. User interaction is currently limited to the rendering settings such as camera position. However, this is no limitation but a design decision: There are many different kinds of applications where Biosphere3D can be used, so if all possible interactions would be integrated in the base system, it would be unnecessary hard to understand and maintain. Therefore, it has been engineered to be used with higher application layers that provide this interactivity. In fact, the data structures used by Biosphere3D require no pre-processing step; so all data can be modified on the fly with minimal turn around times.

One such application could be a forestry simulation tool where the forester can interactively decide which trees is to cut down while the forest develops over time. If Biosphere3D is used for visualisation, there are three interfaces to the application: First, the current forest has to be transferred to Biosphere3D. Second, the user should be able to select trees in the 3D view. Biosphere3D has to report which tree is visible for a given coordinate in the generated image. Third, the application should be able to modify the rendering settings of individual plants to allow highlighting of selected trees.

Figure 9: Forest stand visualisation calculated by the interactive thinning simulator JTragic (HAUHS et al. 2001; screenshot: Biosphere3D, Flora3D tree models, 2007)

If the simulation tool has a front-end that allows replacing the renderer, then Biosphere3D can be integrated as a library. The front-end has to provide an OpenGL window and handle all user commands, just as it does stand-alone. Biosphere3D exposes its domain model where the tool developer select the necessary components from, for example a class that contains individual plant instances as opposed to a class that deals with vegetation plots. Combining a few of these components creates the visualisation. Each component has an interface for direct manipulation, such as adding or removing single trees. Dynamic highlighting can be implemented by creating a second tree container with different render settings and moving instances between them.

If the simulation tool has no reusable front-end, then programmers can extend Biosphere3D's viewer (fig. 9). The viewer already provides basic support for rendering and user navigation. Linking a simulator to Biosphere3D requires at first to determine the best way to transfer the data. Many simulators support reading and writing files. Based on this, programmers can write the current state to a compatible file, call the simulator as an external process, wait for it to finish and read back the resulting data. This limits time dependent interaction to time slices. Either the user says how long the simulator should run before he wants to interact again, or the simulator runs in fixed slices so that the user can decide every virtual month whether he wants to cut down anything or not. The specific interaction has to be implemented in the viewer. Working with simulators that provide database access or web services is similar, although these have the ability to run parallel to the front-end. However, this game-like kind of interaction is rare in professional simulators.

6 DISCUSSION

In his speech, AL GORE (1998) closely predicted the recent and ongoing Digital Earth developments: "Obviously, no one organization in government, industry or academia could undertake such a project. Like the World Wide Web, it would require the grassroots efforts of hundreds of thousands of individuals, companies, university researchers, and government organizations. Although some of the data for the Digital Earth would be in the public domain, it might also become a digital marketplace for companies selling a vast array of commercial imagery and value-added information services. It could also become a 'collaboratory' — a laboratory without walls for research scientists seeking to understand the complex interaction between humanity and our environment."

Technology has reached a point where scientists and planners are enabled to use sophisticated visualisation tools, and reach a wide audience. Google Earth found its way to our desktops and it is an exiting and inspiring tool to explore planet earth. Scientists, organisations like NASA are contributing and sharing content on Google Earth.

The raw potential of landscape visualisation continues to accelerate. It is fascinating, but also a good time for a critical reflection of the hype. The possibility to have high-class visualisations is no guarantee for an implementation of the planned landscape. The fundamental issues to be addressed with every visualisation in planning come to the fore: Whom is the visualisation aimed at? What should be shown? What is fundamentally important? What is less relevant? (REKITTKE and PAAR, 2005). ERVIN is clear about the fact that the means must necessarily be derived from the end goal: "[...] there is never a single correct answer to any of the many representational and abstraction problems [...], and so reference to the questions: "What is the purpose?", and "What is the question?", is an important touchstone for understanding visualization tasks and evaluating representations" (2004). Accurate and carefully chosen visualisations support the dialogue on community landscape planning and decision-making.

Current technological developments within computer graphics, videogames, and 3D GIS will certainly assist 3D landscape visualisation tools in fulfilling the specific requirements of landscape planners and environmental managers. ERVIN (2001) recommends that research and development of landscape modeling should be carried out in close cooperation with computer scientists. REKITTKE (2002, p. 121) argues that the profession of landscape planning "(…) must be prepared to keep up to date with current developments in the field of digital technology and, if necessary, develop solutions tailored to its needs". BISHOP et al. (2001) state that we should have our thinking on the application of virtual reality technology to experimental landscape research attuned to the next set of opportunities, not to the past set of constraints. Currently, and this is also true for Biosphere3D, the sheer number of plants of realistic densities still pose a problem for real-time visual simulations. Nevertheless, visual (photo-) realism can save on plant densities almost without visible artefacts. The seamless transition from foreground to middleground, and aerial view to "tree-by-tree scale" remains a task for further research in computer graphics.

Biosphere3D bypasses large, non-freely available datasets of satellite and aerial imagery concentrating on high "vertical resolution", e.g. 3D plant models. Users can add their own or licenced geo data.

7 CONCLUSION AND OUTLOOK

Interactive landscape visualisations on Digital Earth have the potential to be developed into a perceptually efficacious, somehow 'natural' user interface in landscape planning processes. Planners and landscape architects will publish their projects 'on earth' addressing stakeholders and the general public. Currently,

mainstream tools and media like Google Earth already offer an easy and wide access to Internet users. Still, the 'digital tool box' lacks support for professional landscape planning processes, and state-of-the-art representation of vegetation.

Second Life is the most hyped of several new virtual reality platforms based on a metaverse concept, a parallel world where users interact as avatars with each other, that uses the metaphor of the real world without its physical limitations, but with a lot of real-life problems and hiccups. These concepts are sociologically and psychologically very interesting, but we doubt that a metaverse landscape is the right platform for real life planners and planning processes. STEINS (2007) compares planning in Second Life as a bit like being in the 19th century, when businesses and the wealthy controlled development." Currently with look and the aesthics of 1990ies computer graphics. Steins thinks, that it "(...) may not be long before we begin to see community design review meetings that take place in a virtual environment like Second Life."

Certainly Digital Earth will evolve, get more community features, links to sensors, and extensions. Hopefully, we don't have to hurry up for our 'claims' with a monthly fee for virtual landowners. Here, fantastic 'metaverses' have the advantage that space (e.g. islands) is theoretically an unlimited resource while space on earth, maybe even on a digital one, is becoming precious. However, 'Google Ads', georeferenced, will conduct us through the digital marketplace, while 'geo spam' might obstruct our view.
Since Biosphere3D shall become open source in mid 2007, it will be available for any kind of application at no cost. We are focussing on collaboration with academic research and teaching. Zuse Institute Berlin (ZIB), the company Lenné3D GmbH, and Leibniz-Centre for Agricultural Research (ZALF) are engaged with the development. ZIB and ZALF are currently developing several modules and using the system to visualize forests in the project SILVISIO funded by the German Federal Ministry of Education and Research.

8 PUBLICATIONS

APPLETON, K. & A. LOVETT: GIS-based visualisation of rural landscapes: defining "sufficient" realism for environmental decision-making; Landscape and Urban Planning 65, pp. 117-131, 2003.

APPLETON, K.; LOVETT, A.; SÜNNENBERG, G. & T. DOCKERTY: Rural landscape visualisation from GIS databases: a comparison of approaches, options and problems. Computers, Environment and Urban Systems, 26, pp.141-162, 2002.

BISHOP, I.D.; YE, W.-S., & C. Karadaglis: Experiential approaches to perception response in virtual worlds. Landscape and Urban Planning, 54, pp. 115-123, 2001.

CLASEN, M. & H.-C. HEGE: Clipmap-based Terrain Data Synthesis, SimVis 2007, 14 pp., 2007.

CLASEN, M. & H.-C. HEGE: Terrain Rendering using Spherical Clipmaps. Eurographics/ IEEE-VGTC Symposium on Visualization 2006, 9 pp, 2006.

ERVIN, S.M.: Digital landscape modeling and visualization: a research agenda. Landscape and Urban Planning, 54, pp. 49-62, 2001.

GORE, A.: The Digital Earth: Understanding Our Planet in the 21st Century. The Digital Earth Vision. Speech of the US Vice President given at the California Science Center, Los Angeles, California, on January 31, 1998. URL http://www.isde5.org/al_gore_speech.htm [site visited on March 19, 2007]

V. HAAREN, C. & B. WARREN-KRETZSCHMAR,: The interactive landscape plan - Use and benefits of new technologies in landscape planning, including initial results of the interactive Landscape plan Koenigslutter am Elm, Germany. Landscape Research 31 (1): 83-105, 2006.

HAKLAY, M.E.: Virtual reality and GIS. Applications, trends and directions. -in: Fisher, P. & D. Unwin (Eds.), Virtual Reality in Geography. London, New York: Taylor & Francis, pp. 47-57, 2002.

HAUHS, M; LANGE, H. & A. KASTNER-MARESCH: Complexity and simplicity in Ecosystems: The case of forest management, InterJournal for Complex Systems, 415, 1-8, 2001.

LANGE, E.: The limits of realism: perceptions of virtual landscapes. Landscape and Urban Planning, 54, pp. 163-182, 2001.

LANGE, E.: Realität und computergestützte visuelle Simulation. Eine empirische Untersuchung über den Realitätsgrad virtueller Landschaften am Beispiel des Talraums Brunnen/ Schwyz. ORL-Berichte, 106. Zürich: VDF, 1999.

MAYER, P.; A. SCHMIDT, A.; SAUTER, J. & G. GRÜNEIS (Inventors): Method and device for pictorial representation of space-related data. United States Patent, Patent No. 6,100,897, Art+Com (Assignee), 1996.

MAYER, P.; A. SCHMIDT, A.; SAUTER, J. & G. GRÜNEIS (Anmelder): Verfahren und Vorrichtung zur bildlichen Darstellung raumbezogener Daten. Deutsches Patentamt, Patent DE19549306A1, Art+Com (Anmelder), 1995.

ORLAND, B.: Data visualization techniques in environmental management: a consolidated research agenda; Landscape and Urban Planning 21, pp. 241-244, 1992.

PAAR, P. & J. REKITTKE: Lenné3D – Walk-through Visualization of Planned Landscapes; -in: Bishop, I.D. & E. Lange (eds.), Visualization in landscape and environmental planning, Spon Press, London, pp. 152-162, 2005.

PAAR, P.: Landscape visualizations: Applications and requirements of 3D visualization software for environmental planning. Computers, Environment and Urban Systems, Elsevier, 30, pp. 815-839, 2006.

PAAR, P.: Lenné3D - The Making of a New Landscape Visualization System: From Requirements Analysis and Feasibility Survey towards Prototyping. -in: Buhmann, E. & S. Ervin (Eds.), Trends in Landscape Modeling, Proc. at Anhalt University of Applied Sciences. Heidelberg: Wichmann, pp. 78-84, 2003.

PAAR, P., O. SCHROTH, U. WISSEN, E. LANGE & W.A. SCHMID: Steckt der Teufel im Detail? Eignung unterschiedlicher Detailgrade von 3D-Landschaftsvisualisierung für Bürgerbeteiligung und Entscheidungsunterstützung. CORP 2004, TU Wien, pp. 535-541, 2004.

REKITTKE, J. (2002): Drag and Drop - The Compatibility of Existing Landscape Theories and New Virtual Landscapes. In E. Buhmann, U. Nothelfer, & M. Pietsch (Eds.), Trends in GIS and Virtualization in Environmental Planning and Design. Proc. at Anhalt University of Applied Sciences. Heidelberg: Wichmann, pp. 110–123, 2002.

REKITTKE, J. & P. PAAR: Enlightenment Approaches for Digital Absolutism – Diplomatic Steping-Stones Between the Real and the Envisioned. –in: Buhmann, E., Paar, P., Bishop, I.D. & E. Lange (eds.), Trends in Real-time Visualization and Participation, Proc. at Anhalt University of Applied Sciences, Heidelberg, Wichmann, pp. 210-224, 2005.

REKITTKE, R. & P. PAAR: Digital Botany. Thinking Eye. Journal of Landscape Architecture, 2: 12 pp. & Cover, 2006.

REPTON, H.: Observations on the theory and practice of landscape gardening: including some remarks on Grecian and Gothic architecture. Taylor, London; Phaidon, Oxfort (facs.), 1803.

RÖHRICHT, W.: oik – nulla vita sine dispensatio. Vegetation Modelling for Landscape Planning. In: Buhmann, E., P. Paar, I.D. Bishop & E. Lange (Eds.), Trends in Real-time Visualization and Participation, Proc. at Anhalt University of Applied Sciences, Wichmann, Heidelberg, pp. 256–262, 2005.

STEINS, C.: Does Planning Matter In A Virtual World? Planning magazine, American Planning Association, January, 2007. URL: http://www.urbaninsight.com/virtual/2ndlife0307.html[site visited on April 05, 2007]

TRESS, B. & G. TRESS: Scenario visualization for participatory landscape planning – a study from Denmark. Landscape and Urban Planning, 64, pp. 161–178, 2003.

WERNER, A.; DEUSSEN, O.; DÖLLNER, J.; HEGE, H.-C.; PAAR, P. & J. REKITTKE: Lenné3D – Walking through Landscape Plans; -in: Buhmann, E., Paar, P., Bishop, I.D. & E. Lange (eds.), Trends in Real-time Visualization and Participation, Proc. at Anhalt University of Applied Sciences, Heidelberg, Wichmann, S. 48-59, 2005.

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Airports as Centers of Economic Activity: Empirical Evidence from Three US Metropolitan Areas

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1 INTRODUCTION

In terms of gross area, Schiphol Airport in The Netherlands is larger than the extended historic center of nearby Amsterdam and the Dallas-Forth Worth Airport in Texas is larger than the island of Manhattan. These two, of many similar, seemingly strange empirical realities conjure up the possibility of radically altering common images and perceptions of region-wide spatial structure and/or understandings of spatial economic organization. Airports and their surrounding areas are emerging as major nodes of economic activity in the 21st century metropolis. This paper focuses on identifying and measuring theoretically driven elements of airport focused or airport centered economic activity.

The emergence of airports as centers of economic activity should not be surprising. Garreau (1991) designated airports and the economic activity around them as "edge cities" in thirteen of thirty six American metropolitan areas he studied. At the metropolitan scale, Giuliano and Small (1991) identified five airport areas as significant employment nodes among a total set of thirty two. Tsamboulas and Dimitropoulos (1999) examined the role of "freight villages" in the European context. More recently, Kasarda (2006, 2001, 2000) coined the term "aerotropolis" to characterize the potential of these airport centered agglomerations. While aerotropoli are compelling notions from the normative or planning viewpoint, less clear are both theoretical considerations and empirical calibrations of what is happening on the ground in and around these airport centers. For example, are these nodes of activity simply concentrations or are they the design of purposeful economic clustering strategies? The purpose of this paper is to begin to examine this question from both a theoretical (based on the twin notions of polycentric metropolitan forms and economic cluster theory) and empirical (based on case study evidence of selected airport centered economic concentrations) basis.

This paper is organized as follows. The next section briefly outlines underlying concepts of polycentric metropolitan form and economic cluster theory, concluding with identification of a set of issues to be explored in terms of airport centered or focused economic agglomerations. In consideration of these gaps, the research problem focuses on the empirical assessment of major airports in three US metropolitan areas – Atlanta, Dallas, and Memphis. Results and analysis are followed by several overall conclusions and speculations about the both urban form and areas of further study.

2 URBAN FORM, ECONOMIC CLUSTERS, AND AIRPORTS

Three interrelated streams of research seem fruitful in thinking about the character of economic activity at and around airports. The first focuses on concepts and issues of polycentric metropolitan form. The second focuses on concepts and assertions from economic clustering theory. The third focuses on the role of airports and air transport within the overall global economy.

2.1 Polycentric Metropolitan Morphologies, Edge Cities, and Aerotropoli

The first theme is polycentric metropolitan form and/or morphology. Polycentricity as a feature is used in two distinct ways. In the European context, polycentricity describes systems of independent cities that are interrelated (usually in a networked organization), the Rhine-Ruhr area being perhaps the dominant image (CENTROPE in Central Europe is an emerging polycentric region). Within North American and perhaps the UK, polycentricity is a feature of the metropolitan region (or city-region). It focuses on multiple centers within a continuously built up urban fabric. The basic dynamic is that as urban places grow into metropolitan complexes the domination of the old core as the primary generator of regional wealth is replaced by a polycentric morphology composed of many centers each contributing to regional growth and wealth.

Although multiple centers have existed in metropolitan regions for a long time (Harris and Ullman, 1945), the beginning of popular study of them is normally attributed to Garreau's (1991) Edge Cities. Garreau not only generated the specific phrase "edge city" but attempted to provide a precise definition: (a) five million square feet or more of leasable office space – the workplace of the Information Age; (b) 600,000 square feet

of leasable retail space; (c) more jobs than bedrooms; (d) is perceived by the population as one place; and (e) was nothing like "city" as recently as thirty years ago (1991, p 6-7). Each criterion could provide a basis for analysis; and some, such as "perceived as one place" could be equated with the branding of locational attributes, a dominant feature of development planning in the late 20th / early 21st century. Giuliani and Small (1991) identified five different kinds of centers in their study of Los Angeles: specialized manufacturing; mixed industrial (one is actually labeled LAX); mixed services; specialized entertainment; and specialized services. Significantly, airports ranked 5th, 6th, 14th, 17th and 18th in terms of employment. Bingham and Kimble (1995) reported similar patterns of differences among "edge cities" around six Ohio cities. McMillen and Smith (2003) and Bogart (2006) apply trade theory and notions of competitive advantage and mutual dependency to characterize subcenters. This literature is satisfactorily reviewed by Sarzynski et al. (2005). Within this mostly economic-driven literature, little attention is given to multi-nodal physical form (Jacobs, 2001) or internal physical morphology of places (Scheer and Petkov 1998).

Kasarda's (2000) aerotropolis is a specific version of the edge city or center within a polycentric spatial structure. His brief definition of aerotropolis is that it is a new urban form comprising aviation-intensive businesses and related enterprises extending up to 25 km outward from major airports.

2.2 Economic Cluster Theory

The second stream of research that seems relevant is economic cluster theory. Economic cluster theory is in vogue both among policy makers and spatial economic researchers, right up there with "creative economies," "IT knowledge networks" and "branding." Two attributes of cluster theory are particularly important. First, that "clustering" is normatively the (only) mechanism that could guarantee economic success. Notice that a cluster does not necessarily guarantee economic success, but success cannot be achieved with out clustering. Second, that there is NOT a direct correlation between "concentration of economic activity" and "economic cluster." Magnitude of employment in a specific place may or may not be for example a competitive arrangement but simply co-location of activities. The case of a declining shopping center is sufficient to make the point.

Three cluster theorists provide guidance for how to know and measure the existence and value of a set of economic activities. Porter's industrial cluster theory (2002) and its application to urban areas (1995) appear most appropriate for the design of new cluster. Yet clusters are more than unsubstantiated policy tools and can be empirically verified. At the evaluation level, Van den Berg et al. (2001) provides a clear set of intuitive criteria to assess existing and emerging clusters. Focusing on different sectors (cultural, electronics, telecommunications, health, media, and tourism), Van den Berg et al. lay out three broad potential criteria. They, and their components, include: (1) spatial economic conditions (strong local demand, intra- and inter-regional accessibility, quality of life, and 'cultware'); (2) cluster specific conditions (initial size and development, cluster engines, strategic interaction, and level of new firm formation); and (3) organizing capacity (strong shared vision, political/social support, and public-private partnerships). Mommaas (2004) is concerned with "place-based (cultural) development." Although not comparable on the surface, emphasis on "place" make the arguments somewhat general. Mommaas' criteria to evaluate clusters include: horizontal aspects; vertical aspects; internal organization factors; external organizational factors; integration and/or openness; specific development paths; and spatial organization. These are all recognizable terms in the language of agglomeration and urbanization economics (cf. Bogart, 1998). Mommaas then examines these criteria in terms of five attributes of overall development practice including: (1) strengthening the identity, attraction power and market position of places; (2) stimulating a more 'entrepreneurial approach, (3) stimulating innovation and creativity, (4) finding a new use for old buildings and derelict sites, and (5) stimulating cultural diversity and cultural democracy.

2.3 Airports and the Fifth Wave

Kasarda and others are found of using the phrases "fifth wave of development" and "fifth wave of transport" to describe the relation of transport mode to city form. From ports to rivers to train to car to air, each mode of transport has severe implications for the movement of goods as well as for the territorial or morphological organization of space. So, just as Times Square in New York developed due to accessibility provided by numerous crossing subways, airports and their surrounding areas are developing as centers of metropolitan form. Burke (2004) has examined the overall impacts of airports in Europe.

At a global scale, Lindsay (2006) has produced a map that identifies aerotropoli in various stages of development from "existing" to "in development" to "planned" to "rudimentary." Eight are in Asia (one existing, six in development, and one planned), one each "in development" in the Middle East, Europe, and Latin America, and five (two planned and three rudimentary) in the US. The European aerotropolis "in development" is at Schiphol in The Netherlands.

2.4 Questions Raised About Airports as Centers of Economic Activity

The brief review suggests a number of concepts that need further elaboration. Foremost among them is the question of "concentration" versus "cluster" as a characterization of the economic activity around airports. Subcenter researchers typically focus on either total employment (as a percentage of regional workforce) to identify centers or on industrial employment distributions (to define functional differentiation). The "character" theme remains elusive, particularly if it is used to mean dynamic or mechanisms of internal organization of the places themselves. Moreover, the role and significance of the larger regional economy on what happens at the airport must be considered. Analysis of an airport center in a multi-scalar analysis would consider three levels of information: the regional economy, the economics of the center itself, and some discussion of its internal physical morphology.

3 RESEARCH PROBLEM AND METHODS

The objective of this paper is to begin to build a theoretically-informed (from polycentric urban form and economic cluster) understanding of the "character" of economic activity in and around airports. The intent is to provide, by executing a multi-scalar research design, some insight into the "concentration v. cluster" discussion as well as to, somewhat serendipitously, discover new questions. More specifically, the research problem focuses on developing case study material for the principal airport in three metropolitan areas in the US: Atlanta (population = approximately 5 million in 2005); Dallas (population = approximately 6 million in 2005); and Memphis (population = approximately 1.3 million in 2005). The choice of the US context is based on familiarity and data. The choice of specific airports is based partially on their early identification by Garreau as edge cities (Garreau had identified the Memphis airport as an edge city, the Hartsfield International Airport area in Atlanta as an "emerging one" and did not include DFW in Dallas at all); by Lindsay (2006) as aerotropoli in various stages of development (Dallas and Memphis being designated as "rudimentary"); by their general visibility in the world of airport and airport real estate organizations and publications; and, by what I thought were intuitive parallels between them and similar situations in Europe, to be elaborated in the conclusion.

The analysis begins, interestingly, from the air from where images of the metropolitan area and polycentric form are evident. Simple aerial images from Google Earth provide both an overview of regional form as well as the location of these airports. The aerial images and data layers from Google Earth provide the basis for choosing airport areas. This is accomplished at the scale of the zip code. The following rule is used: zip codes are "in" the airport area if they are at or adjacent to the airport or if it apparent from the air that they are part of a continuous band of development from the airport site.

National level agencies provide economic data at the zip code scale. Two sources are used. First, the Department of Labor's servlet (http://data.bls.gov/LOCATION_QUOTIENT/servlet/lqc.ControllerServlet) allows calculation of location quotients down to the metropolitan area and below. Location quotients (LQ) measure, somewhat crudely but effectively, the economic competitiveness of a particular industrial sector in a particular region (Peters, 2004). In this model, economic competitiveness is equated with importing wealth into the region. The second is County Business Patterns, a survey conducted annually in March for all non-government and non-self-employed individuals. In addition to providing overall establishments, employment and payroll, detailed data for number of firms and size distribution of firms is available for all industrial categories represented in the North American Industry Classification System (NAICS). These data are used to calculate and calibrate a number of features of the employment in an around airports. In particular, the overall size of the employment concentration (following the major analytical procedures outlined above) is counted, and particular attention is paid to the existence of large firms (after Van Den Berg et al). Size is reported as four levels, with emphasis being placed on the first three: very large (greater than 1000 employees), large (greater than 500 employees), medium (greater than 250 employees), and small. Interpretation is also focused on the particular distribution of firm types.

4 RESULTS AND ANALSIS

Results are presented in three stages. Reflecting the multi-scalar research design, the first stage assesses the employment structure of the three metropolitan regions. The second describes the economic "character" of the economic activity in the airport nodes. The final stage is a comparative analysis.

4.1 Some General Results at the Scale of the Metropolitan Region

The Atlanta region (formally the Atlanta-Sandy Springs-Marietta MSA) comprises a population of 4.92M in 2005 and total employment (non-government) of 1.932M in 2004. The major industrial sectors, defined in terms of total employment are administrative and support services (NAICS 561, 179,603 employees in 2004), food services and drinking places (NAICS 722, 169,496), and professional and technical services (NAICS 541, 147,261). All of these are typical urbanization economy sectors. Significantly below these are three other sectors with over 55,000 employees: merchant wholesalers for durable goods (80,228), ambulatory health care (72,331), and hospitals (59,860). Aside from healthcare (another urbanization economy sector), the importance of durable goods wholesalers portends insight into the regional economy. In terms of location quotients, thirty NAICS sectors have LQ's greater than 1. The ten most important import-potential sectors are, in order, air transportation (481), lessors of non-financial intangible assets (533), telecommunications (517), broadcasting, except Internet (518, this is the home of CNN), electronic markets and agents and brokers (425), couriers and messengers (492), merchant wholesalers for durable goods (423), publishing industries, except Internet (511), and textile product mills (314). Thus, in terms of clusters defined as horizontally similar industrial groups, the Atlanta metropolitan region could be characterized in terms of Transport and Communications, except Internet.

The Dallas region (formally the Dallas-Fort Worth-Arlington MSA) comprises a population of about 5.82M in 2005 and total employment (non-government) of 2,357,064. The major industrial sectors are administrative and support services (NAICS 561, 198,613), professional and technical services (NAICS 541, 163,002), ambulatory health care services (NAICS 621, 108,625) – all urbanization economy sectors. Below these are two others sectors with employment over 75,000: specialty trade contractors (NAICS 238-utilities, 97,823), and credit intermediation and related activities (86,094). Below these five are four other sectors with employment over 50,000: general merchandise stores (68,691), hospitals (62,587), insurance carriers and related activities (55,690), and computer and electronic product manufacture (NAICS 334, 51,849). In terms of location quotients, twenty sectors have LQ's greater than 1. The four most important sectors are air transportation (481, LQ=3.23), ISPs, search portals, and data processing (518, 2.36), postal service (491, 2.02), and computer and electronic product manufacturing (334, 1.86). Thus, in terms of clusters defined horizontally, the Dallas metropolitan region could be characterized in terms of Specialty Trade, Finance, and Computer Infrastructure and Computer and Electronic Product Manufacture

The Memphis region (formally the Memphis MSA) has a population of about 1.26M in 2005 and total employment (non-government) of 516,328 in 2004 – about one quarter the size of the Atlanta and about one fifth the size of the Dallas regional economies. The major industrial sectors are administrative and support services (NAICS 561, 50,259), hospitals (NAICS 622, 24,666), ambulatory health care services (NAICS 621, 22,808), merchant wholesalers for durable goods (NAICS 423, 19,487), and professional and technical services (NAICS 541, 19,487). Here, durable goods wholesalers are in the top group of industrial sectors. In terms of location quotients, twenty sectors have LQ's greater than 1. The five most important sectors are paper manufacturing (322, LQ=3.06), warehousing and storage (493, 2.83), beverage and tobacco product manufacturing (312, 1.97), support activities for transportation (488, 1.92), air transportation (481, 1.73), petroleum and coal products manufacturing (324, 1.51), and electrical equipment and appliance manufacturing (335, 1.50). Furthermore, the location quotient for water transportation (NAICS 483) is 1.46. The portrait of Memphis is as a transport center located in an urban manufacturing center.

Several similarities and differences emerge among the three regions. Clearly, the major similarities include the dominance of urbanization functions such as administrative and support services, health care, and professional services. The location quotient analysis provides a somewhat different picture (perhaps removing these urbanization functions) showing that Atlanta has perhaps the most diverse economy, that Dallas is a higher tech place, but that applications appear to be in the financial sector, and that Memphis is still primarily a manufacturing and service center. In all places, location quotients for transportation support (NAICS 488) and at least one other transportation related industrial sector are significantly above 1.

4.2 The Case Studies

4.2.1 Atlanta (Hartsfield-Jackson) International Airport and Economic Activity Around It

Hartsfield-Jackson Atlanta International Airport (ATL) is located south of downtown Atlanta. Measured in terms of passenger traffic and landings and take-offs (a somewhat spurious conjunction), it is the world's busiest airport since 2005. It is both within the southern city limits of Atlanta and the adjacent city of College Park in both Fulton and Clayton counties. The relative location of the airport to the major features of the Atlanta region and the zip codes that comprise the activity center are shown in Figures 1 and 2.

Figure 1. Location of ATL within Atlanta Region

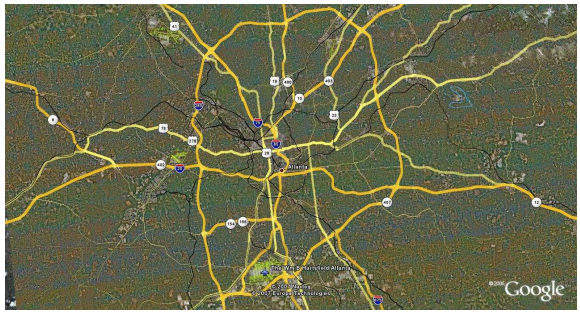

Figure 2. ATL Activity Node

Overall, the economic activity node at or near the Atlanta airport employs about 70,000 non-government employees or roughly 4.1% of the entire MSA non-government workforce. The economic activity is distributed among four different zip codes.

The largest sub-concentration of employees is located in Zip Code 30349 (employment > 23,000), located south and southwest from the airport. Here, there are eleven firms of significant size (employment > 250). There is one very large (employment > 1000) commercial bank and one large (employment > 500) lessor of non-financial intangible assets as well as two document preparation service firms. Two large transportation firms (air transport and support for rail transport) are located here. In addition, there are two manufacturing firms and two wholesale firms all involved in the food business. Finally, there is a religious organization. The second larges sub-concentration is located in Zip Code 30354 (employment > 20000), located to the northwest of the airport. Here, there are eighteen firms of significant size. Eight of them are directly involved in either direct transportation services (six of the eight) or courier services. Four others are presumably airport related – temporary agencies, travel agencies, and security services. Aside from these twelve, there are three manufacturing firms, two of which are involved in automobile manufacture, a real estate credit firm, and a very large computer systems design firm. Finally, there are two hotels.

The remaining two zip codes have fewer employees and fewer significant firms. There are nine sizable firms and 14,073 employees overall in Zip Code 30297, located southeast from the airport. The two large firms are a general freight trucking firm and an electrical utility. The remaining firms include three in the transportation (NAICS=48) sector and four are in the manufacture/wholesaling sectors. The firms in the transportation sector include general warehousing, a courier, and another general freight trucking firms. The two manufacturing firms include a bakery and manufacturer of polish. The wholesaling firms include groceries and automobile and other vehicle wholesaling. Zip code 30337, which includes the airport proper, has seven sizable large firms and an overall non-government employment of 8,000. The three large firms include a grocery warehouse, a professional distribution and logistics firm, and a school. The remaining sizable firms include soft drink manufacturer, an appliance repair shop, and two hotels.

Cluster or concentration? It appears that the economic activity at Atlanta is a concentration, but with possible cluster characteristics. There are clearly airport-sensitive or intensive industries. But there are also a number of firms involved in manufacture, warehousing, and wholesaling, particularly of food and food products. The co-location of food and food products at various stages on the supply chain to air transport is an area of future study. Moreover, the positive influence of the highway system makes inter-modal transfer efficient. The inter-modality of transport is a feature that all airports must develop, and is evident here in the preponderance of general freight trucking firms.

4.2.2 Dallas Airport and Economic Activity Around It

The Dallas-Fort Worth International Airport (DFW) is located between the cities of Dallas and Fort Worth, at the center of a triangle if one includes the Denton area. The airport is heavily marketed as a business location. In terms of land area, at nearly 18,000 acres, it is the largest airport in Texas, the second largest in the US, and fourth largest in the world. The airport crosses county boundaries and parts of it are located in four other cities.

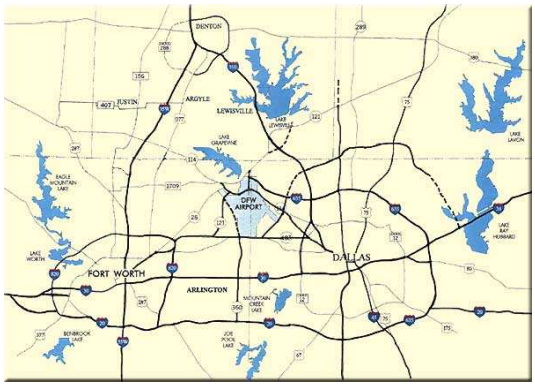

Figure 3. Location of DFW within Dallas Region

Figure 4. Dallas Airport

Overall, the economic activity node at or near the DFW airport employs about 105,184 in 2004 distributed among 3740 firms. This accounts for .04% of the entire metropolitan area employment. Economic activity is distributed over three zip codes, each of which is fairly sizable and each of which extends some distance from the airport, suggesting that the economic impact is "near" but not necessarily "at" the airport.

Zip Code 75038 – located to the southeast and including the northern edge of the City of Irving, has thirty six sizable firms with a total non-government employment of 33,078. There appear to be several industrial groupings in this location. First, there is a financial and information center composed of fifteen firms, including a large estate credit firm and a large wired telecommunication firm. Within this cluster are also a commercial bank, sales financing firm, title insurance, two property and casualty firms, a residential property management firm as well as two professional computer firms, one of which does custom programming. There is also four additional wired telecommunications firms and a directory/mailing list enterprise. Second, there are three manufacturing firms, including a very large manufacturer of analytical laboratory instruments and two others, one involved in semi-conductors and related devices and one involved in surgical appliances and supplies. Third, there is a jewelry node consisting of a jewelry wholesaler and a large retailing operation. Beyond these, there are six (two large) temporary help agencies, a large doctor's office, and one other service firm focusing on computer and office machine repair.

Zip code 75063 – to the northeast of DFW, has thirty two sizable firms and overall non-government employment of 46,082 in 1107 firms. The largest concentration of firms, nine, is in the finance sector, revolving around a very large real estate credit establishments in addition to three (one large) sales financing firms, a consumer lending firm, two loan brokers, a large property and casualty insurance, and a large third party administrator of insurance. There are three information firms, one each in wired telecommunications and in paging, and a large cable and other programming distribution firm. The four professional firms include a very large accounting firm, two custom computer programming and design firms, and a management general counsel firm. The zip code is home to two corporate, subsidiary, or regional headquarters. There is also a large drug and druggists' sundries warehousing firm. At the retail level, there is a large computer and software store and a big box warehouse club and super center. The lone large transportation firm is airport operations. The administrative support area is populated by a very large temporary employment agency, a large telemarketing firm, and two (one large) security firms. There are two educational institutions, one of which is a very large trade school. Finally, there is also a very large medical laboratory, a sports team, a single large hotel, and a very large firm engaged in other personal and household goods repair and manufacture.

Zip code 76051 is located in Tarrant County (on the Fort Worth side of the airport). Overall non-government employment in this zip code in 2004 was 26,024 in 1521 firms, twelve of which are sizable.. The economic activity here seems almost unrelated to airport operations. The very large firms include a wireless

communication company and a hospital. The only other large firm is a corporate, subsidiary or regional headquarter. The remaining firms include two manufacturers (concrete blocks and bricks, air conditioning for automobiles), three wholesale and retail firms of the big box variety (automobile dealerships, boat dealerships, and a furniture store). The real estate sector is represented by a car rental facility. Finally, there is another corporate, subsidiary, or regional headquarters, hotels, and a religious organization.

Cluster or Concentration? The economic activity around DFW (including portions of the city of Irving) appears to be a cluster based on finance, information, and associated computer programming and design. Other than this focus, the general pattern of employment is rather ordinary for an urban place. It is also clear that the economic activity has distinct spatial vectors to it, with the Dallas County area being more "creative" and "information technology" driven and the Tarrant County side being more service oriented. It is also clear that the economic activity is concentrated "near" the airport, but not necessarily "at" the airport.

4.2.3 Memphis Airport and Its Economic Activity

The airport(s) at Memphis are a special, but interesting, case. MEM is a public airport located south of the city of Memphis in Shelby County, Tennessee. It is Northwest Airlines' third-largest passenger hub, with many US routes and a daily nonstop flight to Amsterdam. However, its major fame is that is home to Federal Express' "super-hub." So much so, that combined with the United Parcel Services' third-largest sorting facility, MEM is the largest cargo airport in the world. This is clearly not explained by city size nor signature hub for a major carrier, but to weather conditions conducive (ideal?) for uninterrupted air service.

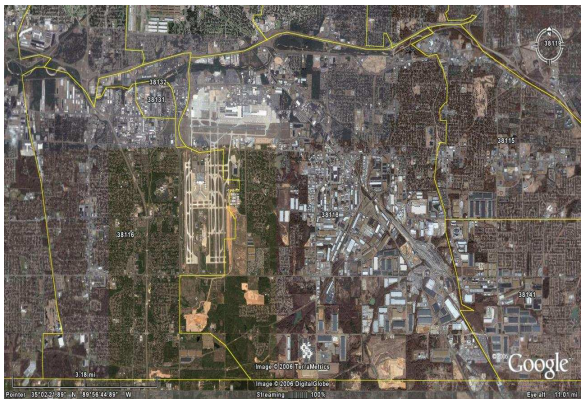

Figure 5. Location of MEM within Memphis Region

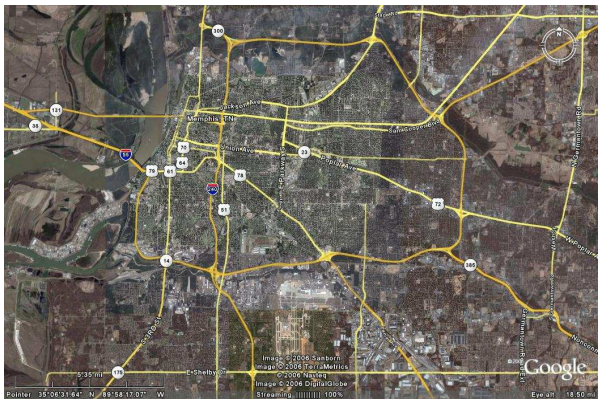

Figure 6. MEM Activity Node

Overall, the economic activity node at or near MEM employs over 105K and accounts for an astounding 20% of the entire non-government workforce in the metropolitan region. This number alone is worthy of signification. There are five zip codes in and around the Memphis airport complex.

Zip code 38118, located east of the airport, has thirty four sizable firms. Overall non-government employment in 2004 was 66,802 distributed over 1690 firms. Ten of these are in the transportation and warehousing sector. Two very large and three other courier firms are the backbone of this concentration, in addition to the three general freight firms and another that specializes in "arranging" freight. However, there is also a large commercial bank and a large accounting firm, located near large to very large six corporate, subsidiary, or regional headquarters. Not surprisingly, there are seven administrative support firms including four (one very large) temporary services firm, a solid waste collection company, a janitorial service company, and a facilities support firm. Beyond these transportation and office functions, there are two health care firms and two firms involved in computer and office machine repair and maintenance. Manufacturing is represented in the area by a brewery and a large coated paper manufacturer. Aside from a very large footwear wholesaler, there is a group of two grocery related firms – a large wholesaler and a large retailer. Zip code 38141 is located just southeast of 38118 and is part of the same economic node. It has overall non-government of 7,976 in 225 firms, seven of which are sizable. There is a large temporary services agency, two medical laboratories, three general warehousing facilitieis, and a soybeen processing firm.

To the west of the airport, Zip Code 38116 is home to nine sizable firms. Overall non-government employment in this zip code in 2004 was 24,557 in 976 firms. Visually, this looks like an area that developed prior to large scale expansion of the airport and the Federal Express arrival – it is focused on a major north-

south highway leading out of Memphis. Four of the sizable firms are in the transportation sector, with two very large firms (scheduled passenger service, general freight trucking), a large courier firm, and another general freight firm. In addition, there are two manufacturing firms, a very large one involved in surgical appliance and supply and another in commercial gravure. Aside from the almost ubiquitous temporary services agencies, there is a large hospital and a museum facility associated with a rock and roll star.

The third node of economic activity consists of two small (geographically) zip codes immediately northwest of the airport – 38131 and 38132 – that together have a non-government employment of 8,491 in 1,297 firms. There are no sizable firms in 38131 and four in 38132. These include a very large general freight firm and a large wholesaler of medical, dental and hospital equipment. The remaining sizable establishments are administrative support firms – a temporary services agency and a security firm.

Cluster or Concentration? In the two largest subareas, transportation and transportation related companies dominate the distribution of industrial types. But, the area also has six headquarters and a small focus on medical and medical related firms. All in all, probably a transportation cluster, with potential for increasing specialization in medically-related activities.

4.3 Some Comparative Findings

There are obvious similarities and differences. Among the similarities is the collection of airport or transport related firms – everything from the ugly (general freight) to the necessary (couriers and temporary service firms). These are most dominant in Memphis and least dominant in Dallas. There is also obvious differences, the most profound being the proportion of the regional workforce that is employed at or near the airport – from the 20% near Memphis to .04% in Dallas. In the remainder of this section, comments are focused along three lines of analysis: (a) locational characteristics viz. metropolitan area; (b) the character, sometimes surprising, of the economic activity; (c) some resolution about the cluster v. concentration issue.

In the case of the two larger cities, both sites are relatively interesting. Both cross jurisdictional boundaries and, at least from reading non-researched reports, are plagued by jurisdictional squabble. But, it is regional form attributes that are intriguing. From the air, the Dallas-Fort Worth region looks either like a triangle (if one includes Denton) or a dumbbell with a very strong bar (the transport spine) holding up two large masses (Dallas and Forth Worth). Along the bar of the dumbbell are several sizable cities, one (Las Colinas) built over the past twenty years. Including Denton in the image, DFW is the very center of the region. On the other hand, ATL is located at almost the southernmost point of the circular interstate system around the city of Atlanta. It is physically at the point of entry from the south – both southeast and southwest. From space, the spatial structure of the Atlanta region looks like a "-Y". The top of the Y are the northern points of the region and represent intersections of two major north south highways with the circular highway around the city, the v of the Y is downtown, and the bottom is ATL. The '-' to the west is an industrial zone through which a major highway runs and which contains another smaller airport.

The correlation of metropolitan region size and age of development also appears related to the types of activities found at or near the airport. DFW is the largest and the location of the airport newer; the opportunity to "start fresh" is apparent. ATL is partially dependent on its relation to the Interstate highway system. MEM is the result of good luck and good planning. It has turned into a specific economic development strategy and the principal employment site in the region.

However, it is the "character" of the economic activity nodes that is the major concern of this paper. Aside from the transport related activity, the analysis demonstrates several interesting features. Each has what appears to be a signature collection – communications in Atlanta, finance and computers in Dallas, and corporate headquarters in Memphis. But, there is also a very large food and food processing presence in both Atlanta and Memphis.

Finally, are these clusters or concentrations? Aside from the transport related activities – which seem more like a wealth creating cluster in Memphis and a service cluster in the other two – the only airport area that seems "cluster-like" as opposed to "concentration-like" is the finance and computer related activity in Dallas.

5 CONCLUSIONS AND SPECULATIONS

5.1 Conclusions

Many of the specific conclusions have been stated above. Here, key findings are reiterated in terms of a larger picture. First, it is clear that the economic activity around this collection of airports is not identical. The set of economic activities represent a blend of historic land use and economic features (the older highway corridor in Memphis, the Interstate System in Atlanta) and opportunities to start on fresh land (Dallas). Second, each airport is symbolically important in different ways. MEM is clearly the "heart and soul" of Memphis; the new sports arena is called the "Fed Ex" arena. And, third, while not related specifically to the data or analysis, there seem to be parallels and lessons from these airports to others throughout the world. The Dallas and Atlanta airports are major transfer points in passenger traffic – they serve a similar function as the several European hubs – Schiphol and Frankfurt being the major examples. On the other hand, the case of Memphis is similar to smaller cities that are seeking to capitalize on the fifth wave of transport by developing basically freight operations, similar to Verona and Bratislava.

5.2 Unintended "Findings" and Speculations

One unintended outcome of this exercise is that I stumbled on secondary, for lack of a better term, airports – and there were lots of them. Their size characteristics and spatial patterns intrigued me in light of the twin theoretical (polycentric metropolitan morphology and economic cluster theory) considerations used. The case of Dallas is most illustrative. DFW is centered on a pattern of smaller airports that, from space, form almost a perfect hexagon around it. Two of these (Love Field in Dallas and Alliance in Fort Worth) are major freight centers (one is now – the former major airfield in the region, one is planned to become) and they are on opposite sides of the metropolitan region. The remaining are general purpose smaller airports. Even below this level are a series of smaller municipal airfields. In Atlanta, there a fewer airports, but the one that caught my attention was the one in the '-' industrial district southwest of downtown. The spine of this area is the Fulton Industrial Highway, located interestingly where Fulton, Cobb and Douglas counties converge. The area if contained mostly within zip code 30336, which has non-governmental employment of over 25,000 and fourteen sizable firms among its 629. The makeup of this area is very similar to that found around ATL -- the largest firms are transportation and wholesaling firms. On the other hand, smaller markets, such as Memphis, do not appear to have as many minor airports. So, the question to be asked and evaluated further goes something like this: is there a hierarchy of airports within a region and does this hierarchy manifest itself is spatially regular ways? Is there a rank-size rule between the size of a metropolitan region and the number of airports?

Second, although jurisdictional and land use issues are clearly beyond the scope of this analysis, I do find it interesting that both Atlanta and Dallas are built on lands of more than one place. This aspect of airport development clearly begs further work.

Finally, the aerotropolis literature is almost as annoying as other normative literatures in their reliance on the notion that the metaphor will yield positive economic benefits. A quick read of this literature suggests that aerotropoli will save Detroit and transform Bela Horizonte the transportation hub of South America. More realistic accounts of the importance and impact of airport centered economic engines are found in Rondinelli (2004) and Hanley (2004). Simply put, branding needs to be accompanied by realistic economic assessments. Yet, it is apparent that the economic activity in and around airports are serious economic engines. The case of Memphis is illustrative. While certain elements of the Memphis intelligentsia are marketing it – via the Memphis Manifesto – as a creative city, it is clear that the real Memphis is encapsulated by activities at the airport. Other cities face similar quandaries. The lovely city of Verona, Italy is known for Romeo and Juliet and its first century Coliseum, yet I suspect that the economic engine of Verona is the Quadrante Europa "freight village" at the airport focused on agricultural and food products. Aerotropoli help, but the region will always be more than just it!

6 REFERENCES

BINGHAM, R.D. & D. KIMBLE. The Industrial Composition of Edge Cities and Downtowns: The New Urban Reality; Economic Development Quarterly, 9:259-272, 1996.

BOGART, W.T. Don't Call It Sprawl. Metropolitan Structure in the Twentieth First Century; New York: Cambridge, 2006

BOGART, W.T. The Economics of Cities and Suburbs; Upper Saddle River, NJ: Prentice Hall, 1998.

BURKE, J. The Social and Economic Impacts of Airports in Europe. ACI-EUROPE, 2004
GARREAU, J. Edge Cities. Life on the New Frontier; New York: Doubleday, 1991.
GIULIANO, G. & K. SMALL. Subcenters in the Los Angeles Region; Regional Science and Urban Economics, 21: 163-182, 1991.
HANLEY, R.E. Moving People, Goods, and Information in the 21st Century: the Cutting Edge Infrastructures of Networked Cities; New York, Routledge, 2004.
HARRIS, C.D. & E.L. ULLMAN. The Nature of Cities; Annals of the American Academy of Political and Social Science, 242:7-17, 1945.
JACOBS, M. 2001.. Multinodal Urban Structures: A Comparative Analysis and Strategies for Design (Transformations, 3). Delft University Press.
KASARDA, J. The Rise of the Aerotropolis; The Next American City. 10, 2006.
KASARDA, J.D. Logistics and the Rise of the Aerotropolis; Real Estate Issues. 25:43-48, 2001
KASARDA, J.D. Aerotropolis: Airport-Driven Urban Development; ULI on the Future: Cities in the 21st Century. Washington DC: Urban Land Institute, 2000.
LINDSAY, G. Rise of the Aerotropolis; Fast Company (July/August), 2006.
MCMILLEN, D. & S. SMITH. The Number of Subcenters in Large Urban Areas; Journal of Urban Economics. 53:321-38, 2003.
MOMMAAS, H. Cultural Clusters and the Post-Industrial City: Towards the Remapping of Urban Cultural Policy; Urban Studies. 41(3):507-532, 2004.
PETERS, D.J. Revisiting Industry Cluster Theory and Method for Use in Public Policy: An Example Identifying Supplier-Based Clusters in Missouri; paper presented at 35th Mid-Continent Regional Science Association, June, 2004.
PORTER, M. Clusters and the New Economics of Competition; Cambridge, MA: Harvard Business School Press, 2002..
PORTER, M. The Competitive Advantage of the Inner city. Harvard Business Review (May/June): 55-71, 1995.
RONDINELLI, D.A. Metropolitan areas as global crossroads: Moving people, goods, and information in the international economy. In R. E. Hanley, (ed.), Moving People, Goods, and Information in the 21st Century: the Cutting Edge Infrastructures of Networked Cities. (pp. 3-20). New York, NY: Routledge, 2004.
SARZYNSKI, A., HANSON, R., WOLMAN, H. & M. MCGUIRE. All Centers Are Not Equal: An Exploration of the Polycentric Metropolis; George Washington Institute of Public Policy, Washington, D.C, 2005..
SHEER, B. & M. PERKOV. Edge city morphology: A comparison of commercial centers; Journal of the American Planning Association, 64:298-310, 1998.
TSAMBOULAS, D. & I. DIMITROPOULOS, Appraisal of investments in European nodal centers for goods-freight villages: A comparative analysis; Transportation. 26(4): 381-xxx, 1999.
VAN DEN BERG, L., BRAUN, E. & W. VAN WINDEN. Growth Clusters in European Cities: An Integral Approach; Urban Studies, 38(1):185-205, 2001.

Global Market Needs New Cities or Development of Border Trade Ports of Kazakhstan

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1 GLOBAL NEEDS

«Just recently the history of Central (at that time Middle) Asia was considered as an integral part of the history of the USSR. Nowadays it becomes a reasonable enough to consider the Central Asia as a local civilization ». [1]

The globalization of economic relations today represents multilevel phenomenon involving not only the separate enterprises and the markets, but also regional and national economy. The labor internationalization and its international division go deeper and the powerful national and regional centers are being formed.

The dynamic growth of traffic flow, goods turnover and toughening requirements to transport mobility directly influence on prompt development of the international system of transport communication.

Since time immemorial, development of transport communication between the states was one of the basic means of development of trans-boundary interaction making big impact on people's togetherness, economy development and cultures mutual enrichment.

The active participation of Kazakhstan in formation of the international transport corridors recently became one of it's strategic priorities. Kazakhstan participates in three basic transit directions within the international Euro-Asian transit: Europe - Russia - China; Europe - China through the countries of the Economic Cooperation Organization; Russia - Central Asia. [2]

The neighborhood of Kazakhstan with such powerful states as Russia and China creates specific environment for development of competitive trans-boundary interaction. China even today successfully carries out two big projects: "Big jump" Uniform Transport Strategy and "Go West " the Program of Accelerated Development of the Western Provinces.

Today the modern transport system of Kazakhstan still constitutes the uniform infrastructure was established in the Soviet times. This fact complicates the work of the transportation system. The basic problems include non-uniform density of transport lines and discrepancy between technological borders of the republican railways and the state borders. The state transport lines pass through the territory of the neighboring state crossing the frontier twice.

The implementation of the Program «The Concept of Formation of Transport Corridors in the Republic of Kazakhstan» started a new stage in spatial development of the country and the construction of railways has been renewed since 1986.

Transport Strategy of the Republic of Kazakhstan till 2015 was adopted in 2006. On the whole main principles of strategy are limited by formation and development of transit transport corridors and investigation of variants of reducing access of the international communication. [3]

The new role of the basic transit directions in territorial and spatial development of Kazakhstan was presented by «Strategy of Territorial Development of the Republic of Kazakhstan till 2015» approved an the end if the year 2006. « … it is anticipated to carry out transition to the axis approach to form territory of the country. The frame basis of axis become existing and planned transport and communication corridors which provide an access to foreign markets and integration of the country with regional and world economics. The major units of axis will become big leading cities integrated with the regional and global markets» [4]

The axis oriented policy of development can become a conflict zone of interests such as importance to provide qualitative, competitive transit and to develop rural and urban areas, investment and local people needs.

The possible compromise in this situation can be reached by «Development of Uniform Transport and Logistical System of Central Asian Transport and Industrial Corridor» (CATIC) which comprises 3 frontier transport and logistics centres are planned to be placed on existing boundary transitions (custom) as Khorgos, Taskal and Free Trade Zone «Seaport Aktau». [5]

The territory of Khorgos ICFC (International Center of Frontier Trade) is located in the southeast part of Kazakhstan on the border with China.

Under the mutual arrangement the territory of Khorgos ICFC consists of two parts: Kazakhstan part located in the territory of Panfilov district in Almaty region and the China part located in Ily-Kazakh area of Xingjian province of China.

The distance from Khorgos boundary transition to Zharkent (border settlement of Almaty region) is about 33,5 km., to Taldykorgan (administrative center of Almaty region) - 321 km and to Almaty (largest city of Kazakhstan) is 361 km. Khorgos ICFC is located in the distance of 1 km from Khorgos city - port (border settlement of Xingjian), 90 km from Kuldja (border settlement of Xingjian) and 670 km – Urumchi (administrative center of Xingjian).

The establishment of Khorgos East Gate PTEZ (Frontier Trade Economic Zone) was an answer to intensive development of the 371 sq. km free trade zone located in Khorgos city-port (China) and construction of Urumchi-Kuldja-Khorgos railway (continuation of Urumchi–Lanchzhou-Lyanyungan) connecting the western and eastern regions of China. [5]

Taskala – Ozinki transition point (custom). Now Ozinki Station in Saratov region of Russia is unique boundary point of the container cargoes passage in direction Moscow - Almaty.

The Taskala is located in the distance of 2 km from the Russian-Kazakhstan border, 105 km from Uralsk (Kazakh border city) and 20 km from Taskala (Kazakh border village).

The project of establishing of International Taskala-Ozinki Centre of Frontier Cooperation (hereinafter Taskala - Ozinki ICFC) in Western Kazakhstan and creation of frontier trade and economic zone on the border with Saratov area of Russia is under discussion. The Akimat of Western Kazakhstan is planning to provide the territory of 150 ha situated between automobile and railway highways for the construction of Taskala-Ozinki ICFC. [5]

The activity coordination of Khorgos with the Aktau Seaport (Free Trade Zone «Seaport Aktau») as the basic Kazakhstan unit in the "North - South" International transport corridor is important for mutual development of transit potential, as it provides substantial growth of goods turnover in this direction.

The preparation of projects on creation of transport and logistical terminal within the framework of the project «Expansion of Territories of Free Trade Zone «Seaport Aktau» is carried out. The Akimat of Mangistau region provides the territory by the area of 200 ha near to FTZ «Seaport Aktau» for these purposes.

The arrangement of CATIC Uniform Transport and Logistics System connecting the basic large reloading points – dry land ports «Khorgos-East gate», "Taskala-Ozinki" and FTZ «Seaport Aktau» creates conditions for objective growth of the international container transportations through Kazakhstan.

Besides three node frontier centres of CATIC formation the special needs appear in front of some basic cities and regions, one of which is Almaty city.

«State Program of development of Almaty city for 2003-2010» was approved by the decree of the President of Kazakhstan under N 1019 of February 10, 2003. The program was developed with the aim of further development of Almaty as cultural, scientific, educational and financial centre of the country according to the Law of the Republic of Kazakhstan on "Special status of Almaty city" dated July, 1, 1998. One of the main goals of the program is formation of new shape of Almaty city according to its status of republican value. [6]

The Law «On regional financial centre of Almaty (RFCA)» was adopted in June, 2006. The Almaty city will be given the special status to force development of the financial market of all country. One of the basic purposes of creation financial centre and important factor for planning activity is it’s role as investment attraction node of Kazakhstan. [7]

The good intentions of new image formation and the greater appeal to investment to Almaty occur at the same time with the actively growing demands on the city, which already has many problems as:

- lack of the public transport system and road infrastructure;
- growing deficiency of power resources and another out-of-date life support infrastructures;

- environmental problems;
- low level of social programs implementation;
- high risk of disaster extreme situations occurrence etc.

The most existing problems of Almaty already exceed the administrative borders of the city and became the issues of regional planning. However official master plan of Almaty still artificially limited to area within administrative borders of the city which represents separate territorial unit. Natural process of interaction of Almaty with nearby settlements which administratively included into Almaty region not so strongly excites local executive bodies as bright local investors who is actively buying land around the city which is more cheaper than inside the city.

The investors were inspired by idea of «Development of Transit Potential and International Trade» actively propose their solutions of cities development problems. New project of four satellite cities as variant of probable spitting of the Almaty city in northern direction of Kapshagai was recently developed. The given project is the large foreign investment offer. Even this system of settlements and each city have English names G-4 (Golden city, Gate City, Growing City, Green City).

GOLDEN CITY is going to be Culture and Entertainment Zone. As one of the primary objective was defined strategic location 15km away from the airport, 30 km away from the center of Almaty.

GATE CITY was planned as Business Zone. The City will be located 8km away from the Airport and from the circumventing access road. Authors propose that Gate city will become a free trade zone.

GROWING CITY is Industry and Research Zone. In the future, this zone will become a hub of trade. This site will become the new location for the sustainable industry of the Kapshagay city.

GREEN CITY represents Eco Zone which will provide additional housing for the Kapchagay city.

In spite of exclusive prospects and solemnity of the given project there is a number of contradictions in its implementation: one of which is their concentration on powerful republican transport axis which literally cuts the territory of some settlements of G4 System.

More and more foreign investments are involved in development of transport infrastructure (building of paid high-speed motorways) and construction of large transport units. But formation of infrastructure should be primary goal of the state and property of public use instead of allocated areas with limited access.

2 PLANNER'S APPROACH AND BORDER TRADE PORTS

Now we reached up the problem „To plan is not enough", but from which side? The dialogue between the investor, the population and planners is always complex issue. Since transition of Kazakhstan to market relations the investment actively interfere in formation and development of territories. The question «Is it enough to plan?» had been eliminated for long ago just because the work of the majority of planners is limited only to development and revision of already designed master plans of cities by out-of-date methods.

The planers silently obey to omnipotent investors and ever less and less concern needs of local population. The master plans are violated to please the private interests frequently focused on short-term benefits. On the background of this silent duplication of master plans arise more and more problems on territorial and spatial development such as active growth of cities and chaotic occupation of the valuable land.

While in case of correct management long-term planning and formation of fruitful soil for attracting and carrying out investment activity under the conditions of modern social and economic development and presence of territorial-spatial resources, Kazakhstan has real chance to become an example of balanced development.

The low level of implementation of the majority nation-wide programs is caused by the lack of its correspondence with strategy of state spatial development (which doesn't still exist).

Even for realization of strategic direction like "transit potential» development, today it is necessary to create conditions for the organized interaction of regions, systems of settlements and separate cities, besides just construction of road and reconstruction of transport units.

Development of an internal network of communications infrastructure of Kazakhstan is the important factor of economic development, where the transport is a kind of source oxygen supplying and distribution system.

There arises necessity for development of new, more effective transit routes and approaches in the field of international transport cooperation. Today the transport corridor doesn't serve just as a route, but the comprehensive technological system of coordinated operations of all types of transport where the special role is given to transport and logistical centers.

The transit potential of international corridors creates infrastructural development of "special areas» serving the basic transport arteries. It is not only spectrum of accompanying services in refueling vehicles, arrangement of trade and meal, etc. It is the complex system of collecting, distribution, manufacturing and processing …

The development of frontier trading ports needs complex approach as they are key elements of the large system which's work correctness depends on abilities these nodes.

Today the planning and implementation of projects concerning the development of basic transit routes are carried out in separation from planning activity and understanding of the role of settlements in formation of new infrastructural opportunities.

In a way of creation favorable conditions for systematic development of Kazakhstan with its rich nature-raw-material base, growing industrial and innovational activity the expected positive result of transit potential development shall be possible only in case of strengthening role of the city and regional planning. It is not allowable to please maintenance of only transit interrelations and to overlook about the balanced development of the country (which's main aim is to create comfortable and qualitative inhabitancy).

At the present stage of socio-economic development «the strategic planning» can become a solution to coordinate work of planners and investors.

3 STRATEGIC TERRITORIAL PLANNING IN KAZAKHSTAN

The integrity of any state in many respects depends on its ability to react to changes in due time and to adjust its territorial conditions for providing efficiency of its use and protection of citizens interests through maintenance of the appropriate quality of living environment.

The condition of living environment - is that material basis of social and economic development and increase of economic competitiveness of the country.

The territorial development is composite system of models covering development of all territory of the country and mutual development of its separate functional subsystems (the transport and engineering infrastructure, the urbanized territories, natural frame and so forth).

The strategic territorial planning is one of the most important tools of the analysis, forecasting and realization of steady territorial-spatial development under modern social and economic conditions of Kazakhstan.

The development of nation-wide strategy of territorial development of Kazakhstan should reveal potential and define prospects of development at all levels: in scale of nation-wide system of settlements, macro regions, subregions, systems of settling, master plans of settlements, urban design projects etc.

The revealing of the priorities on nation-wide level is carried out on the basis of situations modeling with the influence of various factors. For complete forecasting the future processes on the basis of decisions made during the development of strategy of nation-wide territorial development, each «priority direction» should be put on nation-wide model. It is necessary to pay special attention on the areas arising at crossing of mutual interests of two or more directions without taking into consideration administrative borders.

The «Priority directions» of territorial and spatial development of the country is formed by development of nation-wide programs, get real outlines at the level of strategic planning and actively cooperate through creating preconditions for formation of competitive opportunities for positioning of separate regions.

The following step after definition of the role and place of separate regions and their groups at nation-wide level is elaboration of strategy of regions development.

The strategy of region development is:

- the basic tool of making decisions in management of territory;

- clear vision of the future development of area and new opportunities for active participation of the population, local business, the international community, administrations of other regions, the research organizations etc. in development of concrete region;
- the basis of favorable social and economic development, ideological consolidation of the population and also their confidence in the favorable future;
- the plan of the most urgent actions directed on achievement of systematic and favorable development. The basis for development of more detailed plans and programs of social and economic development of region, political and legal measures which realization will allow to provide achievement of the planned aims;
- an opportunity of realization existing and formation of the future potential of the region on the basis of rational use of resources and tools (for example, distribution of the basic industrial forces).
- the base for development of strategy for development of systems of settlements, large and middle-size cities;
- base for raising of living standard of the population and improvement of conditions of enterprises work and investment activity;
- an opportunity of strengthening of national safety.

In a way of development and implementation of strategy of territorial development of regions, for their balanced joint development and active mutual cooperation within the state «main principles» are developed. The basic principles of strategic planning of regions are «base skeleton» precondition for nation-wide territorial development.

In view of specificity of its administrative-territorial organization and social and economic development the basic principles of development and implementation of strategy of territorial development of Kazakhstan might be:

- transparency - an opportunity of general access to trustworthy information about modern condition of territory and prospects of its development, it has great importance for investment policy;
- new approach - transition from flat scheme of zoning (traditional functional) to search laws according to which occurs concentration of processes and the investment interests causing growth, development and evolution of territories;
- responsibility - each separate territory has its own capacity and specificity of development. The arrangement of new functional zones demands special attention as they can become both catalysts and obstacles in the way of future complex development of region or city;
- adequacy - formation of the interconnected network occurs on the basis of logic construction of functions of separate units, management of which should be at one level;
- integrity - infrastructural. It is necessary to generate complete control system of realization of strategy and other actions directed on territorial - spatial development;
- absolute - precise observance of main principles and priorities of development strategy.

4 REFERENCES

BISENBAYEV, A.K.: The Other Central Asia; Arkas, Almaty, 2003 [1]
Economy - Results of Development of Kazakhstan within 12 years: www.kazembassy.ru[2]
Transport Strategy of the Republic of Kazakhstan till 2015; Astana, 2006 [3]
Strategy of the Territorial Development of the Republic of Kazakhstan till 2015; Astana, 2006 [4]
Program of the Further Development of the Khorgos International Centre of Frontier Cooperation in 2007 – 2011; Astana, 2006 [5]
State Program of Development of Almaty City for 2003-2010: www.almaty.kz [6]
The law of the Republic of Kazakhstan “Almaty Regional Financial City Centre; Astana, 2006 [7]

🏆 *reviewed paper*

New borders – sociological analysis of urban interactions.

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1 ABSTRACT

What is characteristic and symptomatic for eastern and middle-European cities, they're trying to 'forget the past', improving many different modernizations in urban infrastructure. The new urban architecture is visible sign of it. From the sociological point of view, all the new buildings and areas impacts new kinds of social interactions and social stratification. It seems to be very significant, to analyze how the urban sphere not only influence social interactions, but also makes these interactions possible. Who is welcomed, in such a space, and what sort of citizens are intruders rather than guests. I would like to present some particular exemplifications of new urban public sphere in polish city, i.e. Poznań city, and its new quality in modern world.

2 INTRODUCTION

The prove it, I'm going to use few results of sociological qualitative surveys realized in Poznań in recent years, although none was projected for this text. All the citied below describe the city and its citizens, and I use it, as well as all the pictures, to make my short description more picturesque, and adequate.

I would like to analyze two particular examples of planning the urban area – the one from real socialism times – former urban blocks districts, that were constructed widely within eastern part of Europe, however nowadays former miracles of socialism, are becoming relatively unattractive, if not, regular slums. I'll compare it with a present examples of brand new built, huge and extremely attractive, miracles of our days – the malls. Both of these examples, however from different realities, have at least one common issue – the planners trust, it will fulfill most of social needs and desires. These cases should be treated also as examples of evolving the urban space and social interactions furnishing it.

Many polish sociologists involved in sociology of urban areas, describe these processes, i.e. Jalowiecki (2006), Cichocki and Podemski (1999), Jalowiecki (ed.), Majer and Szczepanski (2005), Misiak (2005), Wallis and others. They usually use the tradition of Chicago urban studies started by Thomas and Park, and continued by Znaniecki. The importance of Hannerz discourse (Hannerz 2006), and Goffman (Goffman 2000) dramaturgic point of view, brings new perspective to scientific analysis of urban sphere and social interactions. Contemporary polish scientists underline the consequences of 'fast modernization' processes, and a problem of inequalities connected with acceleration of many processes. The processes of modernization in polish cities are not interchangeable.

3 THE PAST

There is a long history in constructing cities as a visible signs of authority's power. Not only the name of a city, but also the most representative buildings, belonged to local ruler, and his people. In polish history, we have many examples of such ideological role, like king's names – in the old capital, Cracow, that meant 'Crak's castle', through the 1920s and created cities that were to improve polish economy, i.e. 'Ironwill', that symbolize 'the iron will' of local people to industrialize poor region of our country. There are also many after-war cases, when according to leading communists party establishment, huge efforts, to change the social structure of existing cities, were taken. With Cracow example again: a brand new district 'Nowa Huta', means 'The New Ironworks', and a new industrialized area surrounded with hundreds of same-looking blocks of flats. Nowadays, at ideological level, it looks similar – however not in such a scale, but many brand new examples of urban infrastructure, and a well known purpose – to shape citizens attitudes, behavior, making a kind of self-implementing prognosis. This can be illustrated with examples like 'The Golden Terraces' as a name for the mall, or 'The Green Hills' that symbolizes a high-quality settlement resort with a nice landscape.

What should be pointed, until 1989, all the new buildings in Poland had to be constructed with the official line of the communist party. As a result there was no possibility for local authorities or private investors to make any independent decisions, about their investments. Every new district was planned and constructed as a proof of 'socialist's party will and people's work', small villages were enlarged to fulfill new tasks leaded

by party establishment, while others were removed, to establish, in example, a new coal mine. In many cases, valuable historical infrastructure was devastated, to prepare a space for new style of building, and new style of living as well. The style was called 'the real socialism'. With no respect to former traditions, with omnipresent standardization of forms – the same not only in the whole country, but the eastern European region in general. It was connected with planned efforts to create new kind of a man – the well-known homo sovieticus cliche. For many people, especially local immigrants from the less developed country, such new built places were a chance for a better living. However most of them, needed only a short period of time to realize, that having few advantages, the new place of residence has many disadvantages as well – including the lack of community life, anonymous contacts with other people, and even poor quality of infrastructure.

Before the collapse of party, its leaders, and their plans, in 1989, generally speaking, most of polish cities completely changed their visual landscape, in comparison with pre-war times. A good example of these, are 70s and 80s building era of block of flats, fulfilling city suburbs. Although most of such areas were brand new, built in former rural areas, with many planners analysis, the results were not really impressive: most of these places were seen as dangerous, unattractive and people manage to get by in it treating their place of living as temporary (that was even written in official registration form as 'temporary place of residence', as everybody waited for a bigger and more suitable flat, and this was a kind of neverending process). The flats were rather small, some of them still has 'the dark kitchen' – means with no windows, and bathrooms 1,6 meters width (the bath size), and 2 meters length. However nobody was complaining, as with the average period about 10 years or more to receive it, it would be unreasonable. The area as a whole, was rather pessimistic, with a standard set of a school, kindergarten and some shops located somewhere in the middle. There was usually also a church, or a place where people were gathering to pray – with many security agents' efforts to control it. The transportation net was rather poor, and the possibilities to communicate using telephones, was not common. The today's name for that, at a conversational level, is 'a social desert'.

There are many remains of the past city planning in Poland, however the planning was not only about architecture, but mainly caused because of political decisions. Usually, since 1950s, the high level of urbanization, was a part of industrialization processes – new districts were located near industry areas. The results might be identified in social structure, and it is probably the most evident and recollect sign of the past. Examples of such processes come from every big city in Poland, with some spectacular ones like, as mentioned above, Nowa Huta in Cracow, Tychy, or Poznań districts – Rataje or Piątkowo. Every time, the new block of flats were built, it was settled with a total social townsfolk mixture. It was a part of architecture plan – to mix people from all social classes making local communities as heterogeneous, as possible.

Such districts, as described above, still exists, and about 30% of citizens of Poznań live there. Some of blocks were painted and or even renovated (the same like in former East Germany, however with the lower scale), while others look still the same. It is even not unusual, the meet western backpackers visiting Poznan blocks, and watching people living there. Another example comes from Cracow, there's tourist agency, similar to Poznań ones, offering a special 'Red Trabant course' among Nowa Huta district. This is another example of brand new district built near to the city in 50s and 60s, as a result of political decision to settle thousands of workers in the traditional university town, the former capital of Poland. Present excursions take part in the real city, sightseeing in the neighborhood of real citizens, however, as tourist guide claims, some of foreign visitors hardly believe it's not fake, as the area look extremely unpleasant and unfriendly to people. Many visitors are western backpackers with a strong demand to 'discover the past' – and that easy in many polish cities.

To sum up, I'd like to point some aspects former city planning growth. The past, this way, in polish cities reality was rather sad, dark-coloured and pessimistic. People forced to live in such area, had no possibility to make it more friendly, or even individualize it according to their own needs. There was a lack of recreational areas, in example 700,000 city like Poznań offered to its citizens 20 years ago only 6 swimming pools, 2 Zoos, 1 tropical garden, 1 ice-rink, and a number of playgrounds for children. The average person spend more time weekly queuing in front of any shop, than at leisure activities.

Sometimes, present television advertisements use particular motifs to present, usually with a facetiousness way, old timers. But most people see only the present – it's certainly colorful and joyful, however it is not clear if all its citizens should be optimistic. I'd like to ask about the future – is it full of chances for everyone interested, or is it rather like 'the game is almost over' and no new runners are invited. The changes are such

wide and deep, that many polish youngsters watching 'sentimental' exhibitions with old pictures, also do not believe, it's real, just as they same-aged young people from western countries.

4 THE PRESENT AND THE FUTURE

Unfortunately areas described above, are not fake, nowadays they are also facing new social challenges and threats. Because such places are becoming relatively less attractive – many people try to leave it, escaping to safer ones. Those who stay, often from lower social classes, are called 'blockers' – means the youngsters, usually unemployed or poor qualified, with high level of aggression, and low level of hope. This is a social problem, as former proves of architecture possibilities, evaluate into slums fate. So the main issues are connected with low level of safety and lack of revitalization enterprises.

Although polish economy is booming, especially in the prices of immovable, you can still buy such flat at relatively low price. In biggest polish cities, the average price of 1m2 of a new built flat in the city center, doubled during last three years, reaching in Poznan level at about 1500€, to 2500€ in most attractive resorts. The boom is stimulated with the growing number of bank credit limits available for average person, and a growing number of better and better situated young people, called 'yuppies'. However it is a worthwhile to remember, that mostly only new buildings are seen as attractive, and it is still possible to find an 'unreasonably cheap' location in the suburbs.

It is not easy to investigate and extrapolate the future in Poland. Last years events, European Community access, and growing number of foreign enterprises taken, suggest some optimistic visions. This is also the new reality of post-communist polish cities, like Poznań. It is one of the biggest in Poland, with estimated number of habitants at more than 700 thousands. What seems to be important, one fifth of them are students. They are another part of new polish reality – growing number of people involved in upgrading their qualifications, believing in the better future. The city gives them a chance – as it is one the most attractive polish city, with many foreign investments.

I would like to illustrate these unique with some of results of quantitative survey taken in Poznań in 2005. For example, most Poznań citizens see the future of their city and region as 'better in the nearest future' – at the level at about 40% for Poznan, and 48% for the whole region (Wielkopolska state). Other answers, collected in the same survey, are even more enthusiastic among younger and better educated respondents (see: Cichocki et al, 2005). The level of optimism in Poznań is one of the highest in the whole country. On the other hand, the same time, threatening number of people, especially young students and specialists (doctors, scientists, or even plumbers), leave this place to emigrate in searching for the better future anywhere in the west. Others see no future for them and wait just to complete their education (relatively cheaper than in the west), and move out. With following examples, and some images, I'm going to present visible aspects of changes and redefining the public sphere in one of polish cities.

Questions, I want to raise, is about the problem of urban evolution, and its 'successful implementation' of the new and better. Last 17 years, since 1989, is probably a significant period of time to evaluate the urban space evolution, its results, advantages and disadvantages, with the main question: for whom it is redefined? Undoubtedly, besides many problems with transport, revitalization of many dark parts of the city, many efforts where taken to improve the character, or just the front-stage of Poznań. In the following part of the text, I'll observe this particular example of a big polish city and its changes. There are two main issues, I'm going to describe. The first one is about space in public and the newest, in polish conditions, changes. The second one is about social interactions determined around it. The interesting area, or better 'stage'(see: Goffman, 2000), of social interactions, is the public space that impacts the way people move, behave, interact, cooperate or compete. A good example is traffic, and the organization of space that makes some reactions acceptable, and others forbidden. A general idea is that pedestrians and cars should not have any occasion to clash, what is, certainly, fully reasonable, the supported by a system of traffic lights, lines, bridges, where necessary, and so on. However the investigation of face to face interactions in public sphere, especially in the new built or rebuilt area, that is very often a kind of 'gated' area, because of security reasons, clean environment, and suitable neighborhoods. Whatever it is, the result is usually similar – 'no entrance' for any social categories, like – homeless town beggars, kids, pedestrians, and others if needed.

Every time, the border is in danger to be crossed, a guard (human or artificial intelligence reaction supported by closed – circuit television systems) will react. All the new built houses in Poznań are fulfilled with safety

improving systems, guard service. Many has underground garages, that allow owners to leave with no contact with other people, as you may get from your apartment to your car, and than reach your office without leaving it at all. Such isolation is a by-side product, however sociologists are interested in it as a reason of many other social consequences, as they are usually identified as negative ones.

5 PROBLEMS

It is also not difficult to see some problems, that appears in this city – I would not describe urban pathologies, somehow interesting it is, but will focus on social consequences of present changes. The first issue is the new stratification redefining public sphere and its users according to some rules.

Bauman describes new city borders dividing its surface in socially isolated parts. Such lines in the city are invisible but limits many other processes (see: Bauman 2000). The only way to identify and investigate, is the try to cross it – if you're identified as a welcomed person, there's no problem, but if not – your problems starts at once. This is something, that is relatively new in polish reality, but a very well-known to all who wants to participate in public sphere. A kind of restricted entrance is an 'ideal type', and in every place if it is not strict enough, it is because of lack of money. It seems to be caused by a combination of factors like the terrorism threats awareness (especially in state area), authorized staff only buildings or even districts, the idea of discreet limitation of entrance for some categories of people – like the poor. In the state of the art it is analyzed as 'gated community issue', but in polish city an interesting question might be raised – if such communities are the only ones in local environment, as no others appeared? What's more about gated, or limited–access, areas is, that almost all of new built, and bought, buildings fulfilling this condition. So that during a relatively short period of time, it will be even more significant. There can be also observed a budget version of gated areas, a closed circuit telephone at the entrance, and iron gates, painted with graffiti.

Another interesting perspective might be seen after dramaturgic theory. As Erving Goffman claims (Goffman 2000), all the face to face interactions might be compare to actor's play, with such important additional elements like the stage – with front stage and backstage. When actors meet, they 'play' their roles, and an important part of the surrounding area ('decors') is to help making needed impression about partner. The decorations play their role in the way to fulfill the actor's image. This concept in very well known in social sciences, especially in sociology, and very often used in scientific discourse about social interactions, and its active character. Goffman underlined the spontaneous character of partners interaction, and their own individuality in it. Another important part of this theory focuses on consequences of everybody's will play and look as good as possible, with the importance of the stage and its sets. As Goffman claims, actors use the space, to improve needed impressions, and making some parts of it more important than others.

I will use Goffman's perspective to analyze to stage role. As I pointed above, a unique character of some urban sphere – i.e. malls, makes some individual behavior, and social interactions more adequate than others. From the former situation, when public sphere was planned as pointless and standardized till the 80s, now, an opposite processes can be observed – the public space is renovating and redefining, allowing people to use it in new ways. But this is not like the change from the worse, to something suitable and proper, because in many cases such changes do not lead to any positive for the community needs.

The malls are probably the only special public spheres, where everybody is invited. In Poznań and suburbs, there are at about 10 big malls, and a certain number in built. What is symptomatic, in most cases such malls are the only new buildings in the surrounding area – imagined as the only sign of modern times, modern architecture. They became, just in 5 years, in important part of city architecture, an element of people's way of living, spending their leisure time, or just time-consuming, as Ritzer claims (see Ritzer 2001). This is also an example of area, where new kinds of social interactions take place. According to the malls' role, such interactions are the by product of consumers behavior, as celebrating of consumption is the main purpose of visit. However some examples of teenagers wandering there, instead of studying (the problem is so big, that even police organized special 'patrols' to identify such pupils and send them back to school), in most cases, it is not possible to meet, or have social interaction with anybody. The human flow is coming, and one can hardly stop without a risk of being tread.

Every weekend, and even during the week, thousands of cars are jamming around it. As all the malls are brand new ones, they are so 'beautiful', that even foreign visitors, from western Europe as well, are sightseeing it (usually as an additional part of a trip to low-priced but high-quality polish doctors, beauty

saloon, and others). They became a kind of must-see attraction. There are many facilities, including typical polish concept, free buses for budget visitors. Extreme discounts, unbelievable occasions makes all this possible, similar wherever it is. In all these places, people are not looking for other people to socialize, but rather for commercial promotions. Even small cafeterias put their armchairs in the hall area, that makes possible to watch consumption space, and increasing the number of nervous pedestrians walking between tables. Using Goffman's perspective again, it can be seen, that even a brand new sphere, as malls, planned for consumers, do not allow you to enjoy it – from backstage salesperson's point of view, it is not so friendly.

Another point of view be compared with present ways of recreational and leisure activities. In summer 2006, during a qualitative field study about 'one-day tourism in Poznań', the same time when thousands people are walking in any mall, the National Park just at the border of the city, 15 kilometers from the center – The Wielkopolski National Park, is almost empty. It was not even easy to meet any person, and Park entrances noticed individuals only. Although it is even possible to watch the forest from suburban mall's parking areas, hardly anybody follows this direction. This text and its issues are not adequate to analyze such complicated social interactions like spending the leisure time of Poznań citizens. The conclusion, from this field study taken in the summer 2006, was that the number of National Park attractions might be counted in tens, while same time mall visitors, might be counted in thousands (see: Isanski, Ornoch-Tabędzka 2006). What is also important, in comparison with our former reality – this time nobody is forced, just persuaded by advertisements, to such behaviour, this is just a symptom of new ways of spending people's weekends and recreation time. So that, there is even undoubtedly a new kind of tourist – the mall tourist, more significant in social scale, than former outdoor recreation. The question 'who pays and who benefits', however fascinating, is probably out of present range. It is still a chance, but with a very astonishing number of people interested in making a reasonable and conscious choice. The present situation of Poznań, and many other polish cities seems not to be really well-planned. Whatever it is or not, the average citizens can hardly see everyday changes as a process, it's rather closer to chaos. It looks like Poznań, even being renovated, offers new renovated areas to few particular number of social categories, but most of citizens could identify costs only, not benefits.

As, in example, city tourists (the category that is not limited to tourists only, and may grasp citizens as well), are temporal users of city infrastructure, they persuaded to use all visible signs to identify it. The public space where social interactions are taken, as I mentioned, takes it's own role. The role for the just-built area, is usually constructed in a way, that makes some reactions more reasonable, while others unwished. Some of traditional behaviors, including a chat or face-to-face meeting, is not even possible, as a big crowd is behind and around. The tourists, as I see it, are prompted to identify the symbolic ground of space, using it, in example, as a source of information of eating manners (forget it in a fast food), the possibility to stop and have a rest – not possible, as benches are rather rare. The same time, consumption is stimulated, and consumers attitude is widely seen. In the city area, tourists are rather consumers. If you visit Poznań as a tourist, and spend a few days sightseeing, your opinion could be similar or even worse.

6 CONCLUSION

As a conclusion of my text, I want to underline, that although in Poznań, as in many others polish and also other central and eastern cities, many changes might be identified – in public sphere, and its connections with social interactions, these changes are usually not with free access for everybody. It is limited according to some particular reasons, that exclude the former public sphere, from the majority of citizen's experience. Dramaturgic interactions, as Goffman saw it, take place in the stage, but there are many levels of stage, with limited terms and levels of use. It is even connected with some architecture improvements to divide users into categories.

One can say this picture is not real, it's too pessimistic. Or, on the other hand, this is only the beginning, with no escape but acceleration of present processes. Another point of view might be raised, as well, that the situation presented above is average with nothing special, in comparison with the western cities, or maybe the only one with the economic aspects. The very small size of the text makes my discourse limited to just few aspects, eliminating others. I wanted to examine some of social aspects of present, and ask for the future. As for now, the number of malls is growing, and it seems to be more attractive idea for people to spend their time this way, instead of outdoor, or even indoor but active, recreation. The National Park is not a real

attraction any more, even university students involved in field study I recalled above, claimed it was their first visit in this forest located not more 15 kilometers from the city center. Some areas became more distant, than at any time before.

7 LITERATURE

Bauman Z., (2000), Globalizacja. I co z tego dla ludzi wynika, [Globalization. The Human Consequences, Blackwell Publisher, 1998], wyd. PIW, Warszawa,
Cichocki R., Cichocki P., Jabkowski P.,(2005), Europejska świadomość Wielkopolan, wyd. Humaniora, Poznań,
Cichocki R., Podemski K.,(1999), Miasto w świadomości swoich mieszkańców, wyd. Humaniora, Poznań,
Goffman E.,(2000), Człowiek w teatrze życia codziennego, [The Presentation of Self in Everyday Life, Doubleday Random Mouse, 1959], wyd. KR, Warszawa,
Hannerz U., (2006), Odkrywanie miasta. Antropologia obszarów miejskich, [Exploring the City. Inquiries Toward an Urban Anthropology, Columbia University Press, 1980], wyd. Uniwersytetu Jagiellońskiego, Kraków,
Isański J., Ornoch-Tabędzka M., (2006), Atrakcyjność turystyczna regionu Wielkopolskiego Parku Narodowego według turystów zagranicznych, w: Strategia Zrównoważonego Rozwoju Turystyki i Rekreacji Mikroregionu Wielkopolskiego Parku Narodowego, Poznań 2006,
Jałowiecki B., Majer A., Szczepański Marek S.,(2005), Przemiany miasta. Wokół socjologii Aleksandra Wallisa, wyd. Scholar, Warszawa,
Jałowiecki B. (red.), Szczepański M.S.,(2006), Miasto i przestrzeń w perspektywie socjologicznej, wyd. Scholar, Warszawa,
Krawczyk Z., Sowa K.(red.),(1998), Socjologia w Polsce, wyd. Wyższej Szkoły Pedagogicznej, Rzeszów,
Ritzer G., (2001), Magiczny świat konsumpcji, [Enchanting a Disenchanted World. Revolutionizing the means of Consumption, Pine Forge Press 1999], wyd. Muza, Warszawa,
www.poznan.city.pl
www.info.poznan.pl
www.epoznan.pl

8 APPENDIX 1: 18 PICTURES

Figure 1. Real socialism architecture Remains

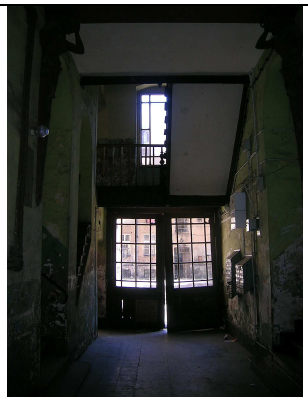

Figure 2. City infrastructure – with no renovation for at least 60 years

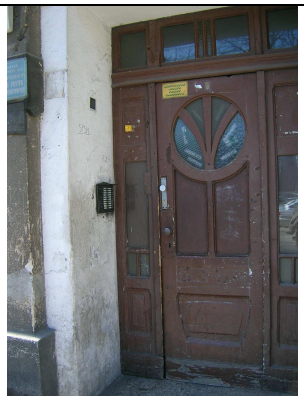

Figure 3. Budget gated area – closed circuit phone

Figure 4. Heterogeneous architecture neighbourhood

Figure 5. View from the city center – suburbs with same-looking blocks of flats

Figure 6. 1970s brand new district – painted from outsider

Figure 7. Typical 1970s infrastructure – a school surrounded by blocks

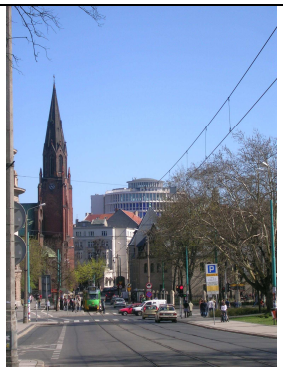

Figure 8. The centre – the chuch, real socialism's mall, and emperor's castle.

Figure 9. Reconstruction – former factory area into skyscraper

Figure 10. The brand new Sheraton, next to devastated old printing house

Figure 11. The mall

Figure 14. The mall inside – spectacular and magic leisure area

Figure 13. The mirage with a closed circuit television motif

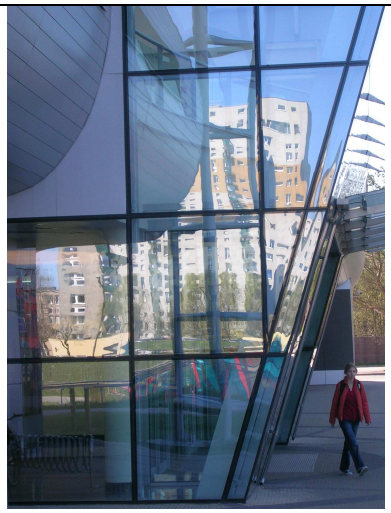

Figure 12. The block of flats mirage in the mall's façade

Figure 15. The mall inside, and architecture similarity to church's

Figure 16. Another mall in butli just next the the existance one

Figure 17. Reconstruction of a city centre

Figure 18. Renovation of a public infrastructure – a kindergarten

🏆 *reviewed paper*

Evaluating Sustainable Appropriation of Urban Public Parks

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1 INTRODUCTION

Urban public parks offer a great potential to raise the quality of life for urban citizens, while at the same time their creation and maintenance requires substantious amounts of money. Surveys have shown that citizens consider parks to be an important element for their well-being, even if used only occasionally. By offering opportunities for equal participation irrespective of gender, age, nationality or social-economic status, parks also enhance social sustainability. We consider social sustainability as the necessary element for the two remaining pillars of sustainability, namely economic and ecological. By equal participation, we mean the possibility for every potential and actual park user to engage in activities as desired, as long as these activities do not prohibit or discourage others to use the park. There are two processes opposing equal participation: First, if a park user leaves or does not show up at all because he or she does not feel comfortable in the park, we speak of processes of exclusion. If the space appropriation in the park is dominated by a certain group of visitors, then there are processes of domination.

We assume that the specific behavior settings of parks (in the sense of SCHOGGEN 1989[7])) and management strategies (KAPLAN et al. 1998) strongly affect visitors' behavior by affording certain activities while discouraging others. Thus, both the design and the management can contribute to minimize usage conflicts and ensure social sustainability. Consequently, the design and management of public parks and recreation areas have attracted a substantial amount of interest. Academical research ranges from technical aspects of counting visitors (ARNBERGER et al. 2006), the usage of parks (BRANDENBURG et al. 2006), a focus on gender issues (PARAVICINI 2002) to more conceptual and theoretical publications on the social construction of public space and its appropriation (KASPAR and BÜHLER 2006, LÖW 2001). On a more administrative level, the postulates of social sustainability and intensive usage of public parks are integrated into the agenda of the city of Zurich, for example (GRÜNSTADTZÜRICH 2006). The spatial distribution of park usage has already been observed in Basel (BAUR 2000), although the resolution is coarse.

In order to enable and foster equal participation, it is necessary to detect and analyze domination and exclusion processes. To do so, our research project uses a mixed methods approach (CRESWELL 2003). We combine qualitative methods such as in-depth interviews and document analysis with observations of park usage, and their subsequent quantitative analysis with geographical information systems and supporting information technology. The latter, quantitative methods will be presented in this paper.

Figure 1: Extensive (Wahlenpark, left) and intensive (Bäckeranlage, right) use of public parks (photographs taken by the author, Zurich 2006)

Our aim is to model the social interaction and resulting space usage in urban public parks at the micro level of individuals.We propose that it is possible to capture and represent the complex interpersonal processes of space use and appropriation on the microlevel using a relatively simple model. This model implements

[7] The notion of behaviours settings goes back to Roger G. Barker (1968). In essence, it assumes that there is a structuration of the environment into discernable settings that influence strongly one's behaviour.

concepts from anthropology and environmental psychology. The main components are socially constructed spaces of interpersonal distances. We show that the use of space and resulting conflicts between park visitors can be modelled using information about the environment (i.e. affordances[8] of the park infrastructure), the activities of the park users and a few individual characteristics such as age and gender. A comparison between several visualization and modelling approaches reveals that dynamic field-based visualizations show the most promise. With our model, it will be possible to evaluate the acceptance and use of urban public parks by the planning authorities with methods that go beyond the traditional surveys. In a next step, we plan to implement a simulation of space appropriation, so that the use of the park's infrastructure can be simulated even before it is actually built.

This research (www.geo.unizh.ch/nfp54) is conducted as part of a National Research Program of the Swiss National Fund (no.54: Sustainable Development of the Built Environment; www.nfp54.ch), as well as in cooperation with and financially supported by Green City Zurich (Grün Stadt Zürich, department responsible for planning and maintainance of public parks; http://www.stadt-zuerich.ch/internet/gsz/home.html; only in german).

2 CONCEPTS OF SPACE APPROPRIATION

In order to detect and analyze processes of exclusion and domination, it is necessary to reveal conflicts in space appropriation. We conceptualize conflicts of space appropriation mainly as an effect of crowding in the sense of ALTMAN (1975), namely when the level of achieved privacy is less than the level of desired privacy. Altman describes four principal methods for regulating the achieved privacy. He calls these principal methods interpersonal control mechanisms. They are: a) verbal behaviour, b) non-verbal behaviour, c) territory, and d) personal spaces. In our case, we will focus on personal spaces as main control mechanism, disregarding the other three. Judging from our observations, personal spaces are the most relevant one. Instead of engaging in (non-) verbal exchange or claiming a delimited territory, rebuilding a certain distance to a nuisance or intrusion is much more common.

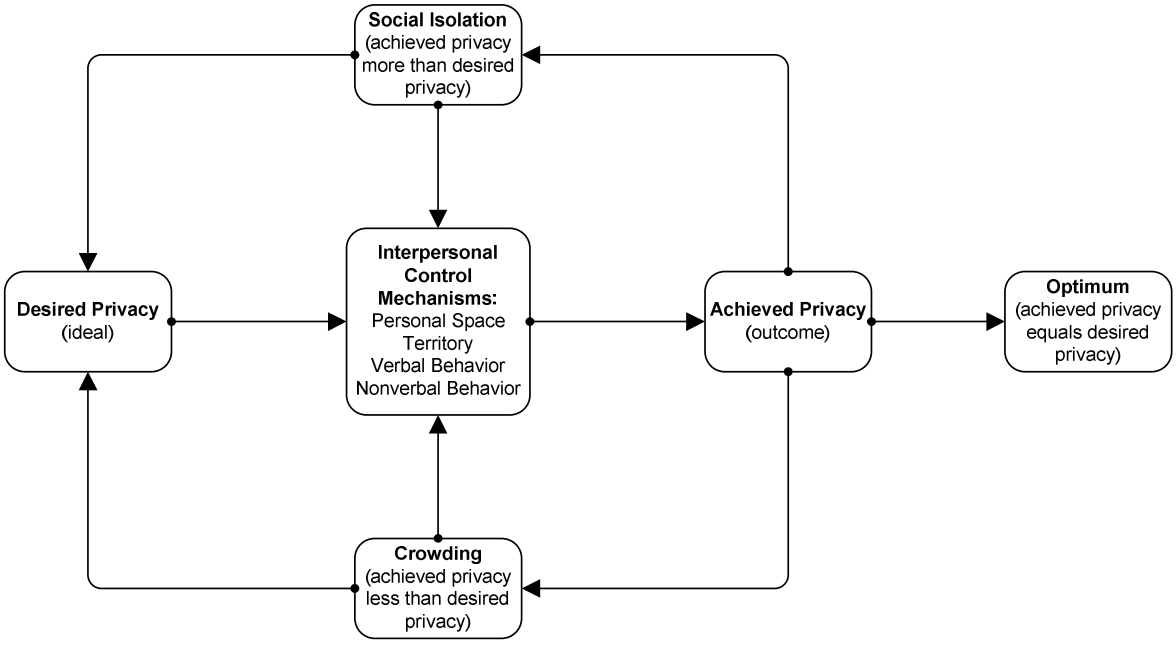

Figure 2: Overview of relationships among privacy, personal space, territory and crowding (ALTMAN 1975: 7)

Personal spaces according to HALL (1966) can be conceptualized as a succession of four concentric spheres with a person at the core: Intimate distance covers the range up to 45 cm (18 inches), personal distance spans the range from 45 cm up to 120 cm (4 feet), followed by social distance that ranges up to 3,6 m (12 feet) and public distance (7,5 m or 25 feet). For the deliminations of these spaces, the distance itself is less significant. The interpersonal distance zones are mainly a result of the communication cues possible, e.g. whether facial

[8]The concept of affordances was created by James J. Gibson (1979). It assumes that objects afford certain positive or negative possibilities of action (such as a chair affords sitting on it) that are intuitively grasped by animals and people without cognitive processes involved.

expressions are discernable, whether touch is unavoidable or (im-)possible, etc.. Unwanted, inappropriate intrusion into these spaces by others can lead to anxiety or discomfort, depending on the relationship between the individuals. As argued by BAXTER (1970) and ALTMAN (1975), these interpersonal distance zones also vary with age, gender and ethnicity. For the beginning we will focus on their relevance for activities, since we have to simplify our model at the start. Incorporating others aspects, such as modifying shape and size of personal spaces according to activity or individual characteristics will be possible later on.

During our extended observations in public parks of Zurich, the following groups of activities have been observed:

- Non-interactive (sleeping, reading, and working)
- Interactive (chatting, observing, overseeing children)
- Eating (picnicking and BBQ)
- Ball games (football, badminton)
- Activities relying on the park's infrastrucuture (such as playgrounds, water basins)
- Other activities on the spot
- Other activities involving movement.

Each of these activities requires a specific space that we call the activity's footprint. The footprint's size and shape is estimated from literature and observations.

We assume the potential for conflict exists when personal spaces and (incompatible) activity footprints of other park visitors overlap. In an example (see Figure 3 below), we look at a football player (left) and a reader (right) and their respective activity footprints (AF) and personal spaces where intrusion is experienced as a disturbance (PS). We assume that the football player's activity footprint is large and disturbs the reader already at the distance of the reader's social distance zone, thus an overlapping provokes a conflict from the reader's perspective. On the other hand, the small activity footprint of the reader will rarely overlap the relatively small personal space in which the football player feels disturbed. This is due to his physical activity, so that he is only disturbed by intrusions beyond the personal distance zone (and probably only if that intrusion constitutes a foul by a fellow player).

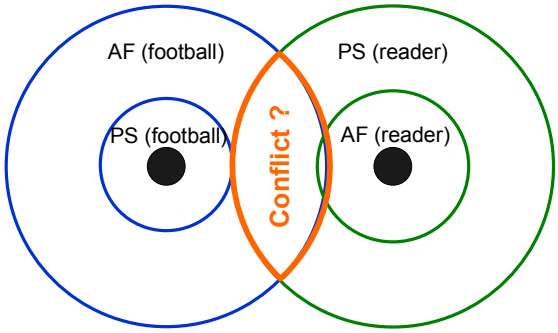

Figure 3: Potential conflicts from overlapping space appropriation

3 DATA CAPTURE AND STORAGE

The empirical data was gathered during field observations in Zurich, Switzerland. During the summer of 2005, one park (the Wahlenpark) was observed on 12 days for several hours each, In the summer of 2006, another two public parks (the Wahlepark again, and the Bäckeranlage) were systematically observed on 14 days for two hours each. The observation slots started on 12:00, 14:00, 16:00 or 18:00. The two parks are both rather small (not exceeding 2 ha) and designed for the local population without special infrastructure attracting visitors from farther away. The new Wahlenpark is located in a large industrial-to-residential conversion zone, while the Bäckeranlage dates back several decades and is located in an innercity residential quarter. In 2007, the Bäckeranlage plus a third park will be observed using the same scheduling. The first observations in 2005 used pen and paper to write down location, time, activity, gender, and age of the visitors. These records were later digitized in ArcGIS, using a standard file-based approach. For 2006, the methods were refind. Using TabletPCs, the observations were directly coded into an ArcGIS personal geodatabase, with a total of 605 and 842 parks visitors recorded. The individual attributes recorded include

estimated age (infant, child, teenager, young adult, senior adult, senior), gender (male, female, unknown) and association to a group of visitors. This information is stored in a table and linked via ID to an event table that contains the locations of the individuals, time of events and types of activity (compare figure 4, which is in simplified STER notation adopted from TRYFONA et al. 2003). Both changes in location or activity constitute an event. Our conceptualization of time therefore is linear and discrete.

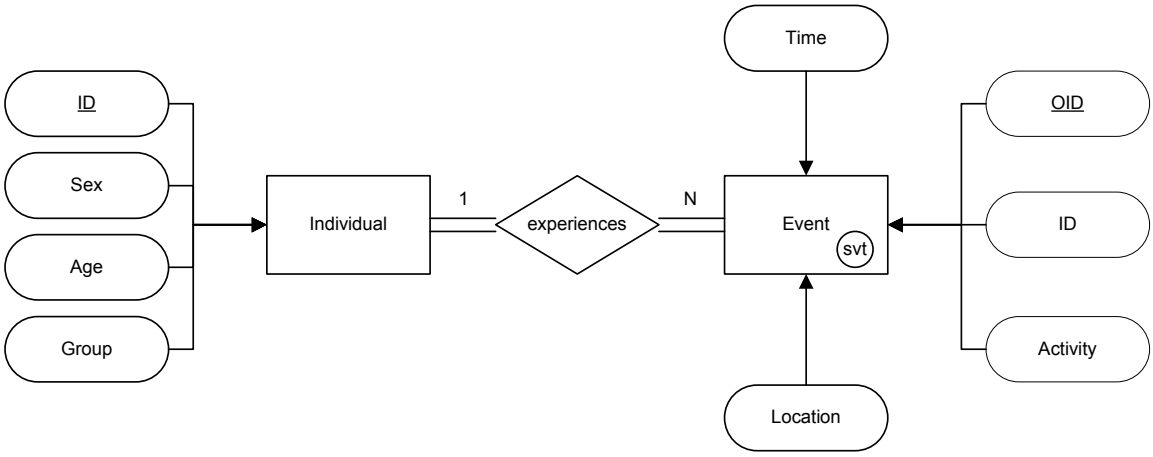

Figure 4: Data model

4 ANALYSIS AND DETECTION OF CONFLICTS

Visual analysis and descriptive statistics for the two parks already indicated interesting trends regarding the spatio-temporal distribution of gender, age and activities, as well as clusters in attribute space (activity/gender, for example). These trends will have to be tested statistically and will be published later. In this section, we will describe our analytical approach for the detection of (potential) conflicts in the usage of the parks.

First efforts for visualizing and calculating space appropriation used the discrete and object-based approach of the data for calculating (potential) conflicts. It coupled GIS analysis and visualization with calculations in a Java program. This approach proved to be both cumbersome and not very efficient. Even more important, personal spaces and activity footprints do not have crisp boundaries, as this approach suggests. Instead, they have vague boundaries, which is due to positional inaccuracy during data capture, and the generalization introduced by the categorization of activities and visitors. The inherent uncertainty of the boundaries can also be addressed by using fuzzy instead of crisp boundaries, with appropriate intrinsic or extrinsic visualization methods. In order to address the mentioned shortcomings of the object-based approach, we decided to use field-based representations.

One possibility to generate activity footprints and personal spaces is to calculate a density surface for each single visitor or group of visitors carrying out an activity together. Using different parameters for the calculations according to activity, density layers are generated that can be checked for overlaps, i.e. conflicts. At the same time, they can give an estimation of the relative intensity of the (potential) conflict (for density surfaces of activities, compare KWAN 2000). So far, we have used this approach with success to visualize distribution of gender and age, while first trial runs on activities were conducted (see below).

Figure 5 shows the Wahlenpark and the distribution of visitors according to gender. Clearly, it is difficult to discern patterns visually from the overlapping points. For one of the days, we calculated the relative density of male and female park visitors. Figure 6 shows this relative density by displaying a higher density of female visitors with peaks (green), while the troughs (red) represent a higher density of male visitors. The visualization suggests a clustering around certain elements of the park infrastructure. While female visitors seem to gather around benches and playgrounds and the fringes of the park, male visitors occupy more of the open spaces in the center.

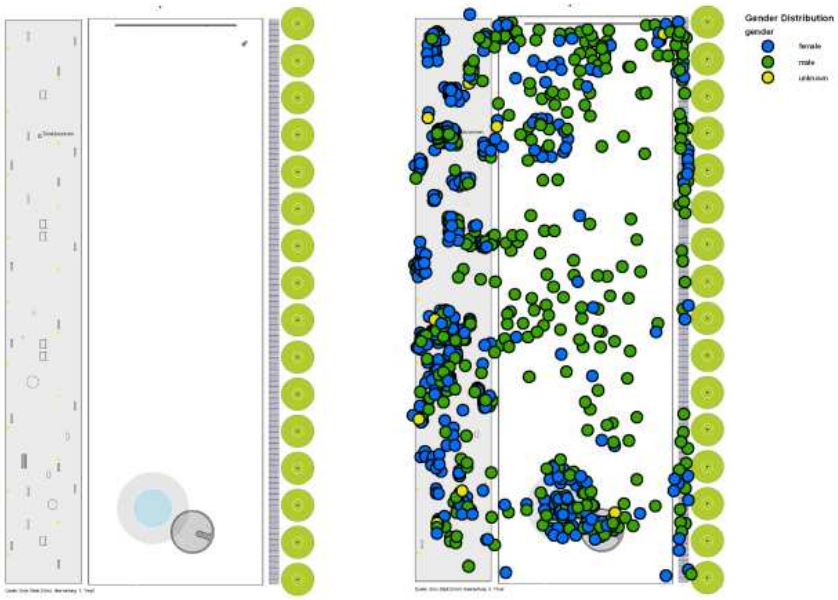

Figure 5: On the left hand side, the Wahlenpark viewed from above (water basin and canopy for providing shade towards the lower end, benches and playground on the grey strip to the left, large open grass area shown as white area in the middle, trees on the right); on the right hand side, the distribution of all visitors according to gender.

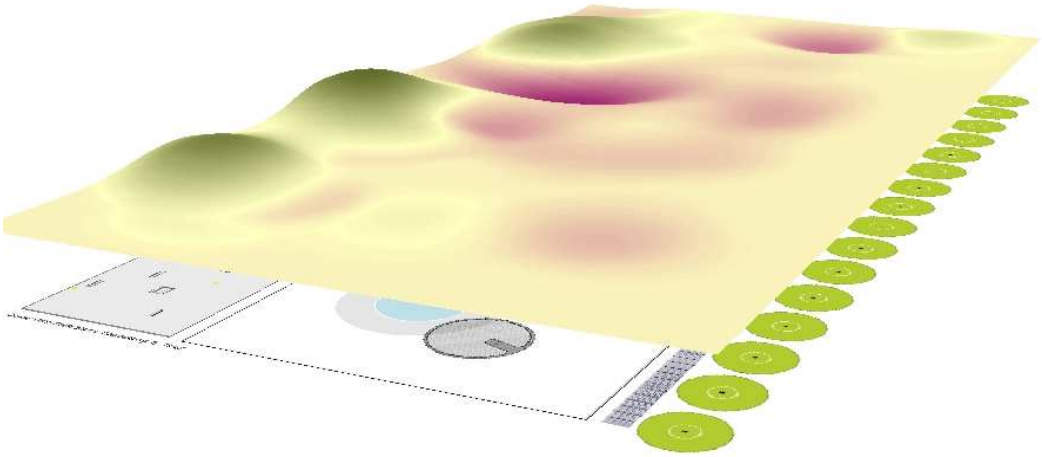

Figure 6: Relative density of female and male park visitors

In order to test a similar approach for different kinds of activities, we reduced the amount of data. With a smaller subset derived from one of datasets, the following calculations were made. First of all, coming back to our original model of space appropriation, we presume that there are no conflicts of space appropriation within one group of visitors. Group in our case means that its members obviously know each other and participate together in various activities. So, the first step was to group the individuals according to group membership as recorded during the observations. If several activities by individual group members were carried out, the prevalent one was chosen as group activity. In a next step, for each group two kernel densities were calculated: One for the activity footprint, and one for the personal space. As already mentioned in our example in Figure 3, different activities have different activity footprints and personal spaces. To account for this, we chose different radii and population values for the kernel density calculations. It is important to remember that these values at this stage of research are assumptions grounded in own experience and observations. They have to be verified and refined. Additionally, for the sake of simplicity, we operated with circular activity footprints and personal spaces. Each group's activity footprint was then checked against the personal spaces of all other groups via map multiplications, so that only overlapping spaces would retain any value at all. The resulting fields of potential or actual conflicts of space

appropriation were then added together to provide an overview (see Figure 8). A simplified workflow is displayed in Figure 7.

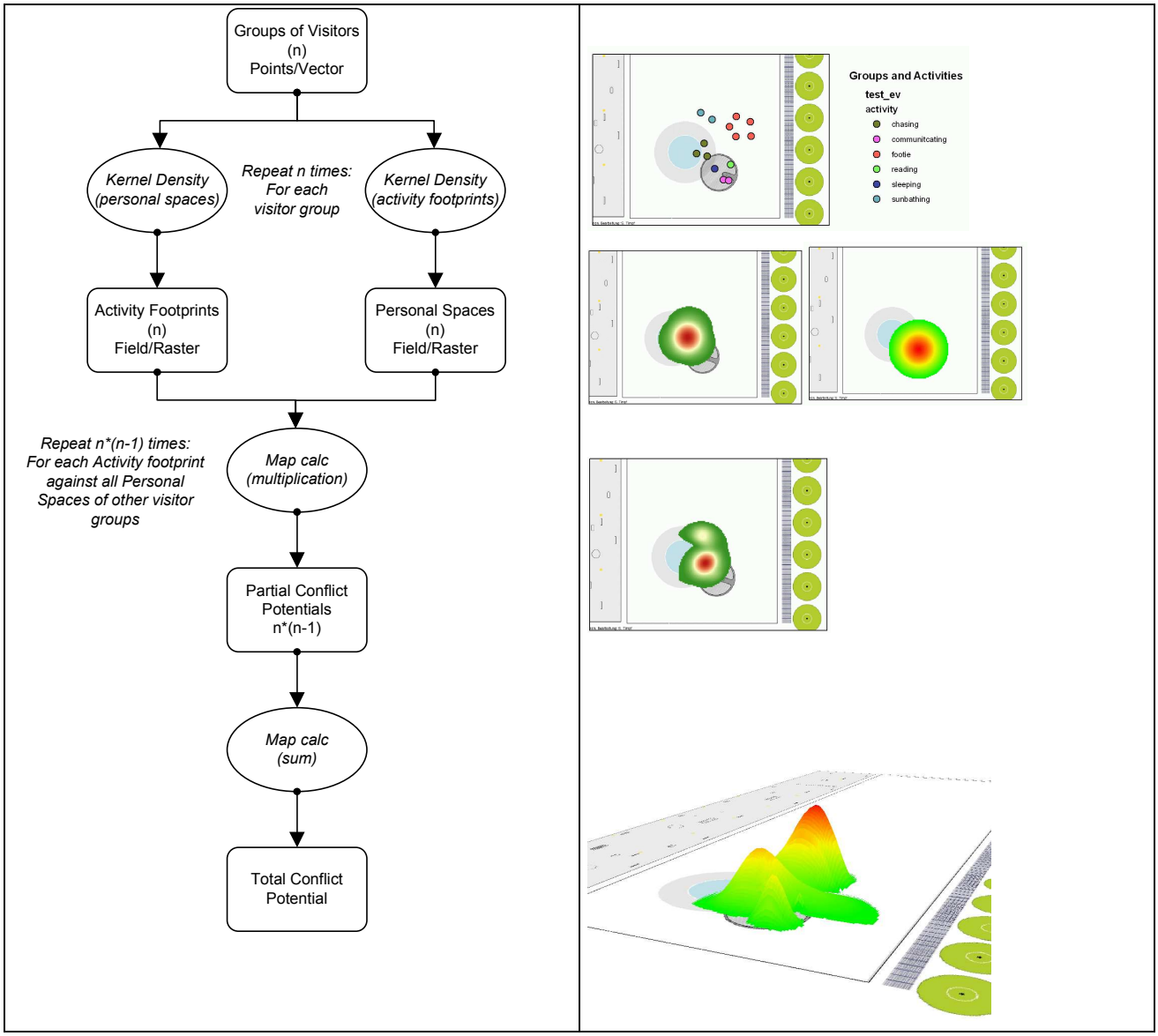

Figure 7: Workflow

5 CONCLUSIONS AND OUTLOOK

The first testing of methods and the results show that our goal of modelling social interaction at the micro level is already possible with the use of only the most relevant input information, namely environment and type of activity. Other topics such as gender conflicts, park appeal for varying age groups, nationality or ethnicity could in principle be also modelled with this method. We use both original and already applied methods on newly captured data, integrating them with developments from diverse fields such as environmental psychology, anthropology and geographical information science and visualization.

In order to discover the processes and interactions adequately, it is also necessary to take the temporal dimension into account (PEUQUET 1994). The animation of the object-based event data is already possible via the use of the TrackingAnalyst in ArcGIS, while an animation of the 3D density surfaces will require additional effort.

Our aim is to provide an intuitively understandable representation for exploratory analysis first, before allowing the user to drill down and analyse the data with geostatistical methods such as clustering, dispersion or motion pattern analysis. Thereby the interface can be tailored towards the specific needs of user communities such as administration, planning and research. Recent test runs of geovisualization tools and methods in the community of forest officials and rangers have shown, that the requirements of the specific

user groups vary greatly (ANDRIENKO et al. 2006). Representing the academic community, we already work in collaboration with practitioners such as the planning department of Zurich. We intend to test our methods and tools with different user groups.

Multi-agent systems offer the possibility to simulate space appropriation with different samples of park users and to try out the effects of various elements of park design. Another method for modelling conflicts of users in our study is the implementation of user behaviour in a multi-agent system (WEISS 1999). A multi-agent system allows for reproducing the behaviour of the environment and of individuals at a micro level at the same time as at a group level. In our MA simulation potential conflicts show up in the behaviour of the agents - agents try to avoid conflicts and will leave the park if they cannot pursue their activity without conflicts. A potential conflict is highlighted using the colour of the agent icon (from green to red). Other solutions such as change of activity instead of location, or verbal communication would also be possible.Depending on the intention of the user, the integration could be either GIS- or MAS-centric, with both elements closely coupled (compare BROWN et al., 2005).

Our research offers to contribute to the facilitation of park design and management. It should be possible to analyse parks already built that do not “function” as planned, and also to aid in the design of new parks.

6 BIBLIOGRAPHY

ALTMAN, I. (1975): The Environment and Social Behaviour. Brooks/Cole Publishing, Monterey.

ANDRIENKO, G.; ANDRIENKO, N.; FISCHER, R.; MUES, V. & SCHUCK, A. (2006): Reactions to Geovisualization: an experience from a European project. In: International Journal of Geographical Information Science, 20 (10), pp. 1149-1171

ARNBERGER, A.; BRANDENBURG, C. & MUHAR, A. (2006): Besuchererfassungstechnologien als Beitrag für eine nachhaltige Erholungsgebiets- und Stadtentwicklung. In: SCHRENK, M. (ed.): CORP 2006 & Geomultimedia06, pp. 573-580.

BAXTER, J.C. (1970): Interpersonal Spacing in Natural Settings. In: Sociometry, 33 (4), pp. 444-456.

BAUR, B. (ed., 2000): Erholung und Natur im St.Johanns-Park; Baudepartement Basel-Stadt, Basel.

BRANDENBURG, C.; ARMBERGER, A. & MUHAR, A. (2006): Prognose von Nutzungsmustern einzelner Besuchergruppen in urbanen Erholungsgebieten. In: SCHRENK, M. (ed.): CORP 2006 & Geomultimedia06, pp. 721-728.

BROWN, D.G.; RIOLO, R.; ROBINSON, D.T.; NORTH, M.; RAND, W. (2005): Spatial Process and Data Models: Toward Integration of Agent-based Models and GIS. In: Journal of Geographical Systems, 7, pp. 25-47

CRESWELL, J.W. (2003): Research Design: Qualitative, quantitative, and mixed methods approaches. Sage Publications, Thousand Oaks.

GIBSON, J.J. (1979): The Ecological Approach to Visual Perception. Lawrence Erlbaum

GRÜNSTADTZÜRICH (2006): Das Grünbuch der Stadt Zürich. GrünStadtZürich, Zürich.

HALL, E.T. (1966): The Hidden Dimension. Anchor Books, New York.

KAPLAN, R.; KAPLAN, ST. & RYAN, R.L. (1998): With people in mind: design and management of everyday nature. Island Press, Washington D.C.

KASPAR, H. and BÜHLER, E. (2006): Räume und Orte als soziale Konstrukte. In: Raumplanung, 125, pp. 91-95

KWAN, M-P. (2000): Interactive Geovisualization of Activity-Travel Patterns Using Three-Dimensional Geographical Information Systems. In: Transportations Research C, pp. 185-203

PARAVICINI, U. (2002): Neukonzeption städtischer öffentlicher Räume im europäischen Vergleich, Books on demand; Hannover.

PEUQUET, D. (1994): It's about time: A conceptual framework for the representation of temporal dynamics in geographic information systems. Annals of the Association of American Geographers, 84 (3), pp 441-461

SCHOGGEN, P. (1989): Behaviour Settings – A Revision and Extension of Roger G. Barker’s Ecological Psychology. Stanford University Press, Stanford.

TRYFONA, N. PRICE, R. & JENSEN, C.S (2003): Conceptual Models for Spatio-Temporal Applications. In: SELLIS, T. et al. (eds.): Spatio-Temporal Databases – The CHOROCHRONOS Approach, LNCS 2520, Springer, Berlin, pp.79-116.

WEISS, G., (1999): Multi-Agent Systems: A Modern Approach to Distributed Artificial Intelligence. The MIT Press, Cambridge, Massachussetts.

Between the Translating City and the Immediate City

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1 INTRODUCTION .

It is often said that a City "emits messages" . What kind of messages ? We consider four hypothesis :

- The Translating City . The City is in charge of some collective education . Values, and a Doctrine, are exhibited thanks to monuments and symbols . The Future is concerned . The French urban planner Marcel Poete has used the term "mysticism" . "Mysticism" is about Religion, the King, the Nation, Science, Progress … See the three Zola's novels, "Lourdes" , "Rome" and "Paris" . The main character finds the peace of his soul in Paris . Lourdes is ferociously criticized . The train, which is full of sick persons, is a vain (inefficient) circulation . At the opposite, the circulations in Paris are efficient . Rome is too much obsessed by its glorious past . Paris is the modern city . The meaning of the city is decoded . There are four parts, corresponding to Labour, Education, Commerce, Richness and Luxury . These activities are coordinated . The name of the project : Progress . Hence, Hope … The crisis of the Translating City dates from 1930 . It has been described by Siegfried Kracauer . Is a renewal possible ? There are many obstacles . See our other hypothesis . In the Jane Jacobs's views, the idea of "City Beautiful" has bad consequences . And obviously, tribalism or commercial purposes are not compatible with the Translating City .
- According to Jane Jacobs, the City is the place where inhabitants solve their problems . The worse segregation is when there are quarters inhabited by people without problems, and other inhabited by people unable to solve their problems . Social diversity matters very much . The places in the city should allow people to be in touch, observe one another, speak of their problems, collective or individual . It should not be imposed, since social life needs some secrecy (Simmel) . Some individuals are able to construct the social circles (Simmel) to which they belong, other need people near from them, in the same quarter, giving them advices and help .
- The city can be considered as a décor allowing scenographies and spectacles . The purposes are commercial . Medias are involved . An example is interactive billboards . There is no more a street, there is a shop . The first to describe the commercial purposes of the City was the sociologist Simmel . The City is the place for fashion, commerce and efficient circulations .
- Some sociologists (like the French sociologist Maffesoli) believe in the hypothesis of tribalism. A tribe is a group of individuals wanting to share emotions . They have some passion in common . They want to enjoy the present time . They are interested in these themes : the past, the places, Nature, divinities and myths … They believe in utopias . Inside the tribe individuals communicate, but they do not communicate very much with people outside . For them, some places in the City (plazas, stadiums, places where to meet …) are rich of symbols . These places trigger participation . According to the hypothesis of tribalism, the tribes are necessary to the "adjustment", the mutual acceptation which allows the unity of Society .

In this context, what is the role of these Information Technologies involved in urban life : cameras, mobile phones, Freenets … ?

2 THE CRISIS OF THE TRANSLATING CITY .

In his book, published in 1930, on the clerks in the large German cities, Siegfried Kracauer has described the "emptiness" of the City : no faith, no hope in the collective destiny . The Monarch has no more a role . People do not believe in the Entrepreneur (individual worth, morality) . The clerks are numerous, but they are treated like workers . They loose their jobs . They carry out impersonal tasks . They have time for leisure and see films triggering dreams .

In his book on the detective novel, Kracauer has described the derealized, reifed Society . He starts from the Kierkegaard's philosophy . There are two "spheres" , the upper one, the Absolute which is unknowable, the lower one, Immanence, human nature and only it . The "integral" human being, who achieves the Essence

(the Reality) , lives in a state of tension between the two spheres . He achieves the Essence during rare moments . Living in the upper sphere only, he is a mediator, a priest . Living in the lower sphere only, he is a fallen being . In the detective novel, this tension disappears . It is the realm of intellect, of the Ratio .The detective is the infallible Ratio's agent . The novel tells an absurd process, without a beginning and an end . The characters are disembodied . For instance, the Police is in charge of Order, without cogitating about what it is . It is not infallible . Only the detective is infallible . He is without any personality .

A reflection on Order is not possible, since the tension between the Ethics and the Law does not exist, the spheres of Absolute and Immanence have disappeared .

Perhaps, there is an aesthetic trick . There is a simple tale, which is constructed and well constructed . The reader follows a clear path, to discover how Truth and Morals always exist in the City .

The constant difficulties of the relationship with others are replaced by a temporary "exoticism" . The reader's intellect is challenged . Hence, his fears . When the story ends, it ceases . The Ratio has shed light on the events . The enigma is solved . Order and Law go back . The single cause of the reader's fears was the opacity (not the perennial existence of Evil) . He is reassured .

Today videogames are constructed like that . The City is a décor . The Ratio is replaced by the Winning Strategy . When the player has understood the Winning Strategy, his interest in the game ends . These games are without educative value . Perhaps, they are a cruel reminder of the role of urban planning, sometimes, when it served strategic purposes .

The "emptiness" in the City is created by the end of the tension between the Absolute and the Immanence . According to Kracauer it is like the hall of an hotel . He compares it to the Communion of the believers in a church .

The failure of the Translating City is obvious . There is no more an emission of messages, clearly structured, with a meaning concerning Society, in the City . It favours the attempts by groups, to attract the people's attention thanks to meetings and demonstrations . This evokes what Walter Benjamin has said on films : it is no more the time of clear understanding and the "aura" , it is the time of "shock" . See the example of "smart mobs" . To attract the people's attention, they trigger a shock .

Why this failure ? We find explanations in the Karl Mannheim's book "Ideology and Utopia" (published in 1929) . He examines the role of ideologies and utopias . He considers four utopias : the "millenarian" , the communist/socialist, the liberal/humanitarian, the conservative . All are passionate, except the liberal one . The millenarian utopia tells that an upheaval of Society can create a better life, immediately[(1)]. The communist/socialist utopia tells of Totality and determinism, and is materialist . The determinism explains the past, but mainly the future . The present generates the future . It is paramount to understand how . It is a kind of trial . The important ideas are only those in accordance with the well understood determinism . The economic structure has a determining role . The conservatives believe that the past determines the present . The goal is to be worthy of the glorious past, today . They believe in the worth of the cultural heritage . The liberal utopia is the only one which does not insist on the Totality, the determinism, the present, and materialism . It does not consider that the conditions of life determine the ideas . On the contrary, ideas determine the conditions of life . A straight line leads to a better society, at some pace . The liberal utopia, contrary to the other ones, is not passionate[(2)]

When he forecast a less important role of utopias, Karl Mannheim was wrong . In the years following the publication of his book, the utopias he has described, have moved the crowds . After 1945, the more influential doctrine is the Ordorealism (Michel Foucault) .

The better governance is not a theme for scenographies and spectacles in the City . It is because of the features of the liberal utopia : it is not passionate, it does not insist on the present, it does not speak of Totality . It is why the crisis of the Translating City continues .

Modern Art is a recourse, to obtain that people like the centers of the cities . Some city centers are known as successes, thanks to modern architecture : Amiens, Le Havre, Agadir … Modern architecture in the city

[(1)] A proponent of the worker's self government, Guy Debord, exposes a theory on urban space in "La Société du Spectacle" .
[(2)] It is also exposed in the book of the Austrian liberal economist Ludwig von Mises, "The Human Action" .

centers can be accepted and liked by people, because of the features of modern art : proximity, opposition to tradition, simplicity (geometrical shapes) .

We find ideas on this topics in the Francastel's book "Peinture et société" . He examines the paintings of the Quattrocentro . At this time, the "space in perspective" theorized by Alberti, is slowly prevailing in the paintings . It will be very much used by the painters, in the 17th and 18th centuries . The "mythical thought" had a role . The myths of Power, Richness and Luxury are useful to the community . The symbolic gift is the cement of Society . Often the painters have worked for rich and powerful customers (in Florence, Venice) . They have imagined the architectural styles to come . The painted city predates the built up city . This confirms the Marcel Poete 's "mysticism" . Marcel Poete believed in an imitation of Greek and Roman antiquity, concerning the city centers : streets with archways and a backdrop at the end, fountains, public gardens, monumental crossroads . With the Alberti's "space in perspective" , something new appears . It will produce the monumental city of the 18th century (Bath, Washington) and 19th century (Paris, Vienna) .

According to Francastel, Art is linked to Rite . The Artist wants to trigger the acceptance of some myths . Today, the painters invent a new figurative space . They invent a new language using images, as scientific and technicians invent new languages . Therefore, if the language which is invented by the painters goes with the evolution of Society, there should be a "resonance" between the modern architecture in the center of a city (imitating the shapes of painting) and people . A condition is to let the artists express themselves (not the "mysticism" of Marcel Poete, which implies that the meaning of messages is chosen by those ordering the work) .

Examples are :

- The new shapes obtained by computing (Frank Gerhy) .
- Sculptures evoking the mathematical topology .
- The "open space" . According to Francastel, some painters have imitated the roman frescoes . The character is at the center of the painting, livening up the space, but locally, while surrounding him there is a vast and mysterious space .

According to Francastel, the evolution of Art implies two kinds of artists, forerunners and other with a more educational role . The works of these artists (having a more educational role) can be attractive and charming . Therefore modern art in the center of cities can be accepted .

Take the examples of urban places which are very popular, even if they are not at the top, from the point of view of aesthetics : the Saint Michael fountain (Paris) , the Manneken Piss (Brussels) , the little Mermaid (Copenhagen) . The attractiveness is explained by the themes described by Francastel (the rite of gift as the cement of Society) : Power (Saint Michael fountain) , Vitality (the Manneken Piss) , The Waves and the Woman (the little Mermaid) .

3 THE COMMERCIAL PURPOSES OF THE LARGE CITY .

According to Simmel, the Large City allows fashion . The lower class can imitate the upper class, immediately . Hence the prosperity of the Large City . As the upper class abandons the fashion when it has extended to the lower class, fashions are replaced at a quick pace . The instant of the beginning of a fashion and the instant of its end are almost concomitant . Present and change are valued . It is like the Walter Benjamin's "shock" . Products need to be cheap . Fashion extends to other domains than clothes . An historical change was necessary : the power of the bourgeoisie . Note that the German sociologist Sombart disagrees : according to him, aristocrats made huge expenses to buy luxury goods . What matters is that there are many people paid with salaries, workers and clerks (Kracauer). It allows the lower class imitating the upper class . Fashion has two aspects : imitation and distinction . Ideas are "reduced" (because to follow a fashion is not really a choice, it is imitation) . There is a confusion between qualitative and quantitative : the individual following the fashion follows it more than the other, he does not make something different . Fashion reconciles contradictory trends in life : the universal and the particular (it corresponds to imitation and distinction) . Life in the Large City implies many stimulations and changes : hence awareness and nervous intensification . However individuals protect themselves from too many shocks, thanks to

indifference . Hence, the jaded mindset . Also, they are reserved . In the Large City, one finds awareness, indifference, reserve . In the small City, one finds habits, sentiment, stronger links between individuals . In the large City, often the other is considered with antipathy, because he makes other choices (than oneself) .

A century after, these descriptions are still pertinent . The Large City is a décor for scenographies, spectacles, parades . As it is noticed by Simmel, it is difficult to sell new goods to jaded, indifferent people . However scenographers want to attract thousands of people in the same place, at the same time. Medias are involved .

Interactive billboards are an other example .

Mobiles allowing geolocated services could be used in two ways . Either visitors and tourists retrieve information on the places in the City, if they are interested in these explanations . Either they look at the landscapes of the City, less, as it is easier to retrieve information on the shops where to buy goods, from their mobiles, than search, walking and discovering the City .

The Simmel's remarks on nervous saturation are still pertinent . There are too many things to look at and to do, in the urban places . Could you walk in a city, look at the urban landscape, listen to your walkman and listen to the voice coming from a pole, giving you advices to cross the street ?

4 THE TRIBES IN THE CITY .

A tribe is a group of individuals, having an interest in common . This interest is in a topic like : clothes, Nature, myths, the past, a social cause (solidarity with a local group) , sport … They have not a rational goal . They want to enjoy the present, to have the experience of living together, sharing some passion . According to Maffesoli, in a society where "politics is saturated" , it allows the groups in the City to accept one another . It is a kind of "adjustment" . The tribes experiment new ways of living and feeling . They influence the beliefs and the way of considering the social stakes . It is not because of reasoning, but trough the usage of symbols, attaching importance to choices concerning the everyday life or the relationship with the other . There is a kind of display effect . They do not convince, they show the possible meanings of choices, acts, ways of life .

Obviously, they can trigger an attrition of urban life . Some are discrete (the fans of astrology) . Other are sometimes vulgar or dirty (the owners of dogs) . Other are somewhat violent . They want a territory and to train people . People have to behave as they want (for instance, not to enter their territory) . We understand what is this kind of territory thanks to the Konrad Lorenz's ideas (the animals' territory) . Training, also, evokes animals and countryside . It is an attrition of urban life (social acceptability is its main feature) . Their appearance is not the appearance of those following a fashion . According to Simmel, one follows a fashion to please . In the violent tribes, they want distinction only . They exhibit signs of what they are . They wear uniforms, like in the case of supporters exhibiting the colours of their sport club . Examples of these violent tribes are bikers (in some cities) , dealers, supporters, fans of techno music …

"Happy slapping" is an example of violent tribalism . It poses the Jane Jacob's question : "Who does use his (her) eyes to watch the street ? " . The Jane Jacob's answer was : the inhabitants . An other answer is cameras everywhere in the City, collecting data which are at the police's disposal . Those organizing a "happy slapping" seem to say : "it is our eyes" . They ape the authorities themselves . Hence the authorities' response : a law forbidding "happy slapping" (in France) .

Other tribes can help to achieve an "adjustment" . It is not thanks to rational doctrines, but thanks to sympathy, motivation, influence or beliefs …

5 CONCLUSION .

The frame of the detective novel is still the same (except for a few authors) . Now, a team holds the enquiry . Perhaps there are disputes between the members of the team . Perhaps one of them has personal problems . It is only details . It is still the realm of the Ratio . They use Information Technologies : they know data on mobile calls, or retrieve data from databanks (photos, life stories ..) . According to Kracauer, the detective is the infallible agent of the Ratio . What matters is his mind, not the tools he uses . He perceives interesting signs that the other do not perceive . Today he could perceive an interesting sign in a huge mass of data .

We should reflect on the use of Information Technologies inside a framework allowing to understand the Reality . The Absolute and the Unknowable exist . If we forget the “relationship” (the relationship between the Absolute and the Immanence) , Information Technologies will fall into pure immanence . The Totality is known by an individual through rare experiments, progressively . Apparently only, the autonomous legality (separated from ethics) achieves the Totality . There is only a simple contrast of legal and illegal, appearing through facts . Outside the “tension” we could accept a use of Information Technologies determined by a hastily defined Ratio . We should avoid making the mistake of posing the question of the use of Information Technologies, in terms of tools only . The Integral Man should reflect on the tools and their effects, while accepting the “tension” (between Ethics and Law) .

Cameras can watch cars and people in the streets, personal data on the passengers taking planes can be collected . A reflection on the use of these technologies is necessary . The Community cannot accept an unspecified and uncontrolled use . A recourse is to destroy the data, quickly . For instance, if a toll to enter the City is acceptable, data on the number plates, which are collected to check that the toll is paid, should be destroyed one day after . It is the same, concerning these automatic radars, alongside roads and highways, which trigger fines paid by drivers .

Tribes are involved in some problems that the managers of cities have to solve . Here are two examples :

- The flight to California . Given the generous measures in favour of poor people in the State of California, thousands of people come in California, to live there, every year . Also, they are attracted by sun, the climate, the pleasant atmosphere … Many years ago an other tribe, the hobos, were travelling through the territory of the United States, for free, by train, all year round . This tribe was studied by the American sociologists . Today the problem posed to the Californian authorities is tough, since there is not a clear criterion to distinguish between “good” and “bad” migrants .
- The fans of techno music . The tough problem is when they meet to listen to the music they like : one hundred of thousands people meet together for one day, eating and drinking … In France, the State makes expenses and organizes these meetings in some places, far from the cities (in disused airports, for instance) .

Tribalism can explain in part, the content of the communication allowed by the Freenets in the large cities . There could be two kinds of content :

- Individuals and groups want to solve their problems : to find a job, to ask advices, to support a project …
- The communication inside a tribe is concerned . It is communication between those in the tribe, only . They like some symbols . They want to share emotions . Even if it seems frivolous, these flows of communication have a role . Many places in a City have a symbolic meaning . Tribes are interested in these places . It allows the “adjustment” . The existence of Society implies collective representations which are common, which are shared . The “symbolic marking” of the urban space has a role . It would be vain to seek to have an influence on these tribes . Obviously, if a Freenet is watched, it will not be very much used . A feature of the tribes is their “fluidity” (their interests and goals are ephemeral) , and it makes difficult to have an influence on them .

6 REFERENCES .

FRANCASTEL P . Peinture et société . Denoel . 1994 .
KRACAUER S. Les employés . Avinus . 2000 .
KRACAUER S. Le roman policier . Payot . 2001 .
MAFFESOLI M. Le temps des tribus . La table ronde . 2000 .
MANNHEIM K. Idéologie et utopie . Editions Maison des sciences de l’homme . 200

Where are the planners in Municipal Wireless deployments?

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1 INTRODUCTION

In April 2007, Philadelphia, the fifth-largest U.S. city, will host the American Planning Association's 2007 National Planning Conference. As a planner and member of APA, I read the program with interest to see what the "hot" planning topics are this year. As a strong advocate of the involvement of planners in municipal wireless deployments, I was somewhat surprised that the conference program made no mention of Philadelphia's ambitious Wireless Philadelphia project which represents one of the largest wireless initiatives underway in the United States.

Cities have generally been at the forefront of the adoption of the new technologies that transform society, whether railroads in the nineteenth century or automobiles in the twentieth century (11). With more than 300 wireless projects in various stages of preparation in the U.S. alone (9) and a similar number of initiatives in various cities across the globe, it appears that municipal wireless networks represent part of the global evolution towards the Information Society. Planners, in turn, have always played a key role in the implementing and helping cities and society adapt to new technologies. With this in mind, their multi-disciplinary thinking, experience with municipal infrastructures and operations, and strong technical background should offer them an integral role in developing these wireless infrastructures as well. This research aims to explore what role such wireless infrastructures can play in planning and how planners can use them in their work?

According to a new report from ON World (7), in North America alone, the market for municipal wireless could reach $10 billion by 2011. In terms of wireless deployments, Europe lags behind North America by about 1-2 years, however, the much vaunted eEurope program and increased European efforts to improve the competitive environment in the telecom sector should foster a similar amount of growth here as well. The main drivers behind these projects are municipal services including public safety, transportation and utility services – areas where planners have traditionally played an important role. As a result, planners in most cities will eventually be impacted either directly or indirectly by the ongoing "unwiring" of the Internet in their towns.

2 TYPICAL OBJECTIVES

In today's global economy, competition does not occur between countries, but between cities. Investment in such new infrastructures is essential for cities to remain competitive and retain or attract new increasingly mobile workers and businesses. The establishment of a digital community is an investment by a city in its citizens and businesses so that they can continue to compete in the global economy. The wireless infrastructure not only helps in breaking down the Digital Divide among citizens, but also promotes efficiency in the public and private sector. Finally, the infrastructure is crucial to developing new innovative services for improving citizen satisfaction and also fostering growth. Some of the reasons cities cite for setting up their wireless infrastructure include (10):

- Economic development
- Social betterment
- Government efficiency
- Tourism and Marketing

3 TECHNOLOGIES AND REQUIREMENTS

The terms municipal wireless or digital communities have often been interpreted as being synonymous with Wi-Fi technologies. However, actually a wide range of technologies are available for "unwiring" a community. These technologies include Wi-Fi, the term commonly associated with the IEEE 802.11 standard; wireless mesh, which combines the characteristics of cellular networks with Wi-Fi technology; the newer WiMAX or IEEE 802.16 standard; the cellular 3g and 4g technologies; and even BPL – broadband

over powerline technologies. In their White Paper on the subject (1), Intel Corporation suggests a number of technical requirements that must be met by the wireless infrastructure considered by the community including:

- Ubiquitous Wireless Local Area Network (LAN) Connectivity — Allow users to easily connect wirelessly to applications and services in the wireless community from any location, at any time, on any device.
- Multiple Device Support for Both Connectivity and Application Access and Usage—The network must support a variety of devices including laptops, PDAs, and similar devices.
- Support for Industry Standards—When possible, the network should support industry standards to ensure interoperability with different vendor equipment.
- Scalability and Adaptability—The network must be able to arbitrarily grow without affecting required performance levels.
- Broadband Connection Speeds—The network must ensure adequate bandwidth for typical applications and services.
- Reliability and Durability—Critical infrastructure must not have a single point of failure. Fail-over and redundancy mechanisms must be included to ensure high availability of the infrastructure.
- A Centralized Management Solution—Tools must be available to efficiently manage the infrastructure and ensure for critical maintenance with minimal disruption to the network.
- Roaming—The network should support full Internet protocol (IP) mobility, including the ability for users to roam between wireless nodes and IP subnets without losing connectivity.
- Quality-of-Service (QoS)—The network should support latency-sensitive applications such as Voice-over-IP (VoIP) and streaming media, as well as have the ability to dynamically allocate bandwidth based on priority.
- Security—Robust but friendly security solutions that are, where possible, transparent to the user should be woven throughout the infrastructure to ensure confidentiality and integrity of all data passing over the network.

In addition to the requirements for the wireless infrastructure, Intel also recommends that communities implement a Government Federated Services Bus (GFSB) as a key component of the deployment. The GFSB is a common core infrastructure that is used for each new application instead of duplicating capabilities for each new application that is implemented. It “includes Web Services and Web Services Management, asynchronous messaging, process choreography, and federated identity.” (ibid)

4 APPLICATIONS

Let’s explore some of the applications that have become prevalent in wireless cities to date.

4.1 Public safety and disaster prevention

Wireless communities across the globe have implemented a range of applications that utilize these infrastructures to enhance public safety or help emergency managers in the event of a major disaster. One of the most common solutions and main driver of Return on Investment (ROI) for such projects is security surveillance. Many cities are deploying wireless enabled surveillance cameras as an alternative to more costly analogue (wired) deployments. The cameras can be fix or mobile, generate high-quality MJPEG images, are shielded behind bullet-proof casings and can be remotely controlled by headquarters or even units in the field.

The wireless network is also used by emergency management personnell to exchange data and information and communicate (e.g., via VOIP or video conferencing technology). Siginificant cost reductions can be

achieved by the ability of personell to complete „digital" paperwork online during down-time in the field as opposed to waiting until they return to headquarters (5).

At least one digital community has used Wireless technology to help minimize the impact of catastrophic events. By setting up a network of wireless sensors, emergency management officials can obtain real-time information on e.g. chemical poison gas leaks, wild fires, or similar catastrophic events, including forecasts of dispersion that allow emergency managers to launch coordinated efforts to protect the population (7). Responses can include using the network to reprogram traffic signals to ensure smooth traffic flows during evacuation efforts, deploying units to affected or soon to be affected areas or using the network to obtain information from hazmat databases.

Through RFID tagging, emergency management authorities can also track units in the field to better coordinate emergency response efforts. Such locator chips in combination with helmet-mounted wireless video cameras help incident commanders and field personnel at the scene share knowledge during emergencies. In combination with Geographic Information System applications, these systems can also help coordinate units on the ground in situations of poor visibility.

4.2 Transportation

Another important driver of ROI for many wireless projects is transportation-related applications ranging from the transformation of public transportation vehicles into mobile hot spots, to the monitoring of traffic conditions and the management of parking spaces.

Wireless networks are used in many cities to support the better implementation of traffic control strategies. Real-time data from a variety of sources including surveillance cameras and RFID sensors enable the monitoring of traffic conditions. Traffic managers can respond to congestion by reprogramming traffic signals or sending alerts through the network. Motorists can avoid troublespots by being forwarned of congestion. Ultimately, transportation planners can use the wealth of data gathered through the creation of such networks to improve overall community transportation strategies.

The wireless network also allows public transportation firms to track and optimize the movements of vehicle fleets, reduce communication costs, and improve passenger experience (4). In this manner, innovative wireless applications can play an important role in both reducing costs and increasing ridership levels.

Some cities have implemented comprehensive Parking Guidance and Information Systems integrating information on public and private parking spaces within the city. Using the system, people can check LCD sign boards at the roadside, access the Internet, or make city calls to obtain real-time parking information (3). Other cities have set up systems allowing them to monitor parking meters remotely to improve efficiency. The parking meter component of the Westminster (London) wireless was a main argument behind that deployment.

4.3 Utility management

Another commonly observed component of municipal wireless projects is a range of applications aimed at improving the efficiency of local utilities and their mobile workforces.

Geographic Information Systems (GIS) are an essential tool for utility managers. Through integration of GIS applications into the wireless network, utilities can create data infrastructures to promote the sharing of data and information among various utility service providers. The chief benficiary for such services are field workers who can access and enter data remotely. Some cities are exploring the use of 3D utility maps to allow repair crews to avoid incidents while navigating layers of utility lines while servicing buried infrastructure.

Similar to emergency managers and public transportation companies, many utilities also use vehicle location tools to help them track their vehicles and optimize routes. Devices installed on the vehicles continuously transmit location and other data over the city's mesh network to the dispatcher. Using a simple browser application, the dispatcher can visually track vehicles in real time.

Another relatively common solution implemented by utility companies involves adapting existing automated meter reading for gas and water meters to the wireless network (6). For such solutions, meters on homes and businesses are equipped with Wi-Fi devices that report consumption several times a day. The meters transmit data to a central server, allowing customers to monitor consumption. The system cuts down on misreadings

as well as mishaps to meter readers accessing difficult properties. Close monitoring helps utility managers match gas usage with gas price fluctuations and control water flow to reduce system breaks (2).

4.4 Enhanced Government efficiency and services

Beyond the obvious reduction of Internet and communication costs in government offices and for their mobile workers, a range of wireless applications are aimed at improving the efficiency of government operations and increasing citizen satisfaction with services.

Outfitting mobile workers with mobile devices (Tablet PCs or PDAs) allows them to send „fresh, detailed reports" back to their office after each call enabling them to conduct more inspections or visits per day (ibid). Like utilities and emergency managers, government offices can also launch resource tracking applications to optimise routes and the frequency of trips.

Most local governments already have a variety of eGovernment services available online. Because of the lack of Internet access, however, many citizens still must resort to getting in line as opposed to jumping online to access these services. Managing the needs of these "unconnected" citizens creates an additional burden on the human resources of the local government. The wireless network not only increases the possibility for citizens to connect to these services using their own devices, but also allows local governments to easily and quickly deploy wireless enabled information kiosks at key locations throughout the city to further increase citizen access to such services. In this manner, "citizens can pay bills, obtain government licenses and access information about local traffic problems, events and leisure activities." The wide range of affairs that can be resolved over the wireless network improves the perceptions of citizens towards their local government and their overall satisfaction with government services (ibid).

MUNICIPALITY	PRIMARY DRIVER
Chaska, MN	Digital divide for schools, businesses and residents
Cheyenne, WY	Traffic-signal management
Corpus Christi, TX	Automated meter reading for city-owned utilities
Lewis and Clark County, MT	T1 replacement; access to remote county buildings
Medford, OR	CDPD replacement public safety
Ocean City, MD	Integrated digital, voice and video for city buildings
Piraí, Brazil	Municipal field-force productivity; promotion
Portsmouth, UK	Bus passenger information dissemination
San Mateo, CA	Police field-force productivity improvement
Shanghai, China	Police field-force productivity improvement
Spokane, WA	Municipal applications and e-Government initiatives
Westminster, UK	Video surveillance and enhanced security

Table 1. Some Digital Communities and their primary drivers. (ibid)

5 ROLE OF PLANNERS IN MUNICIPAL WIRELESS DEPLOYMENTS

From the potential applications described above, it is easy to discern the important role that planners can and should play in such municipal wireless deployments. In order to assess the actual involvement of planners in the establishment of digital communities, the Central European Institute of Technology Alanova Institute of Urbanism, Transport, Environment and Information Society (CEIT Alanova) developed an online survey with a link to the CORP website (see Appendix I). CEIT Alanova also forwarded this link to the mailing list of the Department of Urban and Regional Planning (DURP) alumni of the Florida State University. Unfortunately, response to the survey up until the writing of this paper was somewhat limited. However, researcher could draw a number of preliminary conclusions from the responses of those planners who participated in the survey to date.

Only half of the respondents had encountered one or more of the terms used to describe municipal wireless initiatives. Those who had encountered these terms, not surprisingly, worked in towns where such deployments were already underway. In response to the following question: "A municipal wireless deployment can play an important role in the following planning fields/activities:", on a Likert scale of 1 to 5 ranging from strongly disagree (1) to strongly agree (5) the mean responses for the various planning disciplines were (for the full questiopnnaire see corp.at):

Transportation planning: 4,2

Economic Development: 4,6

Zoning: 3,2

Disaster planning:	4,8
Environmental planning:	4,2
Site planning:	3,2
Parks and recreation:	3,2
Construction permitting:	4,8
Utility planning:	5
Health planning:	4,4
Growth management:	4
Housing and community development:	4,2
Infrastructure planning:	4,6
Public facilities planning:	4,6
Citizen involvement:	4,6

In other words, the deployments were construed as important for nearly all planning fields except parks and recreation, site planning and zoning where there was less consensus on the level of importance. Not surprisingly, the significant impact of deployments on the field of utility planning was unanimously agreed among respondents.

In terms of response to the question "Planners should play a role in implementing wireless deployments because of their:", the following responses saw the highest level of agreement (with a mean score of 4,6):

Ability to work with various stakeholders in the interest of achieving common goals.

Ability as generalists to see the "big picture" and the wide range of potential benefits of such deployments.

Closely followed by (with a mean score of 4,4) their:

Ability to suggest potential wireless applications geared towards improving city operations

The survey offers a very preliminary picture of how planners view the relevance of municipal wireless deployments to their work. Based on CEIT Alanova experts' experience in developing two feasibility studies related to such deployments and reviewing countless others, there appears to be a number of key areas where planners can offer important contributions to the success of wireless initiatives, these include:

- Development of the feasibility studies related to the deployments
- Provision of models for stakeholder involvement
- Consultation on potential applications

Feasibility studies for wireless deployments typically contain a description of how the project fits into the policy goals of the community, a presentation of local demographic factors, an inventory of city-owned and/or managed infrastructure (light poles, existing fibre optic networks, etc.), a description of key anchor tenant applications, as well as an overview of potential business models. These topics are all areas where city planners are arguably best-equipped to gather such information. With this in mind, planners should at a minimum play a consultative role in the drafting of these chapters of the feasibility study. In addition, GIS applications tend to be a central component of most wireless deployments ranging from the spectral analysis mapping for planning networks to the actual applications that will run on the network. Once again, GIS is traditional a tool of the city planning offices and it is hard to conceive a deployment occurring without their being consulted.

As with the creation of any new municipal infrastructure ranging from roads to utilities, planners have traditionally played a key role in such projects. City planners are used to navigating a morass of often conflicting interests in order to achieve consensus on the various aspects of such projects. Although by far less capital intensive and disruptive then many other capital improvement projects, municipal wireless deployments nevertheless have their fair share of detractors not the least of which being incumbent telecoms who often feel threatened by local governments' encroachment on what they construe as their "turf". With this in mind, planners can play an important role in ensuring that the various stakeholders are involved and eventually "buy-in" to the project.

As described earlier, a majority of the applications deployed on the wireless network are related at least in part to various planning disciplines. As a result, it is crucial to involve planners in the development of System Requirements Specifications, testing and, ultimately, the operation of the applications. Since it is these "anchor tenant" applications that will drive ROI for most deployments, in many cases their planning (and planners involvement therein) will be a determinant factor as to whether a deployment moves forward.

6 CONCLUSIONS

It is apparent that municipal wireless deployments are destined to become the norm as opposed to the exception for cities as they attempt to stay competitive in the Information Society. Cities have generally been at the forefront of the adoption of the new technologies, whether railroads in the nineteenth century, automobiles in the twentieth century, or municipal wireless infrastructures today. In turn, they have relied on planners to guide them in adapting to the new technologies.

While planners apparently are not the ones spearheading the efforts to "unwire" their communities, it is inevitable that they will play a major role in the deployments and will, ultimately, greatly benefit from the applications that are developed to run on them.

Planners contributions to these deployments will likely lie in three main areas:

- Development of the feasibility studies
- Provision of models for stakeholder involvement
- Consultation on potential applications

With this in mind, the level of their involvement in municipal wireless deployments can ultimately play a significant role in the success or failure of the effort.

7 REFERENCES:

1. Intel Solutions (2005) Core Technologies for Developing a Digital Community Framework Wireless Fabric, GIS Portal, and Government Federated Services Bus Technologies, Intel Solutions White Paper, August 2005.
2. Intel Solutions (2005) Digital Community Best Practices, Intel Solutions White Paper, 2005.
3. Intel Solutions (2005) Digital Community Deployments, Intel Solutions Brief, 2005.
4. Intel Solutions (2006) The Dollars and Sense of Government-Led Wireless Internet: A Guide for Government Employees and Community Activists, 2006.
5. Leon, Nick. Imperial College, London, The Cloud (2006) The well connected city: A report on municipal networks, November 2006.
6. Muniwireless.com (2007) A Perfect Match, Spring 2007 Issue of MuniWireless Magazine.
7. Muniwireless.com (2007) Muni Wireless Broadband: Service Oriented Mesh-ups, Feb. 2007.
8. Muniwireless.com (2007) Rural Wireless – Disaster Management, Spring 2007 Issue of MuniWireless Magazine.
9. Muniwireless.com (2006) 29 December 2006 list of US cities and regions, 2006.
10. Neff, Dianah. Civitium (2006) Wireless Cities Conference, Cannes, France, November 30, 2006.
11. The Wireless Philadelphia Executive Committee (2005) Wireless Philadelphia Business Plan: Wireless Broadband as the Foundation for a Digital City, February 9, 2005.

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Urban Planning of the Heritage City of Varanasi (India) and its role in Regional Development

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ABSTRACT

Varanasi records a settlement history since ca 800 BCE. However, the present city has grown during the early 18th century. Spreads over an area of 84.55 km2, the city is inhabited by 1.50 million people (in 2001), consisting of Hindus (63%), Muslim (30%) and other religious groups. Additionally, everyday about 40,000 commuters visit the city, which increases to 60,000 during festive season. There are ca 3000 Hindu sanctuaries, and 1388 Muslim shrines. The vividness and multiplicity, and diversity and unity are easily envisioned in its religion, culture, society and economy – altogether making a mosaic. Every year about a million Indian pilgrims come here, and approximately 125,000 tourists from abroad visit this city. Till mid 19th century the urban landscape was dominated by tracts of garden-groves and linking water bodies and drains that helped to maintain ecological order and escape from water logging. Under the 'Master Plan 2011' the expanded area proposed for the Greater Varanasi is 179.27 km2. The major changes since 1991 as in the Plan, indicate a catastrophic increase of land under government and semi-government uses (+390.50%), and public and community facilities (+190.63%). This catastrophic change spoils the ecological system of land use; the most crucial group is park and open ground that records decrease of over 60% in comparison to 1999.

The ancient association of the Ganga river with religious, traditional and cultural fabric of the city and the immense influence of associated activities on the development of economic and social life of the city and related tangible and intangible cultural expressions are unique in the world. "The Ganga River and the Riverfront & Old City Heritage Zone of Varanasi" is being in the process of proposal for nomination to the World Heritage List of UNESCO under the category of 'cultural properties'. The heritage zones, areas and properties identified there are at the risk or even destruction due to immense pressures from tourism, economic development and population pressures. The increasing population is over burdening the carrying capacity of urban environment and the river ecosystem and unplanned mass tourism could potentially have a hard impact on the cultural carrying capacity of the old city centre and the river ecosystem. The move made by local NGOs and citizens has activated city administration to reformulate measures for preservation of the cultural heritage of Varanasi. Ultimately there is an urgent need to re-vitalise the city with re-establishing the ecological ordering by promoting civic sense and active public participation, and coordination among various institutions. Since ancient past the city of Varanasi has been serving as the cultural and regional capital. And, at present its role as node in regional development need to be realised and planning strategies to be made accordingly.

Key words: Urban heritage, Riverfront Ghats, Master Plan, Public participation, City region.

1 THE BASIS: GROWTH OF URBAN FABRIC IN THE PAST

Varanasi, known as the Cultural Capital of India, records a settlement history since ca 800 BCE. However, the present city has grown during the early 18th century. Varanasi acquired status of a million city (as urban agglomeration) in 1991 and recorded a population of 1,211,749 in 2001, and ranked 23rd in the hierarchy of million cities in India. The city's population consists of predominant Hindus (63%), substantial Muslims (30%) and other religious groups. The main city sspreads over an area of 84.55 km2, and is inhabited by 1.21 million people, consisting of Hindus (63%), Muslim (30%) and other religious groups. Additionally, everyday about 40,000 commuters visit the city, which increases to 60,000 during festive season. There are ca 3000 Hindu sanctuaries, and 1388 Muslim shrines. Existence of 6 Universities and similar institutions, 150 Muslim schools, ca 100 Sanskrit schools, and 50 Inter and Degree colleges make the place as "City of Learning". The vividness and multiplicity, and diversity and unity are easily envisioned in its religion, culture, society and economy – altogether making a cultural mosaic, in which festivities play a major role.

The impact of intense development pressures is harder in the old city centre where population density reaches to 500 to 700 persons/ha. Every year about half million Indian pilgrims/ devout Hindus comes here, and approximately 125,000 tourists from abroad visit this city. Till mid 19th century the urban landscape was dominated by tracts of garden-groves and linking water bodies and drains that helped to maintain ecological order and escape from water logging. Under the 'Master Plan 2011' the expanded area proposed for the Greater Varanasi is 179.27 km2. The major changes since 1991 as in the Plan, indicate a catastrophic increase of land under government and semi-government uses (+390.50%), and public and community facilities (+190.63%). This catastrophic change spoils the ecological system of land use; the most crucial group is park and open ground that records decrease of over 60% in comparison to 1999.

Kosambi (1970: 90) rightly remarks that "the first cities with full continuity into history lies on the river route, in spite of the difficulty of settling alluvial regions. …. Their foundation at the beginning of the first millennium can be explained only on the basis of still earlier navigation on these powerful rivers that flowed swiftly through impenetrable forest and swamps". In the similar way Varanasi might have grown, and after passage of time became the most famous sacred place of Hinduism. The archaeological findings at Rajghat (northern part of Banaras city) confirm the existence of urban settlements during 800-500 BCE. Ashoka (272-242 BCE), the great Mauryan king, had declared Buddhism a state religion and visited Sarnath. Under his patronage there developed a Buddhist township with many monasteries, stupas and shrines. The inscriptions of Kushana king Kanishka, dated 3rd century CE, refer to the persistence of Buddhism together with animistic religion of Yaksha.

The Pali and Buddhist literature mention the structure, condition and some plans of the city of Varanasi, especially narrating the six beautiful gates surrounding the city and moats along the main protecting rampart walls. Perhaps these gates were linked to the market areas in the city. The city was dominated by mud houses planned in a rectangular design, but by the turn of 2nd century BCE burnt bricks became common in making buildings. The structural plan clearly showed the open spaces between two houses and segregating lanes. Such plans continued even in the Gupta period, 4th to 6th century CE. By CE 490 the Vishvesvara (Vishvanatha) temple had already been built, and in CE 6th century Jangamabari Math was already established.

By the Gupta period the city expanded, following a rough rectangular plan. The main roads were running parallel to the Ganga river, north-south. Evidences support that the city was divided by many wide roads and lanes, however there was no well-planned design. Even today north-south main axial roads and similar structure are marked (cf. Singh, 2005). During the period of Harsha (606-648 AD), a great Chinese pilgrim Hsüan-tsang paid visit to Varanasi and described the city as conglomerate of congested houses separated by narrow lanes, garden and groves, and water pools with lotus flowers.

The major expansion and transformation of landscape took place between 8th and 12th centuries. The first settlements were in the north to the confluence of the Varana to the Ganga, and later expanded in the southern side reaching to the present Kashi railway station. By the mid 10th century the Pratihar dynasty ruled the city and expanded its settlements in the southern part, however by the turn of 11th century the city came under the Gahadvalas that continued till 1197. In the Gahadavala period the city reached to its zenith. Three zones surrounding Omkareshvara, Vishveshvara and Kedareshvara temples came out in full bloom associated with sacredness and settlements, inhabited by traders and migrants belonging to various linguo-cultural groups from different parts of India. After the demolition of Rajghat fort (CE 1194-97) by Aibak and Shahabuddin the inhabitants of the area had to shift toward the west and south-west. Temples were destroyed in 1300s under Firoz Shah Tughlaq (1351-1388). In the 1400s, again under the rule of Sharqi kings of Jaunpur temples were destroyed. During the moments of calm, the Hindus rebuilt temples and lingas but they were again destroyed by the next wave of invaders. Under the rule of Lodis (1451-1526) a major part of the city was destroyed by Sikander Lodi.

A great sigh of relief was surely heaved when Mughal Emperor Akbar (1556-1605) granted more religious freedom. The Rajputs Man Singh and Todarmal, the two senior ministers in the court of Akbar, participated actively in repairing, rebuilding and in new construction of temples and Banaras ghats during his period. The Vishvanatha temple was rebuilt for a third time at a third place under the supervision of Narayana Bhatta. By the order of Aurangzeb (1658-1707), around thousand temples, including city's greatest temples like Vishveshvara, Krittivasa, and Vindu Madhava, were razed. In 1665 the French traveller Jean Baptiste

Tavernier, paid a visit to Banaras and described the architectural beauty of Vindu Madhava temple at the riverside. His account is notable because the temple was demolished in 1673 by the armies of Aurangzeb. There is no major religious sanctuary in the city of Banaras that pre-dates the time of Aurangzeb in the 17th century. The city of Puranic glory and beauty as it was known in the 12th century had disappeared by the end of 17th century. Of course, the sacred city could not be destroyed, but it could certainly be defaced.

During the 18th century under the influence of the Marathas (1734-1785), substantial part of the city had been rebuilt. The city became the recipient of the gratitude, the wealth, the skill and energy of the Marathas. It is said that 'Modern Banaras is largely a creation of the Marathas'. Bajirao Peshva I (1720-40) had patronised construction of Manikarnika and Dashashvamedh Ghats and nearby residential quarters. A number of ghats, water pools and noted temples of Vishvanatha, Trilochana, Annapurna, Sakshi Vinayaka and Kala Bhairava were rebuilt under Maratha patronage. Queen Ahilyabai of Indore built the present Vishvanatha temple in 1775-76. As one after another ghat was added, the temples rose, the city regained its gaiety, and its educational system was revitalised. The urban area of the city continued to develop along the river under the British rule.

By the approval of the British Governor-General Warren Hastings in 1791, Jonathan Duncan, a British resident in Banaras, founded a Sanskrit College, and in 1853 the present buildings of the college were built in Gothic style. In 1916, the Viceroy of India, Lord Hardinge, laid the foundation stone of what would become one of the largest and most beautiful universities in Asia, i.e. Banaras Hindu University. During the early decades of the 19th century Banaras was typical of an oriental city. Streets were not wide enough for wheeled carriage particularly in the densely settled residential areas. The streets generally were at a lower level than the entrance of the houses and shops that lined them. The Grand Trunk road passed from the northern outskirts of the city and the river Ganga was not bridged near Rajghat. The riverside and the inner zone of the city were approached by numerous narrow lanes as one can see even today.

The Municipal Board was instituted in 1867 under the Municipal Act XXVI of 1850, with a view to introducing a general improvement in the existing condition of the city. In continuation of such improvements, the site of the Maidagin tank gradually came to be replaced by a park known as the Company Garden, north of the present Maidagin-Kashi station road. Opposite the garden, to the south of the road, the Town Hall was built, as a result of the efforts of the Maharaja of Vijayanagar, and is surrounded by a large open space that lends itself to the holding of public meetings and functions in the centre of the city (cf. Singh, 2007). The introduction of various branches of N. and N.E. Railways along with the construction of the railway bridge near Rajghat, installation of water works and provision of improved sewerage and drainage works in the last quarter of the 19th century, all these widely modified the urban fabric of Banaras.

India received independence from the British rule on the 15th of August 1947. Since then no substantive change in the urban fabric and city morphology is recorded. On 15th October 1949 the district of Banaras assumed its present form and area by the merger of the erstwhile Banaras State (Kashiraj), and the city of Banaras became the district headquarters. In 1948 The Banaras Improvement Trust was constituted for making 'Master Plan of Banaras', and in 1951 the first such plan was prepared. The latest plan, that also demarcates heritage areas, was approved by the State Government on 10th of July 2001. However, due to the lack of the public awareness and active participation, the complex web of bureaucracy and the rise of both individualism and consumerism there seems to be little hope for the proper implementation of these plans.

2 POPULATION CHANGE IN THE 20TH CENTURY & ACROSS

During the three early decades (1891 1921), the population of the city declined by 11.2 per cent mainly due to several unfavourable factors like poor harvest, droughts, irregularities of weather, floods, epidemics and the post war effects of the World War I. In fact, during 1901 1925, Varanasi was one of the most deadly cities in northern India recording high population and insanitary conditions. Since 1921 the city has recorded constant growth of population, recording a growth of + 28.77 per cent in 1981-91. During 1821 31 the growth rate was 3.81 per cent, while it reached to 28.10 during 1931 41. In fact, "in the first half of the decade the falling prices consequent upon the depression of 1931 must have given a stimulus to the city-ward population" (Singh, R. L., 1955: 56). The closing impacts of World War II had also encouraged city-ward march of population. The post war developments, the influx of rural population for employment and immigration of refugee population were responsible for a very rapid growth during 1941-51, however the abrupt situation had changed in course of time, that is how during 1951 61 the growth rate had slightly

declined. This tendency had continued till 1971-81. However, again during 1981 91 the growth rate became slightly higher, mainly due to impact of tendency of rural to urban migration in search of better livelihood and employment opportunities in the city. The city is also upgraded as metropolis in 1991 by recording population over a million. It is expected that the growth rate would further be increased in spite of measures to check it (Table 1). Among the metropolises, Varanasi has constantly been loosing its rank in population size: its rank was 12th in 1961 which became 15th, 18th and 22nd in the decades of 1971, 1981 and 1991, respectively. In comparison to other metropolises, its growth is slower mostly due to lack of services related to administrative capital and diversified industrial developments.

Units / Year	1991	2001	2011	2021	2031
Municipal Area	929,270	1,103,951	1,367,278	1,640,216	1,835,197
Urban area Addition	101,593	107,798	205,558	344,502	511,962
VUA, Varanasi Urban Agglomeration	1,030,863	1,211,749	1,572,836	1,984,718	2,347,159
Decadal growth, VUA	29.48	17.55	29.80	26.19	18.26

Table 1. Varanasi, Municipal and Urban Area addition: Population Growth, 1991-2031.
(Source: Based on Census of India reports. *Low projection estimates)

Varanasi Urban Agglomeration (VUA), i.e. metropolis, is constituted of seven urban units of different characteristics and status as defined by the Census of India 1991 and 2001. The details of population of these units are given in Table 2.

Urban unit (Uttar Pradesh code 67)	Population, 2001	Decadal Growth Rate, %			
		1961-71	1971-81	1981-91	1991-01
2.1 VARANASI U.A. (Varanasi Dt.)	1,203,961	23.85	25.50	29.48	16.69
(1) Varanasi	1,092,445	23.04	22.45	28.95	17.58
i. Varanasi (MC)	1,059,961	23.89	22.45	28.57	14.47
ii. Lahartara (OG)	5,223	----	----	----	67.03
iii. Lohta	19,706	----	----	----	----
iv. Kandwa	7,555	----	----	----	----
(2) Varanasi Cantt.	17,259	81.99	65.73	1.64	18.03
(3) Maruadih Rly. Sett.	18,739	----	85.38	17.56	- 23.45
(4) Ramanagar (MB)	40,619	7.17	35.13	28.26	34.87
(5) Sheodaspur (CT)	11,420	----	----	85.43	50.08
(6) Phulwaria (CT)	11,971	----	----	61.87	22.60
(7) Banaras Hindu Univ.(NA)	7,788	40.90	26.12	- 6.63	- 32.3
Mughalsarai U.A. (Chandauli)	116,308	----	----	----	27.11
(1) Mughalsarai (MB)	88,387	----	----	----	32.85
(2) Mughalsarai Rly settl. (NAC)	27,921	----	----	----	11.79

Table 2. Varanasi UA: Population Characteristics, 2001
(Source: Census of India 2001, Series 1, INDIA. Registrar General of India Office, New Delhi, 2003).

It is estimated that the decadal growth rate of Varanasi UA would be increased slowly from 16.64 to 26.19 per cent from 2001 to 2021, however most likely the growth rate will decline to 18.26 by 2031 (cf. Table 1). The earlier estimates by R. L. Singh (1985) are therefore not fitting to the present estimates. In fact, R. L. Singh has not considered the case of Mughalsarai and Ramnagar, the two satellite towns, for his estimates.

At present the Varanasi UA spreads over 144.96 sq.km, thus recording density of 7081 persons/ sq. km, while it was 9434 persons/ sq.km in 1981. The decline of density is the result of the growth of residential colonies outside the UA area together with increase in the defined area of the UA in 1991. According to the Census of 2001, of the total population (1,203,961) only a little over quarter (26.64%) was employed, in which industry and manufacturing recorded 10.72%. Trade and commence (6.82%) and other services (5.01%) were the other main categories of employment. Among the population engaged in industry and manufacturing (128,930) about half (50.70%) were in spinning and weaving, followed by metal and manufacturing (14.91%), printing and publishing (6.19%), and electrical machinery (5.02%).

3 INDUSTRIAL LANDSCAPE

Out of total inhabitants of 1,202,443 (in 2001) in Varanasi UA, only 26.64% was recorded as employed, in which only 10.72% was engaged as industrial and manufacturing workers. Earlier the city had attracted the artisans, potters, and weavers who initiated the household industrial establishments like ivory work and making of idols, silken brocades, utensil and zarda. Even at present the people engaged in household industries (i.e. spinning and weaving) here constitute a very high share of workers (51%) which is more than that of Kanpur, the industrial hub of Uttar Pradesh. Metal and manufacturing (15%), printing and publishing (6%), and electricity-machinery (5%) are the other important sectors.

The small scale and household industrial sector is better developed employing majority of industrial workers and commuters. These industries mostly include spinning and weaving, followed with textiles, hosiery, chemicals and soap, food, printing and publishing, utensil, fencing net, tobacco, golden and silver foil making. Spinning and weaving is the oldest and most important household industry employing more than half of the industrial workers.

During post-independence period several large scale factories have been developed in and around the city specially along G.T. Road (N.H. 2) between Moghalsarai and Parao, e.g. Hari fertilisers, Woollen Mill, Engineering units, Agricultural equipment manufacturing plants, etc. With the establishment of Diesel Locomotive Works (D.L.W.) during 1961 in the western part of the city, ail industrial landscape has emerged. The factory manufactures diesel locomotives and employs more than 10,000 workers. Encompassing about 200 ha of land there has developed a well-planned colony of 3,000 quarters. Asia's leading designer and manufacturer of diesel and electric locomotives, this unit supplies locomotives also to Asian, East African and other markets.

An Industrial Estate has been developed to the west of the city at Lohta where small-scale industries have sprung up. These incorporate manufacturing of chemicals, plastic goods, iron bars and metal equipments, etc. The city has recently developed a specialised industrial wing of bead and carpet manufacturing. Precisely, no industrial zone is identifiable. The city has grown haphazardly in a natural process. Some new residential are — as have come up with assistance of the Town Planning Organisation, Vikas Pradhikaran, Avas Vikas Parishad and private colonisers.

4 TOURIST LANDSCAPE

Varanasi is one of the top individual tourist destinations in India and about 6 per cent of total international tourists coming to India pay visit to Varanasi. Like any other heritage city, Varanasi is also a product of a unique set of historical, cultural and functional circumstances and presented to particular group of people (i.e. devout Hindus) as a distinct sacred place (for pilgrimage). Tourist Arrivals in recent years in Varanasi shows continuously increase of tourists/pilgrims and also of International tourists. Still the volume of international tourists in Varanasi is considerably high, as it is almost double to some states of India (Singh and Singh 2007). In 2006 the city recorded close to a million domestic tourists and a little over two hundred thousands international tourists, respectively recording 20.6% and 26.1% increase over the previous year.

It is obvious that the major international catastrophes had directly affected the inflow. The terrorist attack on the World Trade Center, New York on 11 September 2001, which resulted to the loss of more than half a million lives, had directly checked the inflow of international tourists. Thus in 2002 there was a decline of 20.5% in tourist influx in Varanasi. This had a severe and multiple bad affect, resulting to loss of about half of the total inflow. In 2002, tourism industry in Varanasi gained a little but again faced great loss in 2003 due to spread of SARS disease in Southeast countries. The countries which having maximum share in Varanasi got severe loss due to SARS which directly affected tourism arrivals. However, since 2004 the tourists flow

to Varanasi has recorded appreciating speedy growth. The local religious and cultural life of Varanasi together with its built architectural heritage and the natural landscape of the Ganga river constitute an immense resource for heritage and sustainable tourism, both Indian and foreign visitors.

This city is very important especially for pilgrimage tourism where tourist enjoy morning boat ride, walk in narrow lanes (gali), feel the Banarasian as well as visit Sarnath where Lord Buddha had given first sermon and established his commune. Sarnath is the second most important tourist attractions after the Ghats of Varanasi. Indirectly by attracting lots of tourist those are followers of Buddhism, Sarnath additionally supports tourists' growth in Varanasi. The number of Indian tourists is continuously increasing since 1998 in case of domestic visitors, but the tendency of international visitors changes according to the global happenings. But in the preceding periods the trend was abrupt that turned according to the prevailing situation in India and internationally.

5 THE MASTER PLAN & HERITAGE ZONES

In 1982 the Varanasi Development Authority (VDA, formed in 1974) made an assessment of the earlier plans of the city. And, under its direction, the Town & County Planning Organisation, TCPO, prepared a comprehensive Master Plan of Varanasi 1991-2011, during which time the population of Varanasi Agglomeration is expected to double of the 1991 (cf. Table 1). The five-tier areal units are defined on the basis of administration and planning strategy, taking Varanasi Development Region, VDR (as in Master Plan 2011). From lower to higher hierarchy they are: Varanasi City Municipal Corporation 84.55 km2, Varanasi Urban Agglomeration, VUA 112.26 km2, Varanasi Master Plan - Operative Area 144.94 km2, Varanasi Master Plan - Projected Area 179.27 km2, and the outer most Varanasi Development Region, VDR 477.34 km2.

Under the Master Plan 2011 the expanded area proposed for the Greater Varanasi is 179.27 km2, however no way the land use categories fit to the standard norm of ecological balance. The most noticeable change during 1991-2011 plan is expansion of the area of the city (+112%). The major changes since 1991 as in the Master Plan 2011, introduced after 1988, indicate a catastrophic increase of land under government and semi-government uses (+390.50%), and public and community facilities (+190.63%). The increasing pace of population results to increase area under residential uses up to 253.63% over 1988 (cf. Table 3). This catastrophic change spoils the ecological system of the land use; the most crucial group is park and open ground that records decrease of over 60% in comparison to 1999. Similarly a great loss of agriculture and open land within the master plan area at the rate of above 40% is again a great warning. In addition to the city's population, everyday about 40,000 commuters visit the city; this numbers increases to 60,000 during festive season.

For the first time in the history of Master Plans for Varanasi, some strategies of urban heritage and heritage zoning were proposed in the recent Master Pan (1991-2011; Table 3) to maintain and preserve the religious and cultural symbols of the ancient glory of Varanasi, and to identify necessary facilities and infrastructure and various heritage complexes (cf. Rana and Singh, 2000: 150-154). A little over 2 per cent of the total area in prescribed under tourism and heritage zone. More emphasis has been laid on the government and semi-government uses.

Se	Land Use Category	**1988**		**I**: MP, as in **1999**		**II**: MP, as in **2011**		Change, **I – II**, %
		Area, ha	% of area	Area, ha	% of area	Area, ha	% area	
1.	Residential	2,615.64	46.16	5,457.24	37.65	9,254.61	51.62	+ 69.58
2.	Commercial	176.08	3.11	475.10	3.28	618.23	3.45	+ 30.13
3.	Industrial	195.31	3.45	981.37	6.77	656.19	3.66	- 33.13
4.	Public & Comm-unity facilities	261.05	4.61	450.42	3.11	1,309.07	7.30	+ 190.63
5.	Recreation (Park/ Open ground)	53.04	0.94	2,705.76	18.67	948.47	5.49	- 64.95
6.	Services &	----	----	----	----	103.97	0.58	---

	Utilities							
7.	Govt. & Semi-Government	56.69	1.00	292.18	2.01	1,433.15	7.99	+ 390.50
8.	Tourism (area) & Heritage zone	----	----	----	----	423.73	2.37	---
9.	Transport & Communication	914.30	16.13	1300.27	8.97	1,460.35	8.15	+ 12.31
10.	Other (agriculture & open space)	1,393.79	24.60	2,832.06	19.54	1,683.45	9.39	- 40.56
	TOTAL Area	**5,665.90**	100.00	**14,494.40**	100.00	**17,927.22**	100.00	**+ 23.68**

Table 3. Varanasi Master Plans, MP: Land Use, I: 1961-91, and II: 1991-2011
(Source : Varanasi Master Plan—2011. Varanasi Development Authority, & Town & Country Planning Organisation, Varanasi Uttar Pradesh. 13 July 2001; 50pp + 1 Map; ref. page 5)

According to the zoning plan, five heritage zones can be identified in Varanasi.

1. Riverfront Ghats (stairways to the riverbank), the crescent-shaped 6.8km bank of the Ganga river (Ganges), from the confluence of Asi drain in the south to the confluence of the Varana river in the north, where lies eighty-four ghats which are marked by lofty palatial buildings built mostly by kings and lords from different parts of India between eighteenth and twentieth centuries. Among the 84 ghats Dashashvamedha Ghat is the most important place for visitation, festivities and architectural grandeur (Fig.6).

2. Durgakund-Sankatmochan Area, consisting of about twenty temples and shrines and the historical water pools of Durgakund, Kurukshetra and Lolark kundas.

3. Kamachcha-Bhelupura Area, possessing some of the old monasteries, ancient shrines and a site associated with the Jain Tirthankara Parshvanath, together with many buildings of the British period (18th – 19th centuries).

4. Kabir Math (Lahartara) Area, having monasteries related to the life of Kabir.

5. Sarnath, where the Buddha gave his first sermon in 532 BCE, and Ashoka developed township in the 2nd century BCE.

Among the above five, of course the Riverfront City is underway of enlisting under ‘mixed cultural landscape’ in UNESCO Heritage List, ultimately there is an urgent need to re-vitalise the city with re-establishing the ecological ordering by promoting civic sense and active public participation.

6 UNESCO WORLD HERITAGE LIST AND ISSUE OF THE RIVERFRONT GHATS

The Ganga River and the Riverfront & Old City Heritage Zone of Varanasi” being proposed for nomination to the World Heritage List of UNESCO fall mainly into the second category of cultural properties, i.e. “groups of buildings, groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape are of outstanding universal value from the point of view of history, art or science.” These groups of buildings identified in Varanasi fall into the category of historic inhabited town, now enclosed within the modern city precincts, i.e. “historic towns which are still inhabited and which, by their very nature, have developed and will continue to develop under the influence of socio-economic and cultural change, a situation that renders the assessment of their authenticity more difficult and any conservation policy more problematical.”

Furthermore, the Ganga river with its riverfront ghats also fulfil the criteria of Cultural Landscapes as designated in Article 1 of the Convention and specifically that of a cultural landscape “that retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress” and an associative cultural landscape “by virtue of powerful religious, artistic, cultural associations of the natural element.”

The conservation of most heritage properties faces intense pressure. Even if these properties are presently in the same physical conditions as in the last couple of decades and their architectural characteristics are being

maintained without many legal and administrative measures, their architectural integrity is now being threatened. In the name of development, old structures are modified or demolished, even where the structures are made of stone and are not weak. Since the ownership is collective or remote (like maths, ashrams, havelis, palaces, etc.), and renovation work is expensive. Unless stringent measures are taken for protection, there is high probability that new structures, using new building materials, will increasingly replace old architectural shapes and material. Recent construction work and events in the old city demonstrate that even when ownership is in a single proprietor's hands, he prefers rebuilding rather than renovating. Besides these risks, the buffer zones and the skyline of the old city, whose status quo is preserved at this moment, are also being threatened by encroachments and rising heights of buildings.

The increasing impact of pollution and the decreasing volume of water in the Ganga together have a multiplier effect in Varanasi. By end of March the growth of a huge sand-island and speedily downing the water level of the Ganga will be soon proved as a threat to the existence of the Ghats. About three decades ago the width of the river had been 225-250m, however it reached to around 60-70m. The main stream has lost the high speed of the current due to less volume and pressure of water. Close to the Asi Ghat, the first one, the river has already left the bank about 7-8m. The existence of Ghats in Varanasi is in danger because the existence of the Ganga is in danger.

7 TOWARDS SUSTAINABLE URBAN & RURAL PLANNING

Sustainable planning is no way separate from the Eco-friendly planning. If nature is in danger, culture has to pay its price. If both to be taken in an integrated way, it would result to more beneficial in the preservation of the nature and their long-term use by the mankind. In framing the legislative structure care to be taken on these lines. The following major criteria for the development of Ecofriendly structure should be taken into consideration:

1. Structural growth should avoid cutting significant tress and minimise disruption, and eco-system should be maintained.

2. People should respect and ethically preserve the patterns and habitats of wildlife.

3. Building should be spaced to allow the natural scene of trees. Design of house should be made of local construction techniques, materials available and befitting cultural images.

4. Use of automobiles and other vehicles (ships in the holy river, like the Ganga) should be strictly limited, and not allowed after certain distance.

5. Landscaping and waterlines should be in the frame of minimum disruption and limited use of air conditioning.

6. Involvement of local people at different levels and in different activities should be given priority; future policy and strategy always be made in the local environmental perspective.

Remember, a thing is right when it tends to preserve the integrity, stability and beauty of the site as living organism.

8 CITY DEVELOPMENT PLAN UNDER JNNURM

On the 3rd December 2005 the Prime Minister of India, Dr. Manmohan Singh, has declared a development programme for the urban areas called Jawaharlal Nehru National Urban Renewal Mission (JNNURM) through the Ministry of Urban Development/Ministry of Urban Employment and Poverty Alleviation, under the 74th Constitution Amendment Act (CAA), 1992. At its first phase of programme the JNNURM has identified 60 cities, including Varanasi. It has been further noted by him that 'from the point of view of India's national heritage, tourism potential and religious pilgrimage, some cities are of special importance like Varanasi, Amritsar, Haridwar, and Ujjain; and it would be a challenge before this Mission to see that these cities are restored to their historical glory'. The Mission has to work on two ways of improved urban infrastructure and improved urban basic services. The JNNURM plans to trigger deeper process of reform at the state and city level, viz. (i) using fiscal flows to entire service utilities and local governments to change and reform, (ii) decentralisation as potential to spark change and create incentives with the support of effective regulation, and (iii) promoting citizens' demand by making service delivery provision directly to grass level.

The primary objective of the JNNURM is to create productive, efficient, equitable and responsive cities. In line with this objective, the Mission focuses on: (i) Integrated development of infrastructure services, (ii) Securing linkages between asset creation and maintenance for long-run project sustainability, (iii) Accelerating the flow of investment into urban infrastructure services, (iv) Planned development of cities including the peri-urban areas, outgrowths (OG), and urban corridors, (v) Renewal and redevelopment of inner city areas, and (vi) Decentralization of urban services to ensure their availability to the urban poor. In view of these issues the future vision for Varanasi city has emerged to keep and develop it as "economically vibrant, culturally rich tourist city". Under this programme the City Development Plan (CDP) was prepared by the Municipal Corporation (MC) within a month through a hired agency, Feedback Ventures of New Delhi, and was submitted to the Central Government in September 2006.

Under the above CDP the development strategies emphasise urban infrastructure and governance, and basic services for the urban poor. The three sectoral projects that structure the CDP included (I) infrastructure and governance (water, sewage, solid wastes, tourism and heritage conservation, road and transport and communication, and environmental aspects), (II) slum improvement (slum reforms, and housing), and (III) institutional and financial reforms (e-governance, finance and accounts, and financial operating plan). For the operation of CDP a budget of IRs 614.6 billion has been proposed in the proposal.

Surprisingly, in preparing the CDP no way the 'Varanasi Master Plan 2011' in operation was taken into account for assessing land use and spatial planning. In fact, the CDP has only emphasised the financial plans without taking into account any rationality for the carrying capacity, developmental pressures, feasibility, spatial perspective, and above all the public requirements! The issue of tangible and intangible heritage, religious and cultural landscape, were no considered in making plans while they are the backbone and base of its existence and economy.

9 URBAN PLANNING AND DEVELOPMENT OF PERI-URBAN AREAS

The impact of urban sprawl and neighbouring effect is constantly marked by the expansion and growth of two towns across the Ganga river, i.e. Ramnagar and Mughalsarai, lying only at 5km and 18km east of the main city, respectively, respectively recording population of 40,619 and 116,308 in 2001. During 1991-2001 they recorded growth of 35 and 23 per cent, and expected according to the Master Plans up to 30 and 38 per cent in 2001-11, respectively. It is further estimated that both of these towns will be directly linked as a continuous urban space by 2031. This tendency will further intensify the demographic and economic pressure on the city of Varanasi.

For making integration between the urban sprawl and surrounding peri-urban areas there is need to regulate land use at urban fringes. This could be done by setting up a Varanasi Urban Fringe Development Authority. The UFDA could decide on the following (Kumar, Bimal 2003: 51-57):

(i) Conservation of green areas such as orchards, agriculture, social forestry and allied activities.

(ii) Development of water management and drainage system. Ponds and other water retention structures be revived. Any encroachment on such land should be identified and legal proceedings against encroachers be initiated.

(iii) The provisions made under Zamindari Abolition and Land Reforms Acts (specially section 143 and 154) and Consolidation of Holdings Act be used effectively to check diversion of agricultural land for non-agricultural purposes.

(iv) Heavy fine should be imposed (say ten times the cost of the land) in case of such diversion on the owner of the land.

(v) In addition to it, if the agricultural land had been sold then capital gain tax should be imposed on purchaser of the land. Because huge capital gain accrues to the builders who develop colonies in such land.

(vi) The first priority be given to development of social services in the fringe area which will include hospitals, educational centres, training centres for farmers and agro-based industries.

(vii) Barren and uncultivable land should be identified for development of micro-industrial estates and then for developing multistoried residential complexes which are land saving as well.

Besides urban fringes, there is need to restrict the rate of increase of area under land put to non-agricultural uses, in rural areas in general. This could be made possible by adopting following steps.

(a) Discourage migration of people of nearby villages. This could be done by increasing transport facility and by improving road networks.

(b) Strengthen household industries of rural areas by providing them institutional support and market facilities.

(c) Develop green belt around city and any construction in the green belt area be strictly prohibited.

(d) Encourage multi-storey buildings and economic flats to weaker sections.

One important aspect of land put to non-agricultural uses is increasing number of residential houses. However, since population growth rate is faster, per person living area is decreasing. Even more disturbing factor is that per person open area in house premises is also declining. This is the trend in even rural areas. Hence space for community uses and common recreation places must be developed even in rural areas. In city planning we leave space for parks, playgrounds and recreation spots. Such planning should also be done for rural areas. Watershed management could then be linked with development of parks and recreation places. Some area could also be reserved for floriculture and horticulture.

10 CONCLUDING REMARKS

Heritage is the mirror of mankind's growth, progress and prospects; that must be preserved. One has to remember that modern science and way of life, and ancient wisdom and its messages can work together to help in searching harmonious and peaceful path of mankind's integrity with nature. In order that this heritage become a resource for development, it needs to be first documented, then protected, maintained and finally utilized according to specific heritage guidelines and legislations. Only then, combined with an increased stakeholder awareness and participation, will policy efforts and interventions become sustainable – environmentally, socially and culturally. We may separate ourselves from the web of our heritage in the line of modernity and secularism, but it would always be in the heart and soul of ourselves (cf. Singh, 1993: 306). A thing is right when it tends to preserve the integrity, stability and beauty of the site as living organism.

It is notable that the move made by local NGOs, experts and eminent citizens of the city, to propose the nomination of the old city centre of Varanasi for inclusion in the UNESCO World Heritage List has activated the present sensitive and positive city administration to propose comprehensive measures for the preservation of the cultural heritage of Varanasi. Mahatma Gandhi rightly warned us that "nature has enough for everybody's need, but not for everybody's greed". A mass awakening of awareness in the context of old cultural values would promote a new spirit of sustainability. Such a revival, however, need not turn into fundamentalism nor should it cause any damage to secular life. In temporal frame we have to give respect to the past, search solutions in the present, and make directions for the future. Moreover the issue of urban sprawl and interlinks with the surrounding areas (peri-urban) also taken together in the CDP.

11 REFERENCES

Kosambi, D. D. 1970. The Culture and Civilisation of Ancient India in Historical Outline. Vikas Publishers, Delhi.

Kumar, Bimal 2003. District Model Land Use Plan. District – Varanasi. Uttar Pradesh. Final Report. Sponsored By. State Land Use Board, Uttar Pradesh. G.P. Pant Social science Research Institute, Allahabad. http//www.planning.up.nic.in/landuseboard/Varanasi.pdf

Singh, Manmohan 2005. Speeches: Prime Minister, Dr. Manmohan Singh. PM launches Jawaharlal Nehru National Urban Renewal Mission. December 3. <accessed: 10 January 2007>,

Web: http://jnnurm.nic.in/jnnurm_hupa/jnnurm/Prime%20Minister's%20Office.htm

Singh, R. L. 1955. Banaras. A Study in Urban Geography. Nand Kishore & Sons, Banaras.

Singh, Rana P. B. eds.1993. Banaras (Varanasi). Cosmic Order, Sacred City, Hindu Traditions. Tara Book Agency, Varanasi.

Singh, Rana P. B. 1997. Sacredscape and urban heritage in India: Contestation and perspective. In, Contested Urban Heritage. Voices from the Periphery, eds. Shaw, Brian and Jones, Roy. Ashgate, London (UK): 101-131.

Singh, Rana P. B. 2005. Growth of City, Banaras. In, Banaras, The City Revealed; eds. George Michell and Rana P. B. Singh. Marg Publs., Mumbai: 8-15.

Singh, Rana P. B. 2007. Banaras (Varanasi): History, Geography, and Bibliography. Sundeep Prakashan, New Delhi.

Singh, Rana P. B. and Rana, Pravin S. 2002. Banaras Region. A Spiritual and Cultural Guide. Pilgrimage & Cosmology Series: 1. Indica Books, Varanasi.

Singh, Rana P. B. and Singh, Ravi S. 2007. Urban Fabric of Banaras, a Holy city: Growth and Perspective; in, Mishra, R. P. (ed.) Million Cities of India. Concept Publ. Pvt. Ltd., New Delhi.

Sustainable Spatial Development. Region of Navarre's Case (Spain)

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1 ABSTRACT

The European Spatial Development Perspective (ESPD) in Navarre meant a change of viewing regional development as well as spatial planning within this subject. It drove to substitute the Regional Act of Spatial Planning and Urbanism (LF 35/2002, LFOTU) to adapt it to this new situation and concepts globally named **New Territorial Culture** .

Since that moment, we started to design original Territorial Governance tools: planning instruments as the Navarre Spatial Development or the Spatial Master Plans, Sustainable Spatial Development concepts and indicators, the set-up of a participating body in the Social Council for Territorial Policy, a technical and studies unit which applies this governance in the Territorial Observatory of Navarre, dissemination and training campaigns of these tools, as well as Network work, internally within Navarre and Europeanwide in spatial and sectorial aspects (Navarre Network of Local Institutions towards Sustainability, GIS, Navarre's Territorial Information System [SITNA], ESPON/ORATE, and so on).

2 SPATIAL PLANNING IN NAVARRE BACKGROUND

The fundamental law which gives a special status to the autonomous region of Navarre, *Ley Orgánica 13/1982 de Reintegración y Amejoramiento del Régimen Foral de Navarra*, gathers the authonomy of the region in Spatial Planning and Urbanism issues. Since this fundamental law, three Spatial Planning acts have been aproved in 1986, 1994 and in 2002 which is the one it is going to be referred to in this paper.

From the European Conference of Ministers responsible for Spatial Planning (CEMAT), the **European Spatial Development Perspective** (ESDP) is adopted by these Ministers at the Potsdam Council in May 1999. It has been proved there is a real possibility to have a global spatial planning document for the whole EU. Moreover, the methodology and its nature are the appropiate to develop similar national and regional tools.

Therefore, the ESDP is a reference document which sets out from an impact evaluation that sectorial policies have on the territory, and acknowledges it as a mean through which opinions about these policies are said. The ESDP stablished a **new territorial culture** and a new way of accesing to the territory dimension itself. The ESDP proposes its implementation to be mainly applying national and regional "Spatial Strategies" so that policies should adopt these instruments.

The Environment, Spatial Planning and Housing Department of the regional Gouvernment of Navarre started to outline the Navarre Spatial Development contents and the draft of the current Regional Spatial Planning Act 35/2002, since the agreement of the need to have a law with an instrument which follows these new guidelines.

Beyond that, these considerations shows the multidisciplinar aspect of the action and management of sustainable development models which agrees with the Spatial Planning European Charter, approved in 1983, environmental, social and economic point of view. That has guided many professionals' work in this issue.

3 THE CONCEPT OF SUSTAINABLE SPATIAL DEVELOPMENT AND SEMANTIC CONTENT

The European Union brought into line the Fifth Environment Action Programme international guidelines[9]. In this programme it was written the famous quote "*We cannot wait...and we cannot make a mistake*", and had the measures European agencies as well as member countries have to bring into action in industry, waste,

[9] European Union, "Towards Sustainability". Applicable report and European programme of policy and action of the Fifth European Community in relation to the environment and sustainable development. D.G. XI. ISBN 92-827-6687-X. Luxembourg, 1997

transport, agriculture, fishing, and so on. Every sector started to adapt their different policies according to basic sustainability criteria.

European spatial planning has some principles to apply in different target sectors (transeuropean networks, mountain areas, etc) and different European areas (Atlantic Arc, Mediterranean, Baltic...). There were made diagnosis of these areas, Europe 2000+ was approved and a European spatial planning perspective was written. These documents setted some principles and general guidelines, for example:

A new cohesion perspective more territorial and qualitative.

Opening towards new Community areas.

Transnational perspective of spatial planning.

Develop spatial planning methodologies and tools.

Develop the spatial planning potential in the environment integration

Set directives about plans and programmes environment impact assesments.

Define certain environmental frameworks in certain sectors as support of the *sustainable spatial planning*.

This labour ended as said before with the ESDP. Therefore, according with the ESDP, adding "regional or territorial" to the concept of sustainable development means adding the spatial concept of the different strategies and plans. That development shall be harmonious and balanced in its environment and its relation with the other territories, it has to guarantee to the citizens of that territory the same access to infrastructures and knowledge as any other citizen, at least those who belong to the European Union. All this, considering its cultural and natural features which are considered as a property of the European Union itself.

Knowing these European directives, the 35/2002 act explanatory statement makes an "*unavoidable objetive Navarre's sustainable regional development*". Therefore, the 2nd article of this act is strengthened. This article links the LFOTU objective or purpose with certain constitutional principles and the spatial planning definition itself which is: "*a public duty of planning, organization, management and land cover and use*" whose " *purpose is the sustainable regional development of Navarre, according with the constitutional principles. It guarantees the right to enjoy an appropriate environment for a personal development, rational use of natural resources, the right to have an appropriate dwelling, and conservation, promotion and enrichment of Navarre's Cultural, Artistic and Historical Heritage, as well as community participation in the values generated by the urban action of public bodies*".

But the law not only takes the concepts theorical enumeration. It is considered that the concept has a specific content and can show it in some specific instruments. The Sustainable Regional Development is described in the Regional Development Model (Regional Strategy) and is applicable to Spatial Planning instruments as well as in the local planning through the Regional Development and local territory strategy and occupation Model (EMOT). Sustainability's conceptual content should soak, this way, the different planning instruments until it reaches every town planning and regional resolution.

Within this framework Navarre's Parliament approves in June 2005 the Regional Development of Navarre (ETN). Besides, it typifies the concept of Sustainable Territorial Development and sums every quantitative content of its variables and measures and monitoring parameters in six "conceptual boxes" up and its corresponding **synthesized indicators**:

Three general, exactly the same as the Sustainable Development Strategies:

Social Cohesion: integration, solidarity, diversity bewareness.

Competitivity: economic growth, employment creation, investment...

Conservation: resources protection, of environment and biodiversity.

Three territorial and coherent with European Union Regional Development Policy:

Polycentrism: territorial balance, new relation between rural and urban areas, reflection of European policies and development of the local ones

Accesibility: to infrastructures and knowledge to new technologies

Identity: Cultural and natural intelligent management.

4 THE ETN REGIONAL DEVELOPMENT MODEL

The ETN meant an opportunity to settle a **model of spatial development** for our region. This is a reference framework which allows make the most of the synergies and the complementary issues of the depicted iniciatives which will have to contribute to its implementation of the Spatial Planning instruments which are mentioned in the LFOTU act, to strengthen our territories comparative advantages and to release the projects of the XXI century Navarre.

Navarre's areas, "Navarre from the outside", the belonging of Navarre to suprarregional spaces and its Region-City Concept overlap:

- The Pyrenees or European Natural Area and the interregional collaboration through the Pyrenees Working Group.
- The Atlantic Arc, understanding that the whole region of Navarre belongs to it.
- The Ebro axis, taking into account that the national documentation includes Pamplona as a city within it.
- The Region-City which not only is an order change but also a conception of approaching first to the Region, analyzing the region as a whole and put it into different European networks.

The Regional Development Model elements are a way to settle this model with a look to "Navarre towards the inside":

- The Urban subsystems
- The Gateway areas.
- The Joint areas
- The infrastructure corridors.
- The structural natural areas
- The structural rural areas.

5 SPATIAL PLANNING INSTRUMENTS AND PLANNING PROCESS

Remember that the Spatial Planning European Charter settles this is a scientific discipline with an analysis and working methodology in spite of its multidisciplinary character. Spatial Planning is also a policy and due to that it has ideological interpretations. It is also an administrative technique subjected to a specific procedure and specific laws.

The 35/2002 regional act stablishes a planning order summarized in this table below. Therefore, the ETN is the strategical planning of the Department but also must be a guide for the structural and operative planning of other departments and other administrations. That is the meaning of the interadministrative collaboration and the European Spatial Development Perspective application guidelines.

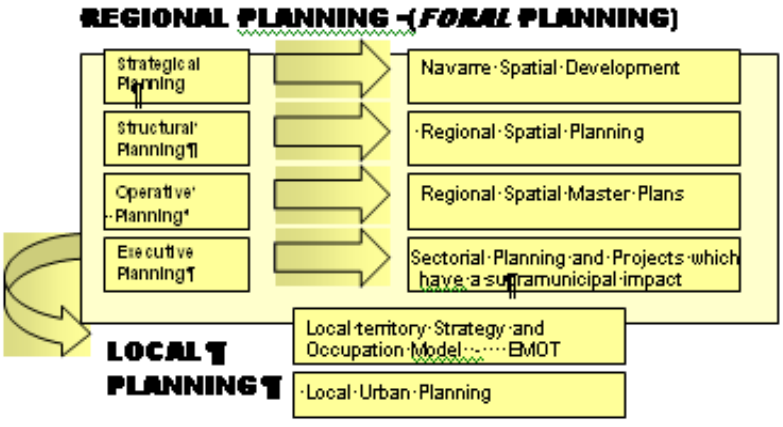

Table 1: Spatial Planning Instruments in Navarre. Territorial Observatory of Navarre

The sectorial policies must take into account its characteristics within the natural environment. Following the European Spatial Development Perspective points, the ETN takes into account every environmental tool used by the Regional Gouvernement of Navarre and makes use of them with others through its needs in the territory. The ETN is not a strictly sustainable development strategy because that would need the real involvement of every sectorial policy. The ETN means to stablish a performing framework over the different policies relations may have on the territory and, that way, turn it into the first reference tool of every Spatial Planning instrument that has the Regional Gouvernment of Navarre

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🏆 *reviewed paper*

Creation and Management of Object-Based Terrain Models of Urban Environments

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1 INTRODUCTION

Ongoing research in Computer Graphics, Geoinformation Science and Database Design provides the possibility to create very large and detailed, interactively explorable 3D-city and 3D-landscape models. State-of-the-art technologies and methods not only provide the opportunity to acquire and display 2.5D and 3D content, but to create realistic geovirtual environments, which can be operated in real-time on consumer computers. Geotainment products such as 3D RealityMaps (http://www.reality-maps.de/), or virtual globes such as Google Earth (http://earth.google.com/) are the best example for the progresses achieved in the recent years. These 'products' usually combine digital terrain models and high-resolution remote-sensing data with more or less detailed 3D models of structures, vegetation, and a virtual sky. Despite the progresses made, building realistic and information rich GeoVE still requires high effort in creating and manging 3D content and because of that effort, most 3D city models only encompass 3D models of large or eye-catching 'real world' objects, such as buildings or trees so far. Structures that cover and structure the natural terrain such as roads, pavements, retaining walls or squares are seldom integrated into virtual 3D city models. As a result the terrain geometry and texture in most 3D city models looks flat and unrealistic, whenever a user navigates in a pedestrian perspective. From a methodology point of view, the reasons therefore mainly depend on limitations of commonly used digital terrain models as regular grid in raster format or as triangular irregular networks. These models are restricted to resemble the terrains surface as a 2.5D surface. Because of this restriction, even very high resolution terrain models are not suited to represent the geometrical structure of typical man-made surface covering structures such as walls, kerbstones, or stairs. Moreover, the missing 'object orientation' of common terrain models neglects semantic aspects, as well as spatial relationships concerned with the discreet objects, which cover the terrain in urban environments. Object-based terrain models, in contrast, would enable us to link spatial temporal, economic or other semantic information to the visual elements of a GeoVE. Therefore, GeoVE aiming at imitating 'the real world', enabling users to explore near photorealistic environments from the perspective of a pedestrian, and at the same time providing access to information related to the spatial structures, such as models made for public participation, 3D navigation or the management of land, rely on very detailed and object-based models of (ground-related) structures.

The few examples including detailed 3D representations of open-space structure or traffic areas are based on manual modeling techniques. Manual modeling of 3D geometry is an established method and many software solutions are available to model 3D geometry and to texture these models. It provides very high flexibility with respect to geometric complexity and visual detail, but at the same time manual modeling techniques commonly require data preparation, data conversion, and additional expertise, and in most cases the resulting models are disconnected from the original geodata. Thus, manual modeling seems to be appropriate whenever a very high level of visual detail is needed and at the same time only few geoinformation have to be integrated into GeoVE. But if the aim is to develop city-wide representations of ground structures, which are linked to administrative databases, manual modeling techniques are too limited and inefficient.

To overcome these limitations we will present an approach which enables the semi-automatic creation of object-based terrain models in urban environments from 2D cadastre data. Therefore, an object-oriented modeling concept to process detailed urban land covering data is developed by combining the SmartTerrain modeling approach (Buchholz et al. 2006) with a GIS-based management and configuration system for data preparation.

2 METHODS & MATERIALS

SmartTerrain (ST) models are based on the idea to transform existing 2D geo-referenced vector features into 2.5D and 3D features. The idea is implemented by defining a class model of six basic structure elements (Table 1) and class-specific transformation algorithms. Each ST class possesses a set of parameters, which

can be used to configure geometry and material properties. These configuration parameters are used as input parameters for transformation functions that convert polyline and polygon features into 2.5D or 3D objects. Geometry generation and texturing algorithms have therefore been developed and integrated into a prototypic ST editor. The editor is implemented on the basis of LandXplorer technology (3DGeo GmbH, http://www.3dgeo.de/). It reads shapefiles and creates objects from feature geometry and configuration parameters which are managed in the attribute tables of the input features. Besides visualization and object-configuration capabilities, a material catalog for managing texture and color materials and two prototypic rendering techniques for water surfaces and ground vegetation are integrated into the editor.

ST class	Description
GroundArea	Class to represent 2.5D surfaces; provides access to an extrusion function (e.g. traffic lanes or pavements can be depicted as extruded features).
WaterArea	Class to represent water surfaces; uses an hardware-shader to simulate a vivid water-surface.
Stair	The abstract class is extended by the classes RegularStairs that can be interactively configured by few parameters and IrregularStairs which are composed out of a polygon stack.
Kerb	Class for the representation of kerb-type objects; objects are created from polyline features by buffering and extrusion.
Wall	Class for the representation of wall-type objects; objects can be represented by polygon or polyline features; extends the base functionality of Kerb by adding a wall toping.
Barrier	Class for the representation of barriers; provides a solution to depict e.g. fences by extruding line features and applying a texture that supports alpha channels to define transparent picture parts.

Table 1: Initial SmartTerrain classes and a short description of their functionalities

In the following section an example will be presented explaining the modeling of a ST model from the digital town map (“Stadtgrundkarte”, STGK) of Potsdam, Germany. The general approach and data preparation work have been presented in the context of a diploma thesis (Ross 2006). For this reason only a short introduction on the data used and data preprocessing is given. Following the introduction, two mapping-concepts are evaluated, which are used to map ST elements to the CityGML schema. Experiences gained during testing, development of the ST schema, preparatory work, and design of an export function, result in a modeling concept that facilitates the modeling process and at the same time considers integration of additional data, hierarchical structuring, and compatibility to CityGML.

2.1 Introduction to SmartTerrain modeling: City Channel Case Study, Potsdam

The ‘City Channel’ case study is our developing environment. It shows a small part of the historic city centre of Potsdam in Germany and is modeled from the STGK. The STGK includes detailed information on buildings, transportation objects, vegetation and street inventory. It is maintained by the commune and provides a base data layer for many administrative and planning-related tasks. The detailed information on ground and ground-related structures such as material information, kerbstones, stairs, walls, changes in surface covering material, footprints of buildings, rails, gullies and other features led to the initial idea of an ‘geometry generator’ facilitating the creation of detailed object-based 3D models of ground structures in urban environments.

The data of the STGK is derived by ground survey and maintained in a GIS. It includes a detailed feature type catalog and the target scale is 1:500. Land-use boundaries and boundaries between different surface covering types are described by polyline features representing either physical 3-dimesional objects, such as walls, stairs, and kerbstones, or one-dimensional idealized borderlines between different land-use, respectively surface-covering types. Land-use information and surface-covering material of ‘ground areas’ are represented by point features. The term “ground area” is used here as a metaphor for all surface patches which are enclosed by boundary polylines; at the same time GroundArea resembles the basic ST class to represent planar features. Buildings and some other objects, such as large walls, are represented by closed polylines or polygon features, and small ground-related objects, such as gullies or hydrants, are represented

by point features. Furthermore, locations of road signs and traffic lights, trees in public-space, as well as representations of complex structures like bridges, or passages are included in the STGK.

Modelling a ST model from this source data requires extracting all polyline and polygon features representing boundaries between different land-use, surface-covering types, or structures and building an area-wide polygonal dataset that represents uniformly covered ground areas. Information on the surface covering, respectively land-use, can be transferred to the created polygon features from the point signatures. The object-type catalog of the town map lists 16 'artificial' surface covering materials and 16 'natural' types. For each covering type, which occurred in the study area, a material identifier and material parameters, such as color, path to texture file, and size, have been assembled in a XML-based material catalog. To create an initial ST model this polygon dataset is converted with ESRIs 3D Analyst into a 3D feature dataset. The resulting 2.5D surface can be loaded into the interactive editor (figures 1a -1d). Figure 1a depicts a screenshot of the editor with simple building models, a raster based terrain model, and a carthographic representation of the input data. The in-built geometry generator processes the input features and creates geometry and appearance from attributes stored in the input features (Figure 1b). This primary result does not depict the 'real' situation so far. Because of the approach to reconstruct height information from a digital terrain model, the GroundArea, Wall, and Stair polygons form a continuous 2.5D surface without vertical offsets. Thus the usual vertical offset between e.g. a traffic lane and a pavement is not depicted in the model. For the same reason the brick walls stand on the terrain, although in reality it is part of an artificial channel. The editor, therefore, provides some basic functionality to adjust the height of objects, as well as the height of single vertices. It furthermore allows to interactively manipulating configuration parameters such as texture orientation or geometry parameters.

To complete the modeling all polyline features representing physical objects such as kerbstones and walls are added to the ST feature dataset. Analog to the preparation of polygon-based features, configuration parameters for geometry generation and texturing are stored in the attribute tables. Figure 1c shows the result from adding polyline-based features and manual adjustment of heights and configuration parameters.

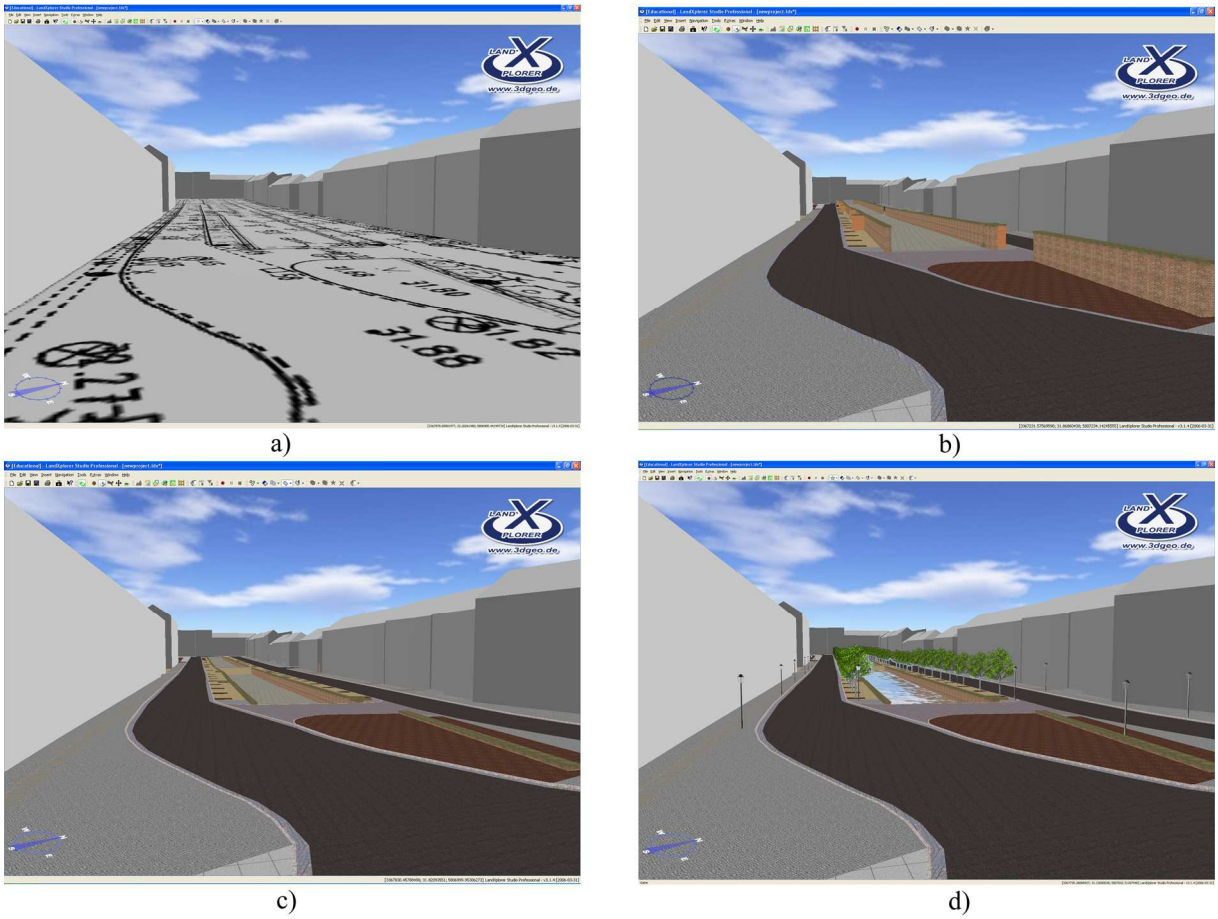

Figure 1 a-d): Screenshots of the SmartTerrain Editor showing a) a digital terrain model draped with the STGK in raster format and simple building models and b) the initial result from linking configured polygonal input features to the material catalog. In c) polyline-based features are added and heights and feature-specific texture parameters have been modified Figure 1 d) finally, shows

the usage of the prototypic shaders for the representation of water surfaces. Furthermore, 3D models of street-lights and a simple tree billboard are used to increase the overall detail of the scene.

The object-based terrain model shows high visual and geometrical detail, and a direct connection to the input features is maintained. Finally, additional elements such as models of trees and street lights are added increasing the realism of the scene (Figure 1d). The elements added in this image are: A water surface, which is rendered using a hardware-shader, street lights as 3D models, and simple billboards of trees.

2.2 Export of ST models to CityGML

The example ST model derived from STGK is still limited with respect to interoperability and semantics. In order to enhance these two aspects an export utility is currently under development. As promising potential future standard for virtual 3D-city models, CityGML is chosen as target schema for the export function. CityGML has been developed by the Special Interest Group 3D of the Geodata Initiative North Rhine – Westphalia since 2002. In 2006 it received the status of a discussion paper at the Open Geospatial Consortium (OGC 2006). CityGML is "a common information model for the representation of 3D urban objects. It defines the classes and relations for the most relevant topographic objects in cities and regional models with respect to their geometrical, topological, semantical and appearance properties" (http://www.citygml.org/). Besides spatial properties, the data schema includes hierarchically structured classes of city objects, aggregation, and relationships between objects. Thus CityGML provides a data schema to model structured 3D geoinformation of urban environments. In order to map the ST objects to CityGML objects, two approaches are evaluated. The first approach is to define 'default' CityGML values for each ST class, while the second approach is based on the definition of additional attributes, which determine the CityGML (sub-) classes and attributes, as defined by the candidate CityGML schema.

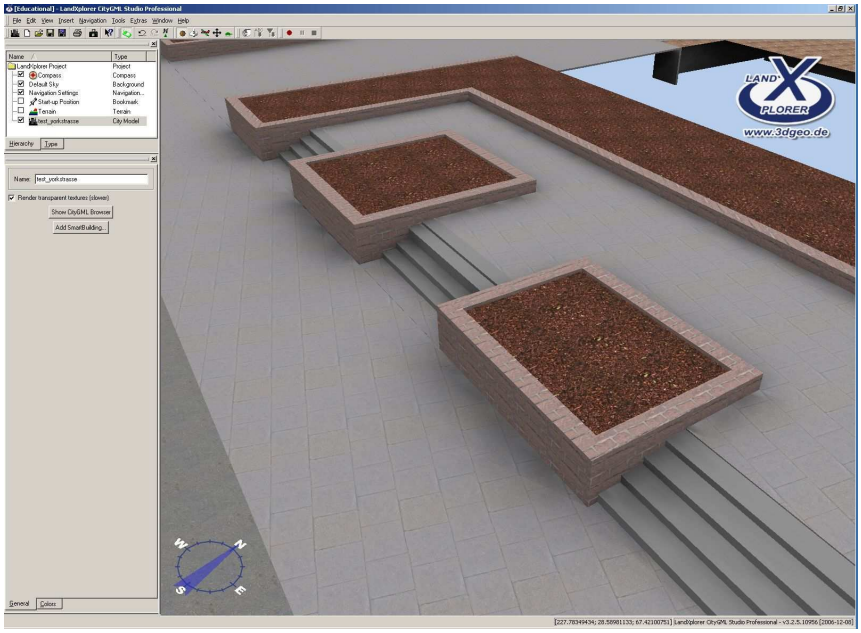

Figure 2: Detail from the City-Channel dataset created with the ST Editor and mapped to CityGML. The data is visualized in LandXplorer CityGML Viewer.

2.2.1 Export to CityGML by 'default mapping'

A direct mapping of STM objects to CityGML would be the easiest way in terms of data creation and management. During the design of a direct mapping schema, it became apparent that additional information is needed to create a structured CityGML dataset. On the one hand this is due to the ambiguity of the ST class GroundArea, which encompasses elements from three possible CityGML subclasses: TrafficArea, AuxiliaryTrafficArea, and PlantCover, on the other hand the City Channel dataset misses information needed to create aggregation groups represented for example by the CityGML classes TransportationComplex and CityObjectGroup. Neglecting the latter problem, the five remaining ST classes (Kerb, Wall, Barrier, Stair, and. WaterArea) can be mapped to CityGML. Stairs and kerbstones can best be defined by the 'function'-attribute of TrafficArea objects (cp. CityGML schema 3.1.1, external codelist 'TrafficAreaFunctionType'). Thus they are mapped to TrafficArea features with the respective attribute set. Walls are mapped to

GenericCityObjects with the class attribute ‘wall’, barriers are mapped to CityFurniture with the class attribute ‘1440’ (fence), and WaterAreas are mapped to WaterSurface features and the waterLevel attribute is derived from the height of the polygons that constitute water surfaces.

As stated before, with objects of the ST class GroundArea the point is to decide, whether they are mapped to PlantCover, TrafficArea or AuxiliaryTrafficArea. This can neither be decided from the ST classes, nor can it be presumed that the input data for a ST holds an explicit definition. Moreover, it might even be a domain specific question, to decide which CityGML feature type should be chosen. Therefore, CityGML allows to reference one geometric object through more than one feature. The TrafficAreaFunctionTypeList for example, lists ‘green_spaces’ and ‘flower_tubs as possible value for a TrafficArea object, but vegetation-carrying areas could as well be mapped to PlantCover or AuxiliaryTrafficArea objects. Thus it would be possible to describe a GroundArea object as being a TrafficArea feature and at the same time a PlantCover feature. For simplicity reasons the mapping function used for the City Channel dataset has been configured to map all GroundArea objects to TrafficArea objects. One exception is defined: Features having the prototypic ‘grass shader’ assigned to themselves are mapped to PlantCover objects and the height property is acquired automatically from the shader settings. The default-mapping rules have been tested with the initial City Channel data. Figure 2 depicts a detail from the mapped ST rendered in LandXplorer CityGML Viewer (3D Geo GmbH 2006).

As a result of the used approach, visual detail is maintained, but missing aggregation groups and hierarchical structuring reduce semantic detail and lead to an unstructured list of single CityGML features. Thus, the objects depicted in figure 2 know that they are part of a city model and what (sub-)class they represent, but they do not know if and how they stand in functional relation to other objects.

2.2.2 Export to CityGML by ‘attribute mapping’

The concept behind the attribute-mapping approach is to represent the target CityGML structure and semantics in the attribute tables of the input features. It introduces nine additional ‘CityGML-attribute keys’, which are added to the existing set of configuration parameters. The keys and short explanations are enlisted in table 2.

Key	Description	Values
citygmlClass	Constitutes the CityGML class of objects	Terrain related CityGML feature types: *TrafficArea, AuxiliaryTrafficArea, PlantCover, WaterSurface, CityFurniture, GenericCityObject*
citygmlGroup	Used to define a feature to be member of a *CityObjectGroup*	Unique ‚String’ identifier per group
transportationComplexType	Used to define the type of a *TransportationComplex*	*Road, Track, Railway, Square*
transportationComplexName	Assigns a unique name to TransportationComplex.	Unique ‚String’ identifier per *TransportationComplex*
classAttribute	Used to store class-specific attributes describing a classification of a feature type, e.g. ‘’Querco-Fagetea’ as class attribute of a *PlantCover* feature.	Defined in the external codelists of CityGML
functionAttribute	Used to store class-specific attributes describing the function of a feature, e.g. ‘driving_lane’ as function attribute of a *TrafficArea* feature.	Defined in the external codelists of CityGML
usageAttribute	Used to store class-specific attributes describing the actual	Defined in the external codelists of CityGML

	usage of a feature, e.g. 'pedestrians' as usage attribute of a *TrafficArea* feature.	
surfaceMaterialAttribute	Used to store class-specific material attributes	Defined in the external codelists of CityGML or defined in a additional codelist to gain flexibility
plantCoverHeight	Used to store the height attribute of *PlantCover* features	Any positive number

Table 2: Defined 'CityGML-Attributes' and their usage and possible values

These CityGML attributes can be used to structure the ST dataset and enable users to overrule the default-mapping rules. At the same time it requires users to think about structuring data. For further explanation, a CityGML Road feature in LoD 4 provides a good example. A Road feature is represented by a TransportationComplex, which is an aggregation of features from the sub-classes TrafficArea and AuxiliaryTrafficArea. Such information is not depicted in the original STGK data, because transportation areas are originally modeled by their boundary line and no larger spatial knowledge is embedded. Therefore, the surface patches derived from the ST modeling are not aggregated and aggregation can not be automized. But aggregation groups could be defined by adding a 'spatial mask', which is unioned with the ST dataset. Unfortunately, union is not supported for PolygonZ geometry in ArcGIS. Therefore, to prepare a test dataset for the attribute mapping function, the existing base data has been edited manually with ArcGIS by cutting ST objects at crossroads and aggregation of ST object to CityGMLGroup and TransportationComplex features using the defined attribute keys. Using the attribute mapping approach the City Channel dataset will be mapped to a structured CityGML dataset, which will be evaluated by the developers of CityGML and, if it qualifies, will be available for download on the CityGML website (http://www.citygml.org).

2.3 Conceptual developments – introducing extensions to the initial ST schema

Bridges or sub-surface structures are not considered in the modeling approach, so far, although they are connected to the terrain. Figure 3 depicts a sketch of a typical sub-surface structure. The model is a design study, which shows that the already developed geometry-generation algorithms can be used to create a structure that looks like the entrance to a subway station or sub-surface passage from few polyline or polygon features.

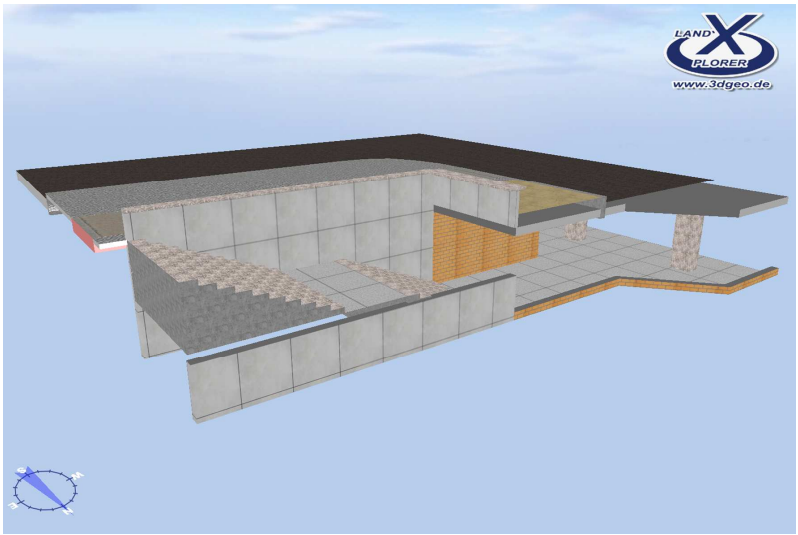

Figure 3: Design study on sub-surface objects. The depicted model is manually modeled from seven polygons representing the stairs, floor and columns. The ceiling is a copy of the floor plane and defined by a height offset and additional material information. The wall-type objects embracing the stairway and the 'room' are derived from the polygon boundaries.

It has been assembled using the interactive editing and configuration tools of the editor. The subsurface structures in the example are represented by GroundArea and Wall features representing floor, ceiling, outer walls and the three columns. The entrance or access to the subsurface structure is modeled by Wall, GroundArea, and Stair features. To create the represented 3D structure from polygonal base data, the height

of the room and the absolute height position of either ceiling or floor, the location of walls, respectively openings and the materials have to be defined. Furthermore, the geometry generator has to be instructed how the data should be assembled to a 3D representation. To realize the integration of such composite structures, the class model is extended by the class ComplexObject. Complex objects have to be defined by base geometry, a set of ST featurtypes (e.g 'subway:wall', 'subway:floor', and 'subway:ceiling'), general object properties (e.g. 'height' and 'floorBaseHeight', 'openingSegments') and processing instructions (simplified: "Create floor from input geometry > create ceiling > move ceiling by 'height'"). To realize this concept, geometry and material configuration parameters are stored in separate cataloges, and linked to the input geometry by a 'ST feature type' identifier. ST feature types are defined by a unique identifier and a collection of parameters, which are related to vector objects in order to enable the generation of several construction parts from one base vector feature. The feature type definitions are stored in a separate table. The sub-surface room in figure 3 for example is represented by one polygon, whose 3D representation is defined by one ST feature type for the floor, one for the ceiling, and one for the outer walls. This way a growing catalog of construction parts can be built and at the same time much flexibility is gained. This object-oriented approach can also be used to define a catalog of several different kerbstones, walls or surface structures. The following section introduces a modeling example which is based on such an object-oriented modeling concept.

2.4 Transferability - Modeling ST models from other cadastral data sources

Using a sample map of a digital cadastre ("Liegenschaftskarte") of Dorningen, North Rhine-Westphalia (Landesvermessung Nordrhein-Westfalen 2007) the general transferability of the ST approach is evaluated and at the same time the modeling workflow is optimized. To provide high flexibility and a usual working environment, a geodatabase is set up in standard GIS software (ArcGIS), which enables the mapping of input feature types to ST objects. To create a ST from the sample map, the included feature types representing boundaries, such as land parcels, land-use boundaries, buildings, or boundaries of transportation objects are selected and stored in a separated data set. The next step encompasses the definition of GroundArea features. As mentioned previously, ground areas are not necessarily represented as polygonal features and have to be built from the input data by creating an area-wide polygon dataset from boundary lines and polygonal features. Both, the GroundArea features derived from the modeling process and the original polyline and polygon input features constitute the ST base geometry. Using point-in-polygon selections and feature attributes, ST feature types are defined and stored as values in the attribute tables. As introduced before, ST feature types are used to describe construction parts, or uniquely textured surfaces and are identified by a unique name, which can be used to link configuration parameters to the base geometries. The feature type 'street boundary' included in the sample map for example, is defined as ST feature type 'kerbstone, beton, DIN EN 1340', because this is a standard kerbstone definition commonly used in construction. The configuration parameters needed for the generation of 2.5D and 3D features are stored in separate tables. The visual appearance of objects is defined by material keys, which are to another catalog holding detailed material information, such as the material type (color, texture material, or shader) and material properties (Path to texture file, width, and height). Thus, modeling a kerbstone with equal dimensions but different material requires only a material-type definition. This setup reduces the complexity of the model by introducing a sharp division of base geometry, geometry generation parameters and material properties of objects, and at the same time a growing database of construction parts and materials can be established.

To create a ST model the material catalog and feature type catalog at present have to be joined to the ST base geometry and exported as shapefiles which are loaded into the editor for visualization and manual post-processing (Figure 4). In contradiction to the City Channel example, this time no digital terrain model is used to derive heights for the base geometry, and thus the object-based terrain model does not depict the 'real' situation, but resides on a flat plane. Approximating the base heights of objects is nonetheless possible and easy if a digital terrain model is available.

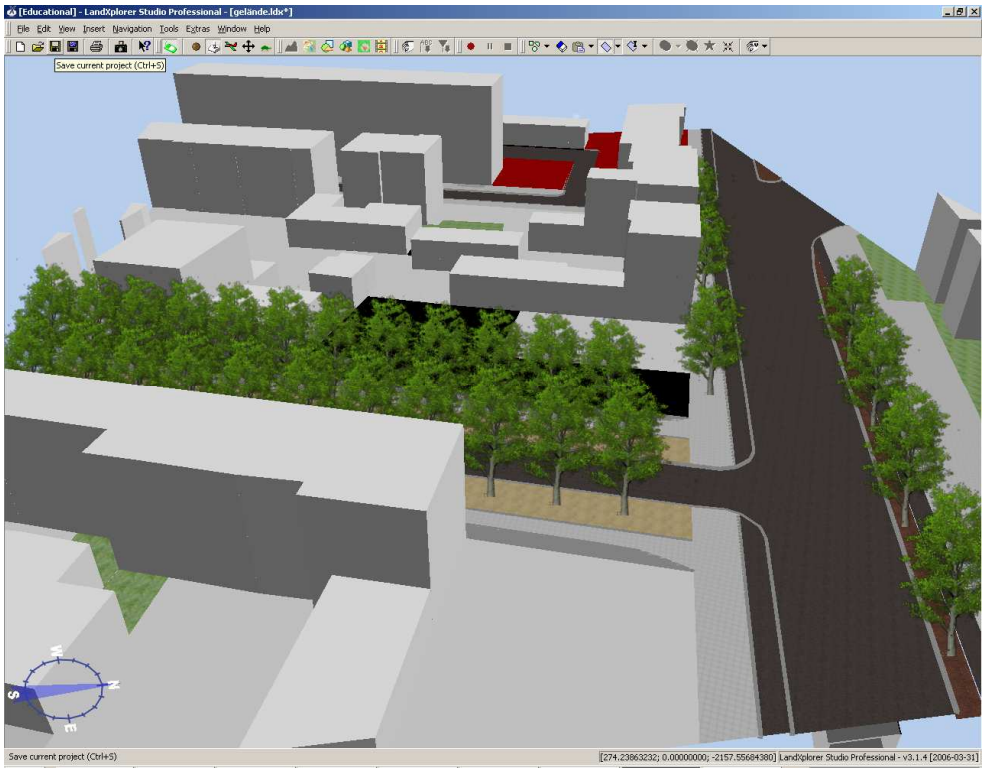

Figure 4: ST model from the example dataset Dorningen

3 RESULTS

As a general result from the introduced ST modeling examples the conclusion can be drawn that the method developed is applicable to the creation of detailed 3D object-based terrain models from large scale geo data, such as STGK or official cadastre data. Moreover, if the input data provides a detailed feature type classification and is topologically clean, ST models can be established rather fast.

With respect to interoperability and semantics the initial modeling approach (compare 2.1) does have some drawbacks, because of the ambiguity of the class GroundArea, as well as the missing spatial context. This problem has been solved by a mapping function which can be used to transfer the model to CityGML. However, to create a structured dataset, additional attributes, respectively spatial knowledge is needed. Furthermore, the initial class model obviously does not cover all ground-related structures so far. Bridges, tunnels, rails and other structures are not depicted in the model, although they are related to the urban terrain. The design study presented in figure 3 shows that such structures can be composed from the available ST elements. Therefore, an object-oriented modeling concept is introduced, that divides the base geometry from configuration parameters, appearance parameters, and CityGML keys. This object-oriented approach has been chosen to process part of the sample map of Dorningen. Although complex objects have not been included in the example, the modeling process is on the one hand facilitated, and on the other hand more flexibility is gained with respect to data update, and the visual properties of objects. This is due to the ST feature-type catalog, which provides a knowledgebase of configured ‘construction parts’. Thus, even if the base geometry of the cadastre is changed, only the ST feature-type keys have to be updated to process an update terrain model. Furthermore, this setup allows creating localized ST models, such as more detailed models made for puplic participation processes or in models for tourism information systems. In these application areas it might be the intention to depict a certain ‘style’ or ‘design’ of the virtual space, which can be achieved by reconfiguring parameters in or adding feature types and material types to the catalogs. Another improvement of the introduced modeling concept is the early integration of features providing spatial context such as the borders of land parcels. Incorporating such ‘spatial units’ during the modeling of GroundAreas, they can be used to select and define aggregation groups needed to structure the data, which is a key requirement to map ST models to CityGML. Figure 5 depicts the introduced modeling workflow and its processing steps.

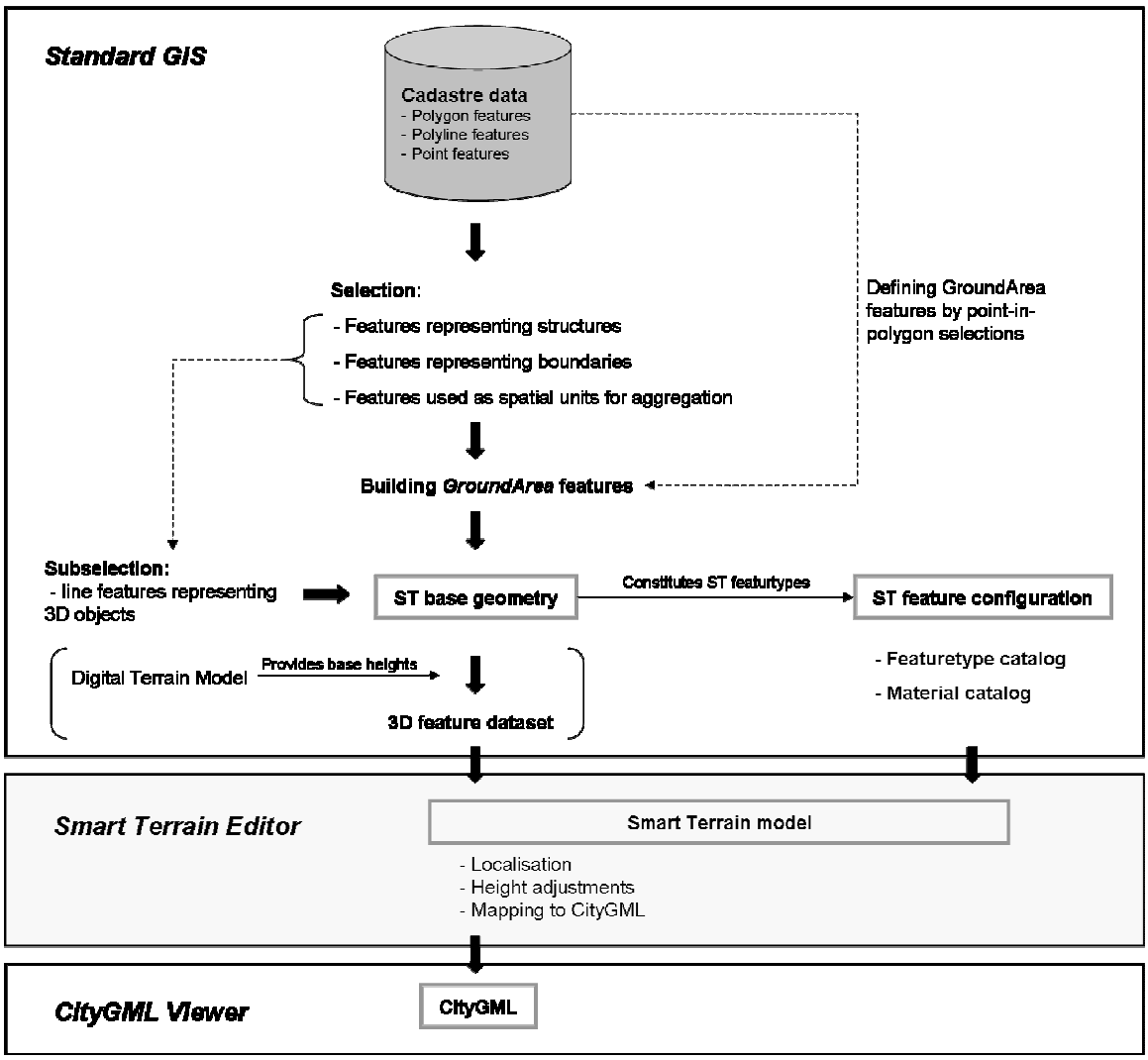

Figure 5: Modeling workflow for the creation of ST models. The graph depicts main steps needed to create ST models. As can be seen from the diagram the modeling is mainly done in standard GIS

The preparatory work is conducted in standard GIS software, which is a key requirement for the usability and acceptance. It ensures that users familiar with geo-data processing can use their usual working environment. The Editor is only used to visually explore the modeling results and to configure feature-specific parameters, such as the alignment of textures and for performing height adjustments. It further provides the export utility to map ST models to the CityGML schema.

Althought the general modeling approach seems to be a promising method for the creation of object-oriented 3D urban terrain models, some questions still remain. The most comprehensive and labor-intensive task with the method so far, is the adjustment of heights. Though the editor provides some basic functionality to adjust heights, it does not provide a good solution in all cases. Especially at locations where objects such as retaining walls or a very steep relief can be found, the use of digital terrain models as a source for height information leads to unsatisfying results. Another difficulty is connected with the export function, which at present requires high expertise to configure the objects properly.

4 DISCUSSION & OUTLOOK

In Germany the situation, with respect to the existence of base-data for the generation of detailed object-based terrain models, is good. Classified datasets such as STGK and ALK/ALKIS („Automatisierte Liegendschaftskarte/Amtliches Liegenschaftskatasterinformationssystem“) are in many communes available. At present the migration progress from the old, sometimes still analog, STGK and the official cadastre data to the standardized ALKIS data model (ALKIS 2007) for the storage and management of cadastre data has begun. In general, it appears that the unified class model provided and the feature types and attributes defined will provide enough information to automate, or at least ease the creation process for ST models.

The presented Dorningen example, is much less detailed with respect to visual appearance, but much more detailed with respect to included geo information than the City Channel example. Moreover, if combined with detailed buildings, vegetation and street inventory, it appears that it can be used to create a detailed geovirtual 3D cadastre. But what would be the advantages of a 3D cadastre and how can it be integrated into planning and management processes? We will address these questions during a research project aiming at the development of new 3D land-use information systems. This project is part of the German research network REFINA, which wants to develop tools, methods and best practice examples to reduce land consumption.

Besides this general research questions, a redesign of the ST schemata and the integration of ComplexObjects will be necessary to enhance the smartness of the model. Therefore, we will introduce topology and new keys, that will ease the problems concerned with the mapping to CityGML and the configuration of height information.

5 LITERATURE & RESSOURCES

ALKIS: Amtliches Liegenschaftskataster-Informationssystem der Vermessungsverwaltungen in Deutschland, Internet: http://www.alkis.info/ - last viewed 14th March 2007.

BUCHHOLZ, H., DÖLLNER, J., ROSS, L. & KLEINSCHMIT, B.: Automated Construction of Urban Terrain Models; In: W. Kainz, A. Riedl, G. Elmes (Eds.): Progress in Spatial Data Handling. 12th International Symposium on Spatial Data Handling, Vienna, 2006

LANDESVERMESSUNG NORDRHEIN_WESTFALEN: EDBS-Musterdaten und Kartenmuster in den "Vorschriften für das automatisierte Zeichnen der Liegenschaftskarte in Nordrhein-Westfalen - Zeichenvorschrift-Aut NRW (ZV-Aut)", download available at: http://www.lverma.nrw.de/produkte/liegenschaftsinformation/katasterinfo/alk/ALK.htm, Internet, last viewed: 14th march 2007

ROSS, L.: Interaktive 3D Geovisualisierung in der Freiraumplanung – Konzepte, Methoden und Verfahren der Modellierung und Visualisierung urbaner Landschaften, 2006 - unpublished

OPEN GEOSPATIAL CONSORTIUM: Candidate OpenGIS CityGML Implementation Specification (City Geography Markup Language), 2006

🏆 *reviewed paper*

Culture, Justice and the Arnstein Gap: The Impact of Structured Public Involvement on U.S Transportation Infrastructure Planning and Design

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1 INTRODUCTION

Enormous quantities of public money are spent on transportation infrastructure (TI). According to the Bureau of Transportation Statistics this infrastructure spend in the U.S. amounted to almost $90 billion in 2001 [1]. In most political spheres, when public money is spent, the public demands a measure of accountability. The dimensions of this accountability depend on the character of the political system that funds TI. In most participatory democracies, ultimate accountability is exercised through a balloting system that ensures elected officials represent, to some degree, stakeholder views and preferences. However, despite enormous expenditure of public monies on TI, this type of accountability is clearly lacking. In particular, the quality of public involvement in TI planning and design is acknowledged to be deficient by the public and by many professionals. Since the public's money is being spent, it behooves professionals to improve this situation.

Our programmatic aim is to improve public satisfaction with both TI design process and product [2]. In this article we characterize the deficiencies of public involvement in the U.S. using the Arnstein Gap as a metric. We propose a theoretical framework for public involvement based on justice. Three principles of justice originally developed by John Rawls [3] are evaluated in terms of their contribution to the observed Arnstein Gap. We explain how this analysis informs the Structured Public Involvement, or SPI, protocol developed and deployed by the authors. The performance of SPI is evaluated using anonymous, real-time evaluations from open public meetings dealing with contentious projects. We conclude by calling for consideration on the part of professionals in non-U.S. contexts to develop and articulate theoretical models for public involvement and, similarly, to evaluate the performance of these protocols using stakeholder data.

2 THE ARNSTEIN GAP

At CORP2006 we proposed the Arnstein Gap as a heuristic for quantifying the extent of the deficit in public involvement in TI [4, p.339]. For six years we have been collecting data from public and professionals during our work on actual TI projects. The Arnstein Ladder [5] is shown to the audience and an anonymous electronic real-time polling system is used by each respondent to quantify first, where the individual feels TI planning is currently located on the Arnstein Ladder, and second, where it should ideally be located. Integer numbers are used corresponding to named steps on Arnstein's Ladder. So far this database contains more than 500 responses from public attendees at actual public meetings in Kentucky, Indiana, Ohio and Arizona (public). It also contains 113 responses from transportation officials with public involvement experience across the U.S. and local land use planners in Kentucky (professionals). Figure 1 shows the results.

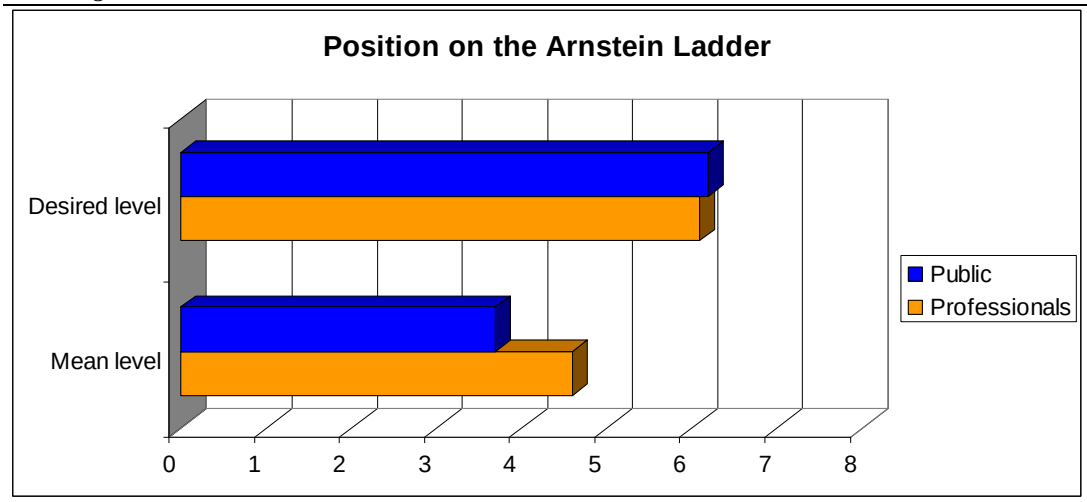

Figure 1. The Arnstein Gap

These findings are significant in several ways. These data indicate a strong agreement on the part of citizens and professionals that the ideal level is just above 6, which Arnstein termed "partnership." This should be heartening, because it demonstrates that when a metric is used directly for this evaluation and meaningful anonymous public polling is undertaken, the public and the professionals are in strong agreement about the desired quality of public involvement. We also note that, contrary to the fears expressed by professionals who are often reluctant to undertake open public polling of this type, it is clear that citizens do not desire "citizen control" of TI planning and design. This means that citizens recognize and desire a degree of expert domain on the part of engineers and planners.

However, there is a statistically significant difference between the public's "desired" and "mean" ratings. We call this difference the Arnstein Gap. The Arnstein Gap indicates that citizens desire a planning and design system that is more directly responsive to public needs. Another salient aspect of the Arnstein data is that professionals are neither doing as well as the public would like nor as well as they think they are. The data show that professionals consider their public participation processes more effective than the public does (4.5 vs. 3.5). The significance of the difference in views between professionals and the public was evaluated using an unpaired two-sample t-test assuming unequal variance. This yielded a p-value of 0.023. We call this self-overestimation of performance the "Professionals' Conceit." These findings may not be surprising, but we have noted that quantifying this data helps to persuade professionals and officials of the both the truth and significance of the public involvement quality deficit.

It is clear that improvement is needed. According to Barnes and Langworthy [6, 8-9] "..there has been little attempt to develop [more general] theories within the context of transportation projects, possibly because systematic public involvement is a relatively recent development in this field." Defining a sound theoretical framework that can be used to develop higher quality public involvement, i.e. to close the Arnstein Gap, is a pressing necessity. We proceed by examining briefly the political context of public involvement and we define an appropriate framework for public involvement based on Rawls' notion of justice.

3 A POLITICAL CONTEXT FOR PUBLIC INVOLVEMENT

Public involvement in TI is carried out within existing political and regulatory structures, such as the National Environmental Policy Act or NEPA [7]. The extent of direct specification of public involvement is highly variable, but a plethora of environmental, planning, and other public good regulations can also affect public involvement in TI e.g. Environmental Justice regulations [8]. These differ considerably between countries and in many cases they differ between sub-national and local political divisions. Adding further complexity is the reality that, although the regulatory framework is relatively fixed, regulations can be interpreted and obeyed in a range of ways by individual design coalitions and partnerships.

Moreover, these political and regulatory frameworks exist within civil societies that see public expenditures as responsive to the needs and wants of the population at large. The political frameworks are not immutable, but in most democracies they are designed to reflect, in different ways and through various mechanisms,

voter preferences. Locally-specific cultural preferences are therefore connected to public expenditure through a complex, tiered political system that possesses considerable hysteresis.

At first blush, then, it seems unlikely, or even fruitless, to search for uniformly effective cross-cultural principles for public involvement. This is not our intent with this analysis. Instead, we propose and evaluate a theoretical solution to the problems associated with classic, or unstructured, public involvement in TI planning and design in the U.S. case.

4 SOME PROBLEMS WITH PUBLIC INVOLVEMENT

Advocating better public involvement in planning and design questions can easily become an empty recitation: easy to favor, difficult to deliver and impossible to measure.

The problems are manifold [9]. Even in cases where public input is solicited, participants often regard the efforts as box-checking proformas that have no influence on design properties i.e. public involvement is performed at a low level on the Arnstein Ladder. This leads to poor attendance at public meetings and a sense of resignation among communities. Often simultaneously, fearful of protracted or supposedly problematic engagements with local stakeholders, professionals and other officials find ways to limit and control the extent of public involvement. Officials claim that "people don't come anyway" to the public meetings, which makes it hard for them, in good faith, to justify increasing the scope of public involvement and incurring additional expense if existing channels are not being used. The awkward dynamic of low expectations and suspicion on the part of the public reinforces the professionals' reluctance to engage proactively with citizens, and a persistent positive feedback loop is established [10].

Many of the public involvement problems with planning and design processes and outcomes can be characterized as injustices of one sort or another.

5 DIMENSIONS OF JUSTICE

In "A Theory of Justice" philosopher John Rawls proposed three foundational dimensions of justice: Distributional Justice (who gets how much); Procedural Justice (how do we decide who gets how much) and Access to Justice (who should be included in the deliberations) [11, p.74-77]. His work has spawned much subsequent analysis, including reformulations of the principles e.g. [12,13].

Frequently, however, only distributional justice is highlighted, with questions of access and procedural justice left unaddressed or somewhat murky [14,15]. Researchers have focused their attention on the deployment of various concepts of scale in struggles over equity and justice, especially in the context of environmental justice [16,17]. They have worked on ways to more finely measure the spatial and social extent of distributive impacts [18,19], combined with alternative methods of analyzing the impacts, such as cost-benefit processes [20].

Distributional justice analyses allow a more straightforward technical and quantitative analysis involving reproducible processes and thus results for researchers. Conversely, "measuring" the justice or fairness of a decision process is much more problematic [21,22]. In some cases, the issues and definitions of procedural justice are forefronted [23]. Even this work, however, typically focuses more on defining principles than on measuring outcomes.

Some experimental research into this specific question suggests that individuals' judgments about equity and fairness are associated with procedural issues than with distributional outcomes, calling into question the wisdom of continued emphasis on distributional analyses [24]. Consequently, we believe it is important for the planning and design professional to consider all three facets of Rawls' justice argument in analyzing various strategies for public involvement.

5.1 Access to Justice

Large public meetings ironically pose serious access questions for the majority who attend. An open microphone arrangement allows accomplished public speakers to dominate the meeting, effectively excluding others. Conversely, a series of smaller meetings consumes so much of participants' free time that they exclude many with jobs and/or children. Sometimes an advisory panel is appointed, limiting participation by fiat. To meet basic access requirements, public meeting input processes need to be scrupulously democratic, straightforward, easily understandable, and time-efficient. However, access to the

decision process involves more than just the ability to participate in public meetings. The very formulation of the "problem" can limit who is eligible to participate. Professionals often make determinations about the initial nature and scale of a problem that leaves the definition of solutions and participants constrained.

5.2 Distributional Justice

Distributional justice is often the implied rationale for many transportation projects. For example, roadways are widened to relieve traffic congestion, the most congested first [25]. That is, those undergoing the most traffic congestion are claimed to be unfairly impacted. Similar arguments can be invoked regarding high crash rates, high noise levels, high air pollution levels, etc. Environmental justice literature is replete with examples of maldistributions of impacts. Furthermore, the studies conducted by professionals that "justify" the need for a project may be very far off the mark as well, and not always by accident [26].

5.3 Procedural Justice

Finally, leaving aside the prior problems, the method of arriving at solutions is also frequently severely circumscribed. A relatively few alternatives are offered by professionals, often arrayed so that their preferred solution appears to be the best technical solution. The general public may suspect that the range of possible solutions is being limited, but cannot confirm it. As a result the tenor of the professional/public engagement conforms to a hostile and adversarial "DAD" protocol, that is: "Decide, Announce, Defend" [27, 3]. Constructing the solution process as a process of adversarial bargaining over constrained alternatives instead of joint problem solving fosters mistrust and lower satisfaction with the outcome [24]. In the end, the entire problem-solution continuum can become formulaic, maximizing the consolidation of decision-making power and minimizing the possibility of justice [28].

Typical public planning processes include justice problems of all three types: for example, access is discouraged either formally by the use of advisory panels or informally by dysfunctional meeting strategies; distributional justice is compromised by professionals' control of the measurement and thus definition of the problem, and procedural justice is limited by restricting public choices to narrow ranges of options.

However, the Arnstein Ladder data suggest that it is not necessary for this situation to arise. Citizens share similar expectations with professionals and elected officials about the level of their involvement. Especially where local cultural landscape aesthetics are concerned, there is no technical "best" solution, and the professional or the elected official is no more qualified than any other individual participant. And even where the nature of the problem is highly technical, it is seldom exclusively so.

6 FRAMEWORK FOR PUBLIC INVOLVEMENT

To design a just public involvement process, then, it is necessary to translate abstract dimensions of justice into principles for process design. The Arnstein data above indicate that a certain level of technical expertise and control is both useful and desirable. Civil engineers, planners, architects and other qualified professionals must establish design parameters around which a problem can be solved, for example they must define minimum levels of safety and service. The legally and financially feasible option range, or public design envelope, must be shown and explained to the public so that they can participate meaningfully. Finally, within the agreed decision domain, public input must be acquired in a form or language that the designers can understand and apply. Equally, within this domain, professionals must refrain from enforcing unnecessarily their personal visual, cultural and locational preferences on participants.

Subject to ethical considerations, such as those proposed by Voogd and Woltjer [29], public involvement should recognize the following principles:

1. Solicit participation from as many representative stakeholder groups and public as practical.
2. Facilitate participation of disadvantaged groups through distributed outreach and reproducible, portable process.
3. Establish the design envelope. This requires an explanation of the legal and financial bounds to the problem (i.e., the domain beyond over which the participants do not exercise direct control).
4. Establish an agreed-upon decision-making process among all participants.

5. Identify and include all criteria of significance to all parties.
6. Provide transparency in method and data collection.
7. Respect participants' time and input.

7 TECHNOLOGIC DIALOGIES/DIALOGIC TECHNOLOGIES

The advantages of visualization as a means of presenting design and larger-scale planning options have been documented in transit design options [30] and in transportation more broadly [31,32]. These advantages include easier comprehension and higher information density and accessibility compared with written specifications and codes [33]. As GIS and visualization technologies converge, in such forms as ArcGIS with 3D extensions, scenario planning tools including CommunityViz, and alternatives analysis softwares such as WhatIf? are increasingly widely used in urban and TI planning and design [34]. Visualization has become an article of faith among planners and officials.

But their use does not by itself improve the quality of public involvement nor the designs and plans. Over thirty years ago, the Transportation Research Board (TRB) published a group of papers exploring the potential for computer visualization to improve the quality of public involvement in transportation planning. In that issue, Arnstein and Winder [35, p.44-48] presciently discussed a series of problems with citizen participation that were likely not substantially improved by visualization tools. These problems included, among others: 1) Which citizens participate; 2) Accountability of transportation officials; 3) Equity of benefits and disbenefits; and 4) Citizen distrust.

Reflexivity is defined as a capacity to negotiate between stakeholder and expert opinions in a participatory decision system. On the one hand, a non-reflexive process is one in which the technologies are used, perhaps unwittingly, or perhaps intentionally, to cipher expert opinion. In these cases GISci technologies become a channel for what Arnstein calls "manipulation" or coercion and lead to what Sheppard [36] finds as suspicion of processes apparently overendowed with such technologies. To the degree that experts are using the technologies to "sell," "convince" or otherwise influence public opinion in a nontransparent way, their use is not reflexive. On the other hand, for example, a participatory visualization process could invite participants to deliver feedback on designs that can be converted into design guidance in architectural terms, for example, density, massing or typology [37]. Reflexive use of geovisual and geospatial technologies is critical in moving stakeholders up the Arnstein Ladder towards "partnership."

8 STRUCTURED PUBLIC INVOLVEMENT

We use the term Structured Public Involvement or SPI [38] to describe a protocol combining dialogic tools, a range of visualization technologies into a participatory decision support system to support, encourage, and make best use of, citizen participation. The aim of SPI is to increase public satisfaction with infrastructure design process and product. SPI assumes that engineers, planners and designers are the technical experts but that citizens best know their own cultural, spatial, and social preferences, and those should be incorporated effectively into the design process.

SPI is a reflexive, iterative and distributed protocol integrating large group input into complex built environment questions. It is a set of linked dialogic processes featuring strongly reflexive use of visualization, spatial analytic and decision-support tools that allow the professional to understand more clearly public planning and/or design preferences. SPI is not a single process applied to all design problem types; rather, it is the set of guidelines for selecting specific dialogic processes and decision support tools for a given problem. It relies on active participation by professionals to help select the specific processes, tools, and techniques to best respond to the question at hand [2].

An example of SPI at work is the recently completed, year-long public involvement stage of the Ohio River Bridges design, in and near Louisville, Kentucky [39]. Working collaboratively with the engineering and design firms, the authors designed and executed a year-long iterative process of gathering and modeling citizen's aesthetic preferences for bridge designs in a complex urban environment. The authors deployed SPI using Casewise Visual Evaluation (CAVE), performing a fuzzy set-based analysis of the aesthetic preference data gathered in public meetings, to help the design team move from a possible range of over 200 designs, to 30 designs, to 12, to 6, and then to 3 finalists [x]. At each stage, the newer designs were improved with the input from the prior round of public meetings. The input process helped designers

understand which specific combinations of design properties contributed to either higher, or lower, aesthetic preference. This information was integrated with other considerations of cost, maintenance, and constructability to arrive at the current three finalists. The public's satisfaction with the overall process was also solicited: consistent with prior work by the authors, the mean public satisfaction rating of the bridge design process was 8 on a scale of 1 to 10.

9 RESULTS OF SPI PROTOCOLS

One of the most fundamental tenets of democracy is accountability. In the case of TI investment, almost no effort is made to determine the extent to which the public are satisfied. Existing claims regarding the performance of public involvement rest on normative assumptions. Where it exists, evaluation is often performed by expert evaluation groups comprised of peers of design and engineering teams or even members of the design team. There are many reasons why this is not compatible with the principles or the practice of participatory democracy. Moreover, this type of evaluation masks the problems with public involvement and is one of the reasons for the existence of the Arnstein Gap.

Over the last ten years we have worked on a wide range of transportation infrastructure (TI) projects in collaboration with design, planning and engineering partners. These projects range from multi-billion dollar interstate bridge design involving thousands of stakeholders [39] to integrated transportation/land use modeling for local municipalities involving a few dozen participants [40]. During these projects, public satisfaction with SPI processes has been gauged by holding an anonymous real-time poll at the same open public meetings where design feedback was gathered. Participants are asked to evaluate their satisfaction on an integer scale of 1 through 10, where 1 is lowest and 10 is highest. This database contains over 500 respondents. Figure 2 shows these results:

These results are indicative. However, they represent the only direct attempt in the literature to gauge stakeholder satisfaction with the public involvement process under live conditions. These findings are important because high public approval ratings of public infrastructure design processes are strong evidence of a fair and equitable process. They also demonstrate the significance of procedural justice in that: "In exchange for participation in a fair and open process, citizens often are willing to support the outcome of the process even if their preferred alternative is not selected." [41, p.2]

10 CONCLUSION

Creating an environment where citizens are, and perceive they are, treated justly in the context of large complex planning and design problems is a very challenging task. It demands a methodical examination of the principles that should be met, and a careful, even meticulous, approach to the specific processes that will negotiate an array of conflicting objectives. We hope this article has helped explicate those goals more clearly and has demonstrated one approach to realizing them. In the same vein, we urge professionals to move past classic myths of public involvement that perpetuate the Arnstein Gap. These myths include claims that the "uninformed" public do not possess adequate understanding of the issues to evaluate them (claims that are sometimes used by professionals to legitimate the public's exclusion [42, p.1465]; the "excessive time" required for meaningful engagement; the argument that "the public won't come anyway, no matter what we do"; the resignation of "we can't give them what they want so why bother"; the notion that failure to achieve consensus is equivalent to process failure; and a number of others [43]

Our work challenges these assumptions. It demonstrates how, in US TI, public involvement can achieve high satisfaction and a strong sense of inclusion with limited engagement time. This success is driven by a clear theoretical structure around which public involvement is organized. SPI features the reflexive use of geovisual and geospatial decision support systems. The public can only be encouraged to participate meaningfully, and to treat professionals with less suspicion, if they see that their values are being taken into account by designers. Longer-term engagement with SPI results in snowball effect, with more people coming to each meeting. Written and verbal comments attest to the public's confidence in the process [44]. In these ways, SPI builds what Docherty et. al [45, p.2225] call "civic capacity."

It is too facile to claim that what works in one place will work in another. It is equally facile to claim, without stakeholder data, that a protocol that shows high performance in one cultural environment will

necessarily perform poorly in another. The success, or otherwise, of public involvement using geovisual and geospatial technologies is strongly dependent on the ways in which the associated group processes conform to prevailing normative democratic ideologies among stakeholders. This success, or otherwise, shows rather less association with what is often viewed as the "outcome" of a design or planning process, i.e. the specific characteristics of the design or plan, than is popularly supposed.

In light of these considerations, we ask that professionals and practitioners in different cultures open a dialog about the kinds of democratic institutions and the theoretical frameworks of justice that could increase public satisfaction with planning and design processes [46]. We seek data, investigation and analysis that connect geovisual/geospatial methods with participatory, or communicative, planning in democratic societies. We seek protocols that assess their performance using open stakeholder evaluations. As a first step, we move for an analysis of the Arnstein Gap in different contexts and an evaluation of appropriate theories of justice, democracy and participation and associated methods for handling Arnstein Gaps, if they exist elsewhere.

11 REFERENCES

[1] Bureau of Transportation Statistics. 2005. Transportation Statistics Annual Report. Washington, DC: U.S. Department of Transportation. Available at http://www.bts.gov/publications/transportation_statistics_annual_report/2005/html/chapter_02/government_transportation_investment.html.

[2] Bailey, K. and Grossardt, T. 2003. Integrating Visualization into Structured Public Involvement: A Case Study of Highway Improvement in Central Kentucky. Transportation Research Record 1817:50-57.

[3] Rawls, J. 1971. A Theory of Justice. Cambridge: Harvard University Press.

[4] Bailey, K. and Grossardt, T. 2006. "Addressing the Arnstein Gap: Improving Public Confidence in Transportation Planning and Design through Structured Public Involvement (SPI)." In M. Schrenk, editor, Proceedings of the 11th International GeoMultimedia Symposium 11: 337-341.

[5] Arnstein, S. 1969. The Ladder of Citizen Participation. Journal of the Institute of American Planners 35(4):216-224.

[6] Barnes G. and Langworthy P. 2004. Increasing the Value of Public Involvement in Transportation Projects, Technical Report MN-RC 2004-20. Minnesota Department of Transportation, Minneapolis, MN. Available at http://www.lrrb.org/PDF/200420.pdf.

[7] National Environmental Policy Act. 1969. Available at http://www.nepa.gov/nepa/regs/nepa/nepaeqia.htm.

[8] Federal Highway Administration. 1994. Environmental Justice.
Available at http://www.fhwa.dot.gov/environment/ej2.htm.

[9] Bickerstaff, K. and Walker, G. 2001. Participatory local governance and transport planning. Environment and Planning A 33(3):431-451.

[10] Connelly, S. 2005. Looking inside public involvement: how is it made so ineffective and can we change this? Community Development Journal 41(1):13-24.

[11] Rawls, John. 1971. A Theory of Justice. Cambridge: Belknap Press of Harvard University.

[12] Hay, Alan M. 1995. "Concepts of Equity, Fairness and Justice in Geographical Studies." Transactions of the Institute of British Geographers NS 20. Royal Geographical Society. pp. 500-508.

[13] Trinder, E., A. Hay, J. Dignan, P. Else, and J. Skorupski. 1991. "Concept of Equity, Fairness and Justice in British Transport Legislation." Environment and Planning C: Government and Policy 9: 31-50.

[14] Pfeffer, N., F. H. Wen, H. M. Ikhrata and J. R. Gosnell. 2002. "Environmental Justice in the Transportation Planning Process: Southern California Perspective." Transportation Research Record 1792: 36-43.

[15] Roberts, P. 2003. "Sustainable Development and Social Justice: Spatial Priorities and Mechanisms for Delivery." Sociological Inquiry 73, 2.

[16] Deverman, R. 2003. "Gathering the Harvest: Assessing Indirect and Cumulative Effects for the Ohio River Bridges Project." Environmental Practice 5, 4: 330-345.

[17] Williams, R. W. 1999. "Environmental Injustice in America and its Politics of Scale." Political Geography 18, 1: 49-73.

[18] Larson, J. R., and J. A. Claussen. 2004. "Statistical Environmental Justice Assessment for a Transportation Corridor." Environmental Practice 6, 1: 71-78.

[19] Kurtz, H. E. 2003. "Scale Frames and Counter-Scale Frames: Constructing the Problem of Environmental Injustice." Political Geography 22, 8: 887-916.

[20] Schweitzer, L., and A. Valenzuela Jr. 2004. "Environmental Injustice and Transportation: The Claims and the Evidence." Journal of Planning Literature 18, 4: 383-398.

[21] Perrons, D., and S. Skyers. 2003. "Empowerment through Participation? Conceptual Explorations and a Case Study." International Journal of Urban and Regional Research 27, 2: 265-285.

[22] Syme, G. J., and B. E. Nancarrow. 2002. "Evaluation of Public Involvement Programs: Measuring Justice and Process Criteria." Water (Australia) 29, 4: 18-24.

[23] Maguire, L. A., and L. E. Allan. 2003. "Public Participation in Environmental Decisions: Stakeholders, Authorities and Procedural Justice." International Journal of Global Environmental Issues 3, 2: 133-148.

[24] Molm, L., G. Peterson, and N. Takahashi, 2003. "In the Eye of the Beholder: Procedural Justice in Social Exchange." American Sociological Review 68, 1: 128-152.

[25] Transportation Research Board. 1975. Partial Lane Pavement Widening. Washington, D.C: Transportation Research Board.

[26] Flyvbjerg, B., Holm, M.K. S., and S. Buhl 2005. "How (In)Accurate are Demand Forecasts in Public Works Projects: The Case of Transportation." Journal of the American Planning Association 71, 2: 131-146.
[27] Campbell-Jackson, M. 2002. Public Involvement. Transportation Research News 220:3.
[28] Bevan, T., J. Actuanza, S. Feldman, and E. Tweet, 2006. "Addressing Sustainability for Major Transportation Projects: Seattle Mercer Corridor Case Study." Proceedings of the 83rd Transportation Research Board Annual Meeting. Washington DC: Transportation Research Board.
[29] Voogd, H. and Woltjer, J. 1999. The communicative ideology in spatial planning: some critical reflections based on the Dutch experience. Environment and Planning B: Planning and Design 26:835-854
[30] Cervero, R., and P. Bosselman. 1998. "Transit Villages: Assessing the Market Potential Through Visual Simulation." Journal of Architectural and Planning Research 15. 3: 181-196.
[31] Landphair, H, and T. Larsen. 1996. "Applications of 3-D and 4-D Visualization Technology in Transportation." Synthesis of Highway Practice 229. Washington, DC: National Academy Press.
[32] Landphair, H, and T. Larsen. 1993. Evaluation and Development of Visualization Technology for Highway Transportation. College Station, TX: Texas Transportation Institute.
[33] Hughes, R. 1998. Guidelines for Use of Visualization. Raleigh, NC: North Carolina Department of Transportation Division of Highways.
[34] Brail, R. and Klosterman, R. 2001. Planning Support Systems: Integrating Geographic Information Systems, Models and Visualization Tools. Environmental Systems Research Institute Press: San Diego.
[35] Arnstein, S. and J. Winder, Jr., 1975. "Discussion of Potential Uses of Interactive Computer Graphics In Citizen Participation." Transportation Research Record 553: 44-48.
[36] Sheppard, S. 2001. Guidance for crystal ball gazers: developing a code of ethics for landscape visualization. Landscape and Urban Planning 54:183-199
[37] Bailey, K., T. Grossardt, and M. Pride-Wells. Forthcoming. "Community Design of a Light Rail Transit Oriented Development Using Casewise Visual Evaluation (CAVE)." SocioEconomic Planning Sciences.
[38] Bailey, K. and T. Grossardt. 2002. Integrating Visualization into Structured Public Involvement: A Case Study of Highway Improvement in Central Kentucky. Transportation Research Record 1817:50-57.
[39] Bailey, K., Grossardt, T., Ripy, J., Williams, J., Toole, L., Bryant, B. Forthcoming "Context-sensitive large bridge design using Casewise Visual Evaluation: Case Study Section 2 Ohio River Bridges Project." Transportation Research Record.
[40] Blandford, B. 2007. Structured Public Involvement in Land Use Planning. Presentation delivered at the Annual Meeting of the Association of American Geographers. San Francisco, CA.
[41] O'Connor, R., Schwartz, M., Schaad, J. and Boyd, D. 2000. State of the Practice: White Paper on Public Involvement. Transportation in the New Millenium, Transportation Research Board, Washington DC.
Available at http://www.trbpi.com/publications/trbwhitepaper.pdf.

[42] Lidskog, R. and Soneryd, L. 2000. Transport infrastructure investment and environmental impact assessment in Sweden: public involvement or exclusion? Environment and Planning A 32(8):1465-1479.
[43] Walters, L., Aydelotte, J. and Miller, J. 2000. Putting More Public in Policy Analysis. Public Administration Review 60(4):349-359.
[44] Bailey, K. and Grossardt, T. 2003. "Community Design of a Light Rail Transit-Oriented Development" in New IDEAS for Transit: Annual Progress Report of the Transit IDEA Program. National Academies: Washington, DC.
[45] Docherty, I., Goodlad, R. and Paddison, R. 2001. Civic culture, community and citizen participation in contrasting neighbourhoods. Urban Studies 38(12):2225-2250.
[46] Maier, K. 2001. "Citizen Participation in Planning: Climbing a Ladder?" European Planning Studies 9, 6: 707-719.

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Grounding Justice in Public Meeting Practice

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1 INTRODUCTION

John Rawl's A Theory of Justice [1], and Justice as Fairness [2] were originally intended to promote a political structure of liberal democracy. Taken together with Habermas' idea of 'discourse ethics' [3], this work has constituted a fundamental aspect of the communicative approach in the planning discipline over the past 20 years [4] [5]. While their work is quite theoretical, it need not be detached from the reality of day-to-day practice. We agree with O'Neill [6] that the work toward greater justice and fairness is eminently practical, and so should derive from their work. In particular, we are interested in advancing justice/fairness in the arena of public infrastructure planning and design through the careful integration of dialogic group processes, technologies of representation, and the opportunistic use of quantitative analysis and decision support tools for public meetings, so as to better realize Rawls' principles in concrete, day-to-day processes [7]. Translating the combined objectives of distributive, procedural, and access justice into practical public meeting processes requires attention to the nature of trade-offs that arise, and highlights the functional benefits of using Rawls' concept of the Veil of Ignorance.

2 JUSTICE/FAIRNESS AND THE MEETING PROCESS

Rawls and Habermas both begin with the premise that a plurality of views exist over the definition of value, and that these are irreconcilable. From this, two important points follow. First, standard utilitarian approaches to analysing public goods are problematic because measurements of utility cannot be uniformly applied to every individual, and thus cannot be summed to create concepts like 'the greatest good for the greatest number'. This then renders many standard transportation engineering calculations such as 'congestion' or 'level of service' as flawed abstractions.

Second, concensus regarding the appropriate distribution of costs and benefits among the involved parties will be impossible. Consequently, attempts to measure and rectify unjust or unfair distributions of impacts and benefits will be only partially successful. This is especially true of the environmental justice analyses carried out under N.E.P.A. in the United States [8].

Since outcomes will, by definition, be inequitably distributed, Rawls and Habermas then concentrate on the decision strategy itself. Rawls imagines his citizens working from the 'original position' or under a 'Veil of Ignorance': that is, without knowledge of how the decision rules will affect them personally, and derives from that a set of principles that he argues would be generally accepted by a reasonable public. He posits the idea of 'maximin' reasoning, wherein citizens will prefer decision rules that minimize the maximum potential 'damage' that could be imposed on them [9]. Habermas avoids prescribing rules and instead suggests that reasonable citizens would themselve derive, through dialogue, the standards of legitimation that would support their decision-making [10]. While the idea of globally-accepted decision rules has been challenged [11], at the level of the neighborhood or the local community meeting, wildly varying notions of what is reasonable are not likely [12,13]. For that reason, we rely on the more prescriptive work of Rawls as regards an appropriate framework for 'fairness' in the context of public meetings.

2.1 Principles of Fairness and Justice

Rawls breaks the analysis of justice into three questions: how are impacts and benefits distributed among people (Distributive Justice); how are the decisions about impacts and benefits made (Procedural Justice); and who is eligible to participate in the decision-making process (Access to Justice) [14]. As regards Process and Access, he posits that people in the 'original position' will subscribe to two guiding principles:

1. Everyone has the same minimum set of liberties that do not invalidate anyone else's same right;

2. Inequalities must meet two conditions: everyone is equally likely to be subject to them, and they must provide the greatest benefit to the least advantaged.

The guidance that arises out of these rather abstract ideas, when applied to the construction of public meetings, is actually quite profound. They become useful as criteria with which to analyze a given strategy or process, current or proposed. They yield, at a minimum, the following set of goals for a public meeting process:

- Solicit participation from as many representative stakeholder groups and public as practical.

This seems a palliative that is recited by all public process managers. In fact it is an outcome of a long-term investment in public participation whereby an organization demonstrates that its meetings will be productive and thus worth attending in the first place. Simply announcing public meetings with a legal notice is inadequate. Additionally, meeting methods themselves must accommodate large numbers of participants without diminishing the participation levels of each individual (see Rawls first guiding principle).

- Facilitate participation of disadvantaged groups through distributed outreach and reproducible, portable processes.

Meeting locations, methods, and technologies that are 'reasonable' to the professional organizing the meeting may not be 'reasonable' to groups or individuals that do not share the same social, cultural, or economic background. Segments of the population that have long experience with official discrimination and exclusion have no reason to believe that the next meeting process will be any different, and thus it is not reasonable to expect them to attend a meeting in the first place. Further, meeting formats that reward those practiced at public speaking serve to further marginalize individuals and reinforce the segregation of ideas and their legitimacy, based on education and public sector exposure. Meeting processes themselves should be 'standardized' so as to yield comparable output from one meeting to the next. This helps guard against the problem of 'underattendance' and decision-making based on too little input. It also allows the information gathering to continue until enough knowledge is gathered to give decision-makers confidence in its reliability.

- Establish the design envelope. This requires an explanation of the legal and financial bounds to the problem (i.e., the domain beyond over which the participants do not exercise direct control).

Our research demonstrates that the public does not desire to control all aspects of planning and design, and they readily accede to a partitioning of the decision environment characterized as 'partnership'. Providentially, so do professionals [15]. Thus the 'problem' of the public taking over a complex planning and design process for which they are not qualified is a fiction. Professionals should structure meetings that clearly define the job of the public and provide useful ways for the public to perform that task. Our experience with a wide range of project demonstrates the public's eagerness to be part of a decision-making process and to contribute in a meaningful way to a solution. On occasion, they will even chide professionals for wasting their participation time at meetings with meaningless 'project updates'.

- Establish an agreed-upon decision-making process among all participants.

Typically the decision-making process is one proposed by professionals that would meet, to the greatest extent possible, the requirements of Rawls as laid out above. While it would be laudatory to develop the process from scratch with the participants, it would consume a significant amount of their valueable meeting time (see principle 7 below) and would signal an abdication of the professionals' responsibility to the public.Professionals should propose a process and then submit it to the attendees for approval or modification, if needed.

- Identify and include all criteria of significance to all parties.

This is a responsibility of the professional to bring her understanding of the project or problem to the public with as much clarity and specificity as possible. In so doing, it will allow two things to happen: the professional will learn the extent to which she in fact understands the full extent of the problem; and it will greatly systematize the process of gaining input from the public by organizing and partitioning the problem to promote understading of it.

- Provide transparency in method and data collection.

This is a logical outcome of the preceeding three principles. If professionals clearly understand the nature of the problem, how it is partitioned, and what they need from the public to proceed, the design becomes fairly straightforward. Transparency becomes a product of process explanation and clarity of input gathering technique. Participants should be able to identify their own specific contributions within the context of the larger meeting process.

- Respect participants' time and input.

This may be the least well understood problem of public participation. It is important that public participation processes be parsimonious with the public's time, especially as it concerns those of limited means who may work hourly or irregular hours. Long meetings, or even long series of short meetings, are both prodigious consumers of time, which may exclude many potential participants, thus seriously violating the idea of access to process. Further, long meetings lead to participant fatigue, which impinges on the consistency of information being gathered. It is incumbent upon professionals that they design time-efficient methods for gathering the maximum amount of useful information from the maximum number of people.

3 STRUCTURED PUBLIC INVOLVEMENT™

The goals laid out above challenge all planning and design professionals, as they have us. In this section, we will discuss how we have addressed these challenges, and explore ways that these goals can be better met in the future. This discussion emerges from our development and deployment of the Structured Public Involvment™ protocol in a range of public sector infrastructure projects.

3.1 Process Clarity and Transparency

A fundamental challenge to professionals is to understand their own design problem and the needed public input for them to proceed. They may be accustomed to assuming the entire design responsibility themselves and then devising means of gaining public approvel of their resultant solutions. SPI™ sorts the design problem into proper domains, isolating and focusing on the public's responsibility and how it is to be answered.

For example, a large bridge design project was recently completed using the SPI™ protocol. Any bridge design is subject to a set of limiting parameters which includes: 1) construction cost, 2) long term maintenance costs, 3) construction impacts, and 4) aesthetic appeal. Of these, only aesthetics is in the domain of the public. That is, using only the first three parameters, bridge engineers could readily narrow the bridge designs down to a few that minimize the overall mixture of cost, maintenance, and constructability. However, they have no knowledge of which designs hold the greatest aesthetic appeal to the public. That is, althought they can minimize cost, they have no way of knowing which designs actually hold the maximum value or benefit for the public.

The goal of the public process became, then, one of measuring how to create the greatest aesthetic value that was consistent with the other three factors. Once this was clear, the design of the method could proceed. Just as importantly, the public could better understand their role in the overall project. Their role was not to choose bridges. Their role was to provide the information necessary to design the most attractive bridge possible given the project constraints on money, maintenance, and construction impacts.

3.1.1 Process Transparency

Once the publics' role in the process is clear, it is important to provide transparency for the process. This generally means conducting the business in a way that participants can verify the legitimacy of the process. SPI™ typically uses electronic keypad systems to gather input from groups. Each scoring event is displayed real time on a frequency distribution, so that respondents can verify their own and others' anonymous inputs. This transparency has the additional benefit of instructing participants on the nature of their tastes vs. others in the group, without the intervention of the professional. Also, because the scoring is simultaneous, there can be no 'Delphi' or opinion-leader effect on participants. They must all make their judgements independently.

3.2 Process Efficiency and the Use of Technology

As noted above, the principle of Access is served by time efficiency. This is served, in turn, by the appropriate use of technologies of representation and decision support. Each provide important advantages that cannot be realized by traditional facilitation tools and methods.

3.2.1 Technologies of Representation

A wide range of representation tools are available for use, from simple charts and graphs through photos, sketches, GIS displays, virtual reality and even 3D and 4D renderings, depending on the capacity of the personnel and equipment. In the case of the aesthetic appeal of bridge designs, the engineering firm used a CAD-based software package that allowed a combination of fixed views for over 30 different bridge design samples to be created and inserted into photographs of the site. This allowed the public to have a better understanding of the aesthetic impact of the bridge designs in their specific context. At later stages a narrower set of designs were rendered to allow fly-throughs and fly-overs, providing the public with more information about a targeted set of options. Thus representation tools were adapted to the stages of the process.

3.2.2 Decision Support Technologies

Beyond gathering data through the use of high-speed, anonymous electronic feedback systems, the actual construction of the feedback itself is critical. Participant feedback can be gathered as simple voting (choose the best), ranking, scoring, multi-criteria evaluation, or, in the case of the bridges, a scoring scheme that maps onto a fuzzy-set modeling strategy. This strategy breaks down the bridge design problem into a set of interactive design variables, namely: height, visual complexity, structure type, symmetry, and superstructure shape. These parameters were derived ina collaboration with the bridge architects and engineers as useful descriptors of bridge desiugn they could employ in their design process. Each parameter can assume three or four values, and combine with any combination of any other parameter, so that the sum total of all possible combinations of bridge concepts exceeds 200.

This number of options is clearly too many for a group of citizens to provide consistent feedback on in a two-hour meeting. However, the use of a strategic sampling routine allowed the shape of participants' aesthetic tastes for various combinations of these design parameters, even those not directly tested. Because the number needed could be reduced to about 10% of all possible combinations, the engineering firm could create the needed number with a modicum of resources, and this number could be reasonably evaluated by participants in a two-hour meeting. In fact, the evaluation phase of the meetings actually consumed less than one hour.

Further, since the set of samples was standardized, the same 'meeting' was repeated on different days in different locations, steadily building a database of participant preference from all over the urban area until the engineering firm and the state sponsors were satisfied that they had a clear understanding of public preferences for the region.

Because there was a broad range of samples, and because participants were cautioned that these were being used to create the subsequent, smaller set of designs, there was no opportunity for 'interest groups' to form around one or another of the designs. In fact, interest by participants was focused on exploring similarities and differences across a broad range of design questions and on using the visual samples to clarify to themselves and to professionals the exact nature of desirable and undesirable designs. Professionals' fears that the public would 'choose an ugly bridge' were unfounded, both because no pre-existing definition for 'ugly' existed, and because the public was not 'choosing' a bridge anyway. That is, there were behind Rawls' Veil of Ignorance, in that they were expressing aesthetic tastes, not making decisions for professionals.

At the conclusion of the data-gathering phase, the total set of participant data was used to construct a fuzzy-set model of aesthetic preferences for the complete set of design combinations. Once this model was built, it was queried interactively with the bridge architects and engineers to understand how the facet of aesthetic preference interacted with considerations of cost, constructability, and maintenance for various potential designs. At all times, aesthetic preference was an important consideration, but at no time was it the only consideration in a design. The design process was thus not hindered by public input, but enhanced in that aesthetic value became a component of the overall design equation.

As the process advanced, various designs were included with different complexes of properties so as to preserve decision options. Even designs that had perhaps moderate appeal were included because of cost advantages, in the event that estimated costs and budgets changed. Public aesthetic taste has some unique properties: the agreement about unappealing designs is much more uniform than that about appealing designs. Thus standard deviations narrow for low-appeal designs, and widen for higher-appeal designs. Making it possible to score each design through the entire range of numbers is critical, because some design elicit bi-modal responses: strong positive and strong negative opinions. This is important because, if the strong negatives cannot be eliminated, the design in question is destined to elicit controversy. Unless there are other mitigating factors for such designs, there seems little reason to defy public taste when other design options carry more appeal and meet all the other necessary criteria.

4 CONCLUSION

The discussion and example given above demonstrate how a consistent philosophical approach to justice informs real public design processes. The careful design of the process responds both to the needs of the professionals and the rights of the public. The use of electronic feedback technologies to enhance the efficiency and transparency of the processes responds to basic fairness doctrines as well, by allowing greater access in terms of numbers of people, ability to participate, and equality of voice. This in turn is an advantage to the professional by helping to ensure an accurate view of public preference is being obtained by making the sample size scalable. In this project, the initial meeting only included 20 designated advisory board members. Once the state clients realized how efficient the process was, they agreed to allow open public meetings where the same process could be pursued in a similar time frame. Participant groups as large as 70 subsequently attended and provided comparable input.

Representation technologies allow participants to be more specific and efficient in their input. In this example, their role as aesthetic value providers was clarified for them, so that they were not confused with the responsibility of making fiscal judgments. This helped 'partition' the input so that it could be used by professionals who, after all, wanted to acquire the greatest value possible from a budget situation that is constantly in flux.

Decision support technologies allowed a complex design problem to be simplified, both in terms of the design properties and the sampling itself, so that the entire logic of the process, in concert with efficient data gathering and focused visual representation, could be encompassed in a two-hour meeting format. This again maximizes access to the process by allowing many more people to fit it into their schedules.

Finally, as evidenced by very high evaluation scores, the public verifies that the SPI ™ process is of high quality [16]. Individuals frequently approach team members after meetings, congratulating them on the quality of the process. We take these evaluations and comments to be the real test of the validity of the SPI™ process, and so make it a point to always gather such ratings. However, there are occasions where the public sector client is unwilling to gather such data and subject themselves to actual, objective evaluation by the public. We hope this research and example will make such situations increasingly rare.

5 REFERENCES

[1] RAWLS, J. 1971. A Theory of Justice. Cambridge: Belknap Press of Harvard University.
[2] RAWLS, J. 2001. Justice as Fairness: A Restatement. Cambridge. Harvard University Press.
[3] HABERMAS, J. 1984. The Theory of Communicative Action, Volume I: Reason and the Rationalisation of Society. London: Heinemann.
[4] FORESTER, J. 1999. The Deliberative Practitioner: Encouraging Participatory Planning Processes. Cambridge: MIT Press.
[5] HEALEY, P. 1997. Collaborative Planning; Shaping Places in Fragmented Societies. Basingstoke: Macmillan.
[6] O'NEILL, O. 2000. Bounds of Justice. Cambridge: Cambridge University Press.
[7] GROSSARDT, T. and BAILEY, K. 2003. Structured Public Involvement: Problems and Prospects for Improvement. Transportation Research Record 1858. Washington, DC: National Academy of Science.
[8] BAILEY, K. And GROSSARDT, T. 2007. Culture, Justice, and the Arstein Gap: The Impact of Structured Public Involvement on U.S. Transportation Infrastructure Planning and Design. Presentation at CORP 2007, Vienna, Austria. May.
[9]] RAWLS, J. 2001. Justice as Fairness: A Restatement. Cambridge. Harvard University Press. P. 42-43.
[10] HABERMAS, J. 1984. The Theory of Communicative Action, Volume I: Reason and the Rationalisation of Society. London: Heinemann. P. 287.
[11] CAMPBELL, H. and MARSHALL, R. 2006. Towards Justice in Planning: A Reappraisal. European Planning Studies 14 (2). February. Pp. 239-252.

[12] KURTZ, H. 2005. Alternative Visions for Citizenship Practice in an Environmental Justice Dispute. Space and Polity 9 (1). Pp. 77-91.
[13] TRAWICK, P. 2002. The Moral Economy of Water: General Principles for Successfully Managing the Commons. GAIA 11(3) pp. 191-194.
[14] RAWLS, J. 1971. A Theory of Justice. Cambridge: Belknap Press of Harvard University. Pp. 74-77.
[15] GROSSARDT, T. and BAILEY, K. 2007. Justice and the Public's Involvement in Infrastructure Planning. (forthcoming) in Practicing Planner. American Institute of Certified Planners.
[16] BAILEY, K. And GROSSARDT, T. 2007. Culture, Justice, and the Arstein Gap: The Impact of Structured Public Involvement on U.S. Transportation Infrastructure Planning and Design. Presentation at CORP 2007, Vienna, Austria. May.

Intenet Based Participation:
Emerging From A Local Planning Tool To A Federal eParticipation-System

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1 INTRODUCTION

Public participations for formal planning processes have become a common method in Germany since the nineteen sixties for planning projects like motorways, harbours, airports etc..

But public participation is gaining higher significance within the next few years. Especially the European Union is putting a strong focus on this issue: numerous research programs, various directives and the according national legislation indicate a tangible increase (compare the Aarhus convention, the EU-directive on public participation or the EU water framework directive). A more detailed description of the legal regulations in Germany is described in Schulze-Wolf & Menzel, 2007 and Schulze-Wolf & Köhler, 2007

Planners and politicians agree that due to huge personnel and material cut-backs in the public sector, future participation projects can only be efficiently carried out by massive utilization of the Internet.

Furthermore as a result of the increasing availability of PCs and Internet in the public and private sector the communication possibilities and habits have changed dramatically. Internet business, e-mail, chats, blogs -to mention only a few- became familiar to almost two thirds of the population of Middle Europe. Nevertheless it has to be kept in mind that there is a digital divide between a majority which is 'living online" and a minority (mainly elderly or poor people) which isn't.

But anyhow these transformations in society communication habits must be recognized and acted upon by authorities in order to prevent a governmental communication isolation.

2 ONLINE PARTICIPATION

As a first approach an Internet based participation has to reproduce the different stages, the workflow and the ways of communication of a conventional formal participation procedure. Thus it allows the online substitution of the traditional participation and creates advantages for the authorities as well as for the participants.

In addition to this mere substitution the Internet offers a lot more possibilities to improve and enhance participation procedures. This can be achieved by integrating the great variety of the techniques which were developed to conduct informal participation procedures like public budget discussions or municipal overall concept discussions.

The overall objective for the development of an Internet based paricipation system is to create a uniform and continuous communication system without any breaks or changes of media

2.1 Prerequisites

Basically a formal participation process consists of three identifiable stages:

- Presentation of all planning documents
- Communication between the authorities and the participants
- (authority) internal assessment process with a concluding hearing

Existing eParticipation platforms suffered from the disadvantage that only parts of these stages or necessary functions were integrated. This leads to difficulties because the information exchange procedure makes use of various media types. This also restrains the overall acceptance and understanding of the innovative potential of this type of eParticipation.

2.2 Technical Requirements

The realization of an Internet platform for formal participation requires elaborate technical solutions. This is due to the fact that the comprehensive planning documents usually consists of both, a great number of large format maps and extensive written documents. Furthermore formal participation procedures frequently go

along with a huge number of statements. In this article 'statement' is meant as a generic term for objections, proposals or comments which are in use within different participation procedures.

In addition the use of email as the main communication channel has been increasingly impaired through Internet viruses, worms and spam-mail, so that desired mails are sorted out through restrictive filtering of mail servers. Finally the unencrypted email communication is a severe security risk.

As governmental bodies are frequently engaged in participation procedures there is a need to reflect their workflow in an Internet based participation scheme in order to minimize media breaks.

The prerequisites and the technical requirements lead to the following aspects which had to be realised in an Internet supported participation system:

- Online presentation of large-format and yet well readable (high resolution) cartographic material
- Online presentation of comprehensive written material
- Writing statements and remarks regarding selected paragraphs
- Drawing statements on maps
- Re-identifying concerned paragraphs or maps
- Accurate assignment of statements to participants
- Completely database supported
- User friendliness
- Obvious benefits for participants and planning authority
- Only Internet browser necessary
- Secure transfer of statements
- Flexibility to adapt to different types of planning processes
- Good price/performance ratio

2.3 First Steps

In April 2002 the Development and Implementation Project Interactive Landscape Plan Koenigslutter was started. One main objective of this interdisciplinary project was to develop a map-based Internet participation platform (v. Haaren & Warren-Kretschmar, 2005; Halama & Roccasalva 2006).

A developer team consisting of software engineers from entera - Environmental Planning & ICT and researchers from the University of Hanover developed the basic concepts for an eParticipation platform. This took place in conjunction with the preparation and implementation of the landscape plan and was carried out in 2002 and 2003. The developed so called 'participation modules' were implemented and evaluated during the public participation procedure for the landscape plan. The evaluation revealed many useful hints and suggestions on system deficits and further development necessities. The results of this Development and Implementation project are available as an open source project.

Due to the limited financial resources of the project the further development of the 'participation modules' were completely privately financed by entera. Meanwhile the 'participation modules' have been redesigned twice and are available under the name of Participation-Online (Beteiligung-Online as it is called in German).

3 CONCEPT

The basic concept of the 'participation modules' respectively Participation-Online combines a number of innovative technical approaches. However several of the technical solutions could only be conceived or begun throughout the duration of the Development and Implementation Project Interactive Landscape Plan Koenigslutter. The finalisations and implementations of these tools were realized later. In spite of its development deficits the Interactive Landscape Plan Koenigslutter was considered by Steinmann, Krek and Blaschke (2005) to be in the group of PP-GIS (Public Participatory Geographic Information System) with the highest degree of interactivity.

3.1 Internet

All three participation phases run exclusively on the Internet. That means that participants as well as the planning authority need only a web browser to accomplish all the necessary tasks like searching, drawing, printing, database queries and so on. As all of the data processing is handled by the Internet server there are no special technical requirements for the users' computers.

Therefore no gaps between online and offline working periods, no redundant data storage and no changes or breaks of media occur.

3.2 Database

To be able to overcome the above mentioned disadvantages of email communication, the basic concept provided a different communication structure: the necessary database application is not used only for storing and retrieving statements but serves as a communication centre as well. Therefore all the statements are written dirctly into the database by the participants themselves. This frees the authority from the time consuming task of feeding lots of statements into the database.

The necessary database application was developed and implemented on an Internet server. All statements which are written into the database make use of the secure Internet protocol (https) and a 128 bit encryption (SSL).

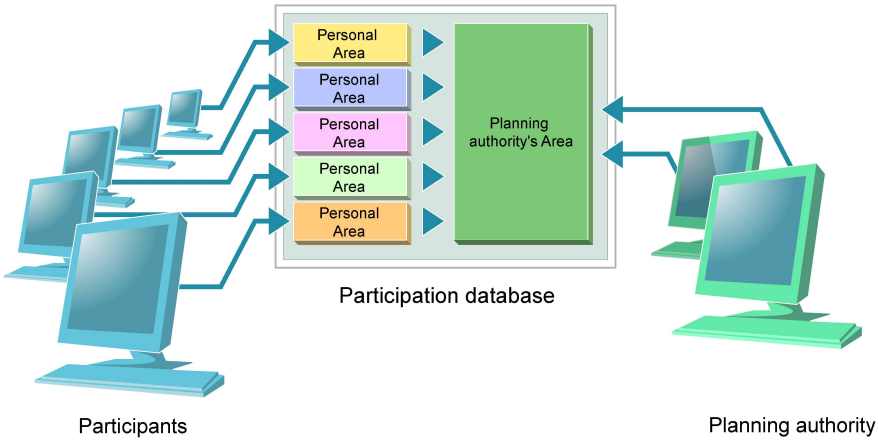

Fig. 1. The participation database

The core application is the so called participation database (Fig.1.). It consists of two strictly separated areas which are password protected: The working area of the authority and the individual personal areas of the participants. The personal areas are created for every person or institution that takes part and is only accessible by that person. It is here that all the comments and statements are created, stored, collected, edited, and finally 'sent' to the authority. The process of sending does not use the Internet protocol at all because the data is simply transferred from the personal area to the authorities working area in the same database.

For every single statement, a specimen copy remains in the participants personal area, which of course either can be saved locally onto a hard drive or printed out.

3.3 Written Statements

Usually written statements are referring to a certain paragraph or phrase of the planning document. If the source is not precisely indicated it becomes an annoying task to find out which paragraph is concerned.

Therefore the original text had to be converted into a Internet suitable format that allows a visualisation as close as possible to original and at the same time keeping a exact reference of the cited phrase. This was

realized by breaking the text into small addressable parts and using the HTML format for reading convenience. The participant only has to mark the relevant paragraph. With a mouse click this text is transferred into the personal area. There the statement can be written with a word processor.

The participation projects carried out using this technique have shown that Participation-Online helps to produce statements which are shorter, much more precise and clearer.

3.4 Map-based statements

Most formal participation projects rely on maps to visualize the planning intentions. Therefore statements frequently refer to mapping contents and its essential not to enable only written but also map based statements.

Unlike other participation systems this is realized by capturing a snapshot of the viewed section of the map displayed with mapserver technology. Simple drawing tools provided by the web application allow to create objects like points, lines, polygons in different colours and sizes. These tools allow to sketch the spatial statements right into the original maps.

The advantages of this are obvious: the drawings always have an exact spatial referenceand are exceptionally precise and well readable. Thus they make the detailed (but frequently inaccurate) description of locations unnecessary.

Due to the fact that the map-based drawings are georeferenced, they can directly be used with a geo-information system (GIS) in order to edit the original geo-data.

3.5 Document Upload

Frequently statements are supplemented by additional material like other planning documents, drawings, maps or even GIS-data. Therefore an online participation tool has to provide an upload possibility for this additional material as an attachment to a statement.

An upload process always bears the risk of an intrusion of viruses, worms and other malware which can disturb or even kill the online participation server. Therefore an accessory upload sever was necessary to be set up. This server is especially intrusion protected and not directly connected with the participation server. Therefore an upload of malicious code onto the upload server has no effect on the participation process itself.

3.6 Analogue Input Interface

In spite of the increasing popularity of online participation there will be a significant quantity of statements which are sent by regular mail. This is due to the mentioned digital divide which is diminishing only hesitantly.

In order to avoid two different management systems for digital and analogue statements there has to be an input interface which allows to integrate and manage the analogue material in the same Internet database as the digital input. Thus, all statements form the participants, sent by whichever method in whatever form, can be managed and processed within the same system.

3.7 Authentication

Depending on the type of planning (e.g. Land Use Planning, Regional Impact Assessment Procedure, Plan Approval Process) it is more or less necessary to identify the participants as the basis of individual communication or communication between authorities.

Therefore a module had to be provided which allows an individual registration and authentication as well as a registration as an authority with different access levels.

3.8 Assessment Tool

As mentioned before the same Internet database is used by the participants creating statements as well as by the authority for the assessment process. Therefore elaborate tools for managing statements, balancing conflicting interests and preparing the final hearing are essential to an online participation tool which claims to cover all three stages of a participation procedure.

Through the authentication procedure prior to the creation of statements, all statements are automatically assigned to the corresponding individual or institution.

With the help of different database tools, all statements on the database are directly accessible. An easy to use but yet powerful query editor allows to retrieve a single statement out of thousands as well as a group of statements with common decisive factors. Statements can of course be sorted and ordered by different criteria.

Statements (single, group, all) can be printed out in a standardized tabular form (synopsis) or any other predefined layout scheme. This allows to produce a complete printed or digitally distributed synopsis of thousands of statements and the related assessments by a mouse click.

An integrated workflow management tool allows to manage and control the process of the assessment. Thus its very simple to keep trace of the status of a single statement as well as of the whole procedure.

All these different tools facilitate the time consuming assessment process which has to be carried out by the authority or the project carrier. As these tools decrease the necessary amount of time considerably the overall duration of a participation procedure will be reduced significantly. This is especially important for large or economically outstanding projects. They will gain substantial economic advantages from this shortening of processing times because of an earlier implementation.

3.9 Components

Participation-Online is not an 'out-of –the-box' product, but rather a complex integration of many different components, mainly adapted Open Source software products. The most important system components are shown in figure 2.

The mapping interface is constructed through MapBender. The participation database and all other database functions are accomplished by high performance database management systems such as MySQL or PostgreSQL. In conjunction with PostGIS, the spatial database extension for PostgreSQL, it is possible to store and retrieve not only alphanumerical data but spatial data as well in the data base.

The scripting language is PHP 5.

The so-called participation modules which actually provide all the complex functions for the online participation are entirely developed by entera.

All system components are connected through system links which can be individually tailored according to the needs of the particular project. Due to the accessibility of the program code for each component (either Open Source or entera owned), Participation-Online offers the highest possible degree of flexibility and adaptability.

The application development system is Linux but the whole system is fully functioning on a Windows server. Therefore it is capable of cooperating with commercial software components like ArcIMS (by ESRI) or Oracle as a DBMS instead of the above mentioned Open Source products. Of course Participation-Online is fully compatible with the OGC standards.

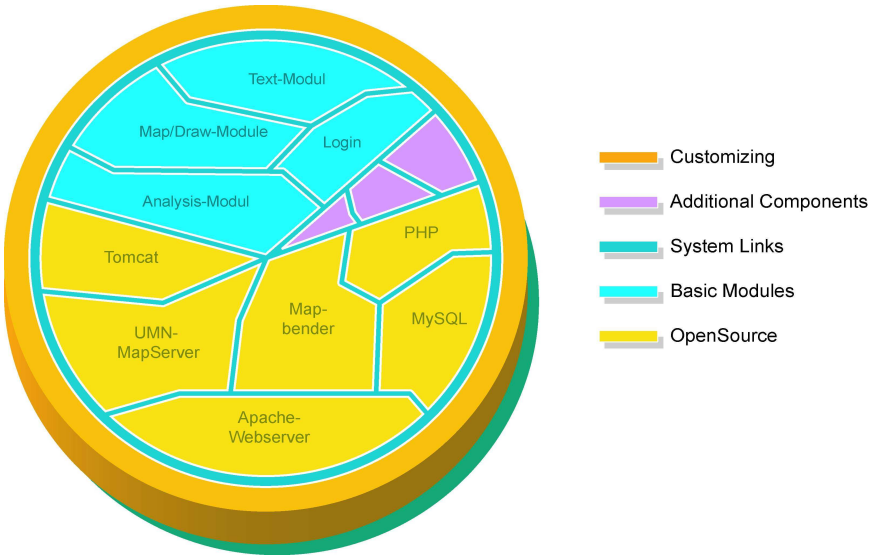

Fig. 2. The components for an Internet based participation platform

3.10 Utilisation

As described earlier there are quite a number of different components necessary to perform the different tasks needed for an online participation procedure. The easiest way to use Participation-Online for a certain participation project is by Application Service Providing (ASP). That means that the complete administration, security, backup, monitoring and the employment of a powerful and specifically designed Internet server with the complete and, on request, individually adapted software components lies completely within the responsibility of the application service provider.

The great advantage of ASP is that the whole service must only be leased for the duration of the participation procedure. This results in savings of cost and time because there is no requirement for skilled personnel. individual hard- and software equipment, and no need to care about installation, maintenance, support, backup procedures etc..

4 DEPLOYMENT

The result of the Interactive Landscape Plan Koenigslutter was a software which was tailored for a landscape planning project but not ready to be used for arbitrary participation projects. The source code therefore had to be revised, a lot of features needed to be altered or added and the setup of the whole system was changed to give it the flexibility and power which is necessary to be adaptable to the requirements of other participation projects.

Finally Participation-Online was released for the first time in Summer 2004. Since then it was used in numerous participation projects in association with diverse types of planning schemes. Meanwhile it is well known in Germany. A prior version is described in the 2006 Specifications Report on Internet Based Participation Measures in Formal Planning Procedures released by the German Federal Ministry of Economics and Technology (BMWi 2006).

Since 2004 a lot of different participation procedures were carried out with the aid of Participation-Online, such as

- Regional Plans (Landesraumordnungspläne)
- Subregional Plans (Regionalpläne)
- Landscape Plans (Landschaftspläne)
- Landscape Framework Plans (Landschaftsrahmenpläne)
- Open Landscape Development Concepts (Freiraumkonzepte)
- Regional Impact Assessment Procedure for Motorways (Raumordnungsverfahren für Autobahnneubauten)

Participation-Online gets improved permanently and more features are added continuously based on the experiences gathered with these projects. Further developments will therefore improve for instance the workflow functionality for both, participants and authority, add more standard exporting possibilities (e.g. Word, Excel) and enhanced the analogue input interface.

Another important development objective will be the integration of eParticipation tools from informal participation procedures. This will combine discursive possibilities with the map and text related functions of Participation-Online.

The current German version 3.0 of Participation-Online was released in spring 2007. A fully featured version is running on the Internet: http://www.beteiligung-online.com. An English preliminary version is available for testing purposes under http://www.participation-online.com.

5 REFERENCES

Schulze-Wolf, T. & Menzel, A. (2007): Neue Wege der Öffentlichkeitsbeteiligung in der Raumplanung – Hintergründe, Konzepte und Erfahrungen. In: Initiative eParticipation & Stiftung Mitarbeit (Eds.): E-Partizipation - Beteiligungsprojekte im Internet.

Schulze-Wolf, T. & Köhler, S. (2007): Internetgestützte Partizipation in der Verkehrsplanung - Beteiligung und Planungsoptimierung. In: Schrenck,M. (Edt.) CORP 2007, Proceedings.

v. Haaren, C. & Warren-Kretschmar, B. (2005): Online Planning - What does it take? A case study in Koenigslutter am Elm. In: Buhmann, v. Haaren & Miller (Eds.): Trends in Online Landscape Architecture. Wichmann Verlag

Halama, G. & Roccasalva, G. (2006): From Government to Governance. E-Government as an intermediate step? The case of the Königslutter Landscape Plan. Urban Governance Course

Steinmann, R., Krek, A., & Blaschke, T. (2005): Can Online Map-Based Applications Improve Citizen Participation? In: E-Government: Towards Electronic Democracy; International Conference, TCGOV 2005

Bundesministerium für Wirtschaft und Technologie –BMWi- (Edt.) (2006): Spezifikationsbericht "Internetgestützte Beteiligungsmaßnahmen in formellen Planungsprozessen"; Im Rahmen der Initiative MEDIA@Komm-Transfer

reviewed paper

A Thematic Soil Plan for the City of Munich – Scopes and Limits of Soil Evaluation in Urban Planning Procedures

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1 SOIL AS COMPONENT OF THE URBAN ECOSYSTEM

Soil as the top layer of the earth's crust, formed by mineral particles, organic matter, water, air and living organisms performs a variety of ecological, social and economic functions vital for human life. Nevertheless the ecological value and significance of intact soils is often grossly underrated compared to the economic value of land. Especially in densely populated areas soils and their manifold functions are impaired and endangered by sealing, compaction, contamination or outright removal. In Germany the conservation of soil is therefore regulated by the German Federal Soil Protection Act (BBodSchG 1998). However, until recently soil played but a minor role in urban planning procedures mainly due to a lack of interpreted, planning-oriented information concerning urban soils and their natural functions. Information about "soil" is usually limited to the economic value, i.e. real estate value or land price, to known or assumed contaminations, to the degree of surface sealing and to the mechanical and geohydrological suitability as building ground. Comparatively little is known about the potential of local soils to develop biotopes for animals and plants, about soil performances in carbon, nutrient and water cycles – e.g. the capacity to infiltrate rain water – or soils' capacity to filter, buffer and transform potentially harmful substances. In this paper the evaluation of natural soil functions listed in BBodSchG, art. 2, in the City of Munich and the implementation of evaluation results in a Thematic Soil Plan as a basis for future planning decisions are presented.

2 SOIL PROTECTION IN THE CITY OF MUNICH

The integration of soil aspects in urban planning procedures is an important step regarding the "mission statement" of soil conservation in the City of Munich with its major objective of "sustainable handling of soil resources to secure or restore their ecological capabilities" (Landeshauptstadt München 2000, p. 4).

This overall concept is substantiated by several guidelines, strategies and measures. The first and most important point is the reduction of soil consumption by restricting the conversion of previously undeveloped areas into building land and limiting the level of sealing. This aim can be achieved by "conventional" planning instruments like the Zoning Plan (Flächennutzungsplan) or Local Development Plans (Bebauungspläne). Because merely quantitative soil protection might not be sufficient for sustainable development of urban centres of growth (Häberli et al. 2002) soil quality has to be introduced as an additional indicator in the planning process. "Quality" in this context must not be reduced to the concentration of contaminants in the soil, which has to be taken into consideration in planning procedures according to detailed regulations (e.g. German Federal Soil Protection Ordinance, BBodSchV 1999), but rather be defined more comprehensively by evaluating natural soil functions (see chapter 4).

Consequently soil conservation policies in the City of Munich include, among others, the preservation or restoration of natural soil functions (Landeshauptstadt München 2002, cp. BayStMUGV 2004). This objective should be achieved by means of both quantitative measures like

- preserving unsealed areas and detecting areas where de-sealing measures are feasible,
- demanding compact building forms in Local Development Plans,
- recycling and vitalisation of abandoned industrial, military or railway grounds,
- inner-city development instead of conversion of agricultural land at the periphery,
- and additional measures taking soil quality into account like
- protecting especially valuable or especially vulnerable soils; in general soil with a high potential to fulfil one or more functions is considered to be "valuable" and worth of proction while "vulnerable" soils are such with a low capability for certain functions (BayGLA 2003) or in need of protection due to high susceptibility to contamination, erosion or compaction (Mosimann 1999),
- preserving natural and near-natural soils especially such with a high potential as biotope for rare species and

- sustainable soil use in agriculture, e.g. minimised application of fertilisers and pesticides, restricted use of heavy machinery on "soft" ground, etc.

Areas with soils particularly worthy or in need of protection as well as areas where action for the preservation of soil functions needs to be taken shall be highlighted in the Landscape Plan (Landschaftsplan). The Thematic Soil Plan (Fachplan Boden) provides previously missing basic information about the characteristics and quality of soil in the City of Munich and is a valuable amendment to the Landscape Plan.

3 THEMATIC SOIL PLAN

The Landscape Plan of the City of Munich shows spatially relevant requirements and measures concerning environmental protection. It is an important instrument for directing future building development towards ecologically less sensitive locations. Goals and objectives of landscaping for the City of Munich are listed in the brochure "Green Planning in Munich" (Landeshauptstadt München 2005). According to these guidelines landscape planning is focussed on achieving four aims of effective and enduring conservation of the natural urban environment:

- "Recreation": allocation and preservation of sufficient green spaces for citizens,
- "Natural scenery": preservation or creation of an appealing environment,
- "Natural balance": e.g. preservation of green corridors for cooling, ground water protection, de-sealing of soils,
- "Protection of biotopes and species": preservation or creation of habitats (biotopes) for rare or endangered plants and animals.

To ensure a consideration of environmental aspects on a par with urban development interests early in the planning process, the Landscape Plan is designed not as an additional planning instrument but as a legally binding integral part of the Zoning Plan (cp. BayNatSchG, art 3, and BauGB, art 1 para 6 and 7g). Thus the Zoning Plan includes stipulations concerning environmental interests on various levels of information (Landeshauptstadt München, 2005). On the first level green spaces for recreation and important biotopes are explicitly included as seperate zoning categories ("public green areas" – Allgemeine Grünflächen and "ecologically sensitive areas" – Ökologische Vorrangflächen). The second level covers special objectives such as (built or partly sealed) areas that are in need for measures to improve urban green, areas with restricted use to conserve and improve especially valuable natural inventory or areas suitable for compensation measures (cp. German Federal Nature Protection Act, BNatSchG, art. 18). Finally, regional or local green corridors – both existing and intended – and areas protected according to other legal regulations e.g. nature reserves, water protection areas or valuable components of the landscape (Bavarian Nature Protection Act, BayNatSchG) are added on the third level (Landeshauptstadt München 2005).

As a synopsis of several thematic plans and concepts the Landscape Plan integrates data about various subjects of protection like water, air/climate and vegetation. These thematic plans help to make contents and specifications of the Landscape Plan more transparent and comprehensible for decision makers and the public. With the Thematic Soil Plan a previously missing component is added to the Landscape Plan.

The Thematic Soil Plan consists of a basic soil map, several evaluation maps (cp. graph 1) showing the capability of soils to fulfil soil functions and sub-functions listed in article 2 of the Federal Soil Protection Act (BBodSchG 1998), synoptic maps with aggregated information of several functions (cp. graph 2) and a textbook with explanations of these maps and the underlying methodology. It provides detailed information about soils for almost the entire municipal territory. Only building blocks in the city center with less than 20 % unsealed surface area are excluded because no technically justifiable evaluation is possible for such strongly altered areas. Moreover, remaining soil on such building blocks should be conserved as habitat for plants and animals, for human recreation and for water retention anyway (cp. BayStMUGV 2004).

4 SOIL EVALUATION

4.1 Data sources and evaluation systems

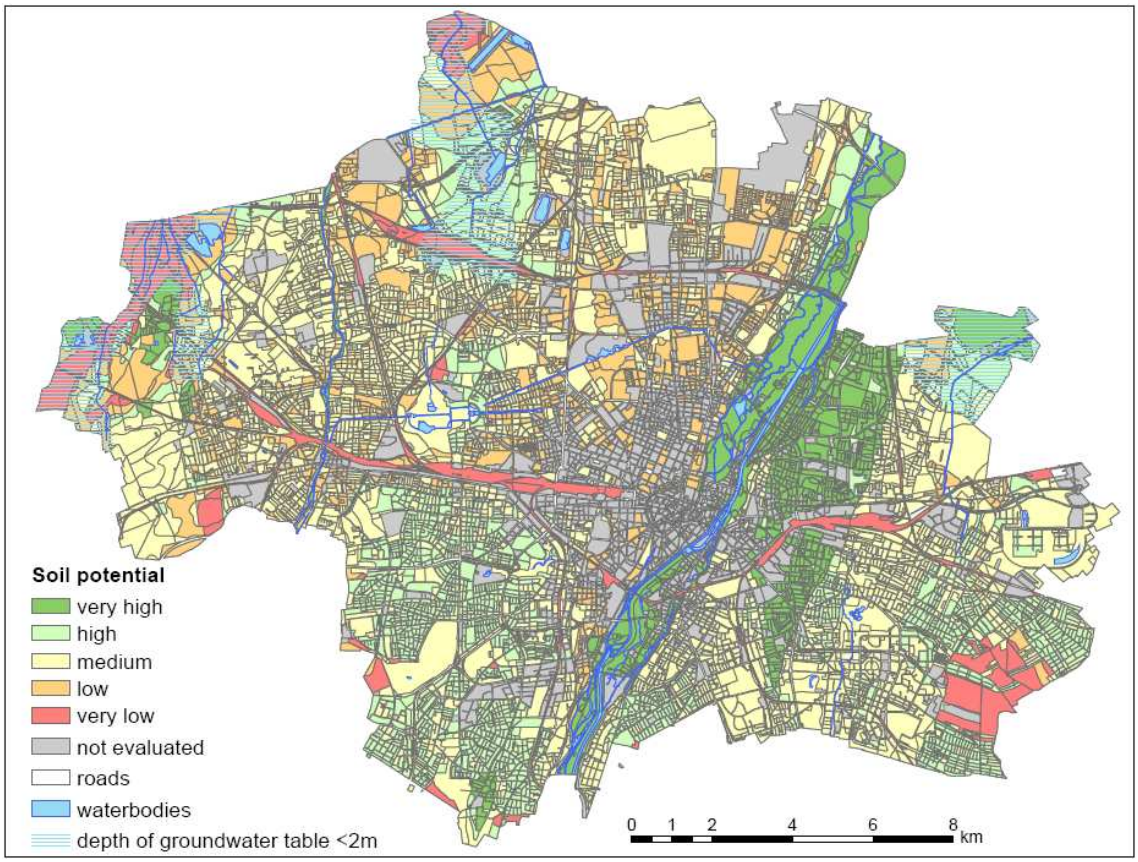
To reflect the heterogeneity and peculiarities of soils in urban areas and thus to provide input of highest quality for evaluation algorithms, area-wide soil mapping would be necessary (AKS 1997, Hochfeld et al.

2003, Faensen-Thiebes et al. 2006). As costs for a high resolution mapping campaign of the entire municipal territory (310 km²) would amount to several million Euro this approach is only feasible for limited areas in the course of specific development projects.

In view of the target scale of 1:25,000 soil parameters were rather derived from existing data sources such as the Soil Map of Bavaria (BayGLA 1986), a Conceptual Map of the potential natural distribution of soils in the city center (Linder 1998), the Land Taxation Overview Map (BayGLA 1985), information about the average depth of the ground water table (Landeshauptstadt München 1993) and a land use map of the City of Munich (Landeshauptstadt München 1996). These basic data were used to evaluate soil (sub-)functions or – more precisely – the potentials of soil to fulfil these natural functions (cp. definition by Hepperle and Stoll 2006). The algorithms applied to derive these information by combining basic soil parameters and additional data are based on existing systems developed and tested in the City of Hamburg (Hochfeld et al. 2003), the Free State of Bavaria (BayGLA 2003), the State of Baden-Württemberg (Umweltministerium Baden-Württemberg 1995) and in various urban regions in the course of the just recently finished INTERREG-IIIB Alpine Space Project TUSEC-IP (Lehmann et al. 2007) to which the authors of this paper were also contributing (cp. Landeshauptstadt München 2006).

In the City of Munich soil plays a role in all the subjects of landscape planning mentioned in the bullet-points above, but especially in the context of ground water protection and as habitat for rare species. Therefore these two aspects shall be explained in detail to exemplify the procedure and results of soil evaluation.

4.2 Soil as filter and buffer of heavy metals



Graph 1: Evaluation results for "soil as filter, buffer and transformer of substances: potential for filtering and buffering heavy metals"
Applied evaluation method: HENNINGS (2000)
Legal basis: BBodSchG art. 2 para. 2 subpara. 1 lit. c

Clay minerals and organic components of the soil have the capability to adsorb, decompose and transform air-borne or water-borne pollutants. Thus soil minimises their potentially toxic effects on plants, animals and subsequently also on humans. Unlike organic compounds heavy metals can not be transformed or decomposed but only (temporarily) be withdrawn from natural cycles by filtering and buffering processes. The potential to filter and buffer heavy metals therefore is of utmost significance in connection with ground water protection (Blume 2004).

The applied evaluation method (Hennings 2000) is also used in the evaluation systems of Bavaria (BayGLA 2003) and Hamburg (Hochfeld et al. 2003). The capacity of soil to adsorb the especially mobile and toxic substance cadmium is assessed as "worst case"-example for other heavy metals such als nickel, cobalt, zinc, chromium, lead or mercury.

In a first evaluation step a certain "relative adsorbation capacity" is assigned to each soil horizon based on the pH-value because filter and buffer capabilites are best under neutral to slightly alcaline conditions (pH-value >6.5). This factor is increased for soil horizons in which the content of organic matter exceeds 2 % and / or the content of clay minerals exceeds 12 %. Finally the "adsorbation factor" is reduced by the content of coarse material – depending on natural conditions and anthropogenic modifications (cp. chapter 4.4) – to relate this factor to the actual amount of fine soil which is relevant for filtering and buffering.

Due to the carbonatic substrate and the modifications in the course of building development – in which artificial carbonatic material such as bricks or building residues are likely to be added to the soil – the pH-value of the topsoil exceeds 6.5 in almost the entire City of Munich. Therefore a rather high relative adsorbation capacity could be assumed. But because the Regosols and Luvisols of the Munich Gravel Plain (Münchener Schotterebene) have extraordinarilly high contents of coarse material only a comparatively small amount of fine soil is actually available. Thus extensive parts of the city, especially the northern part with shallow soils, are only rated as "low" to "medium" while the highest potential is reached in the clayey Luvisols of loess and in Fluvisols along the rivers Isar and Würm.

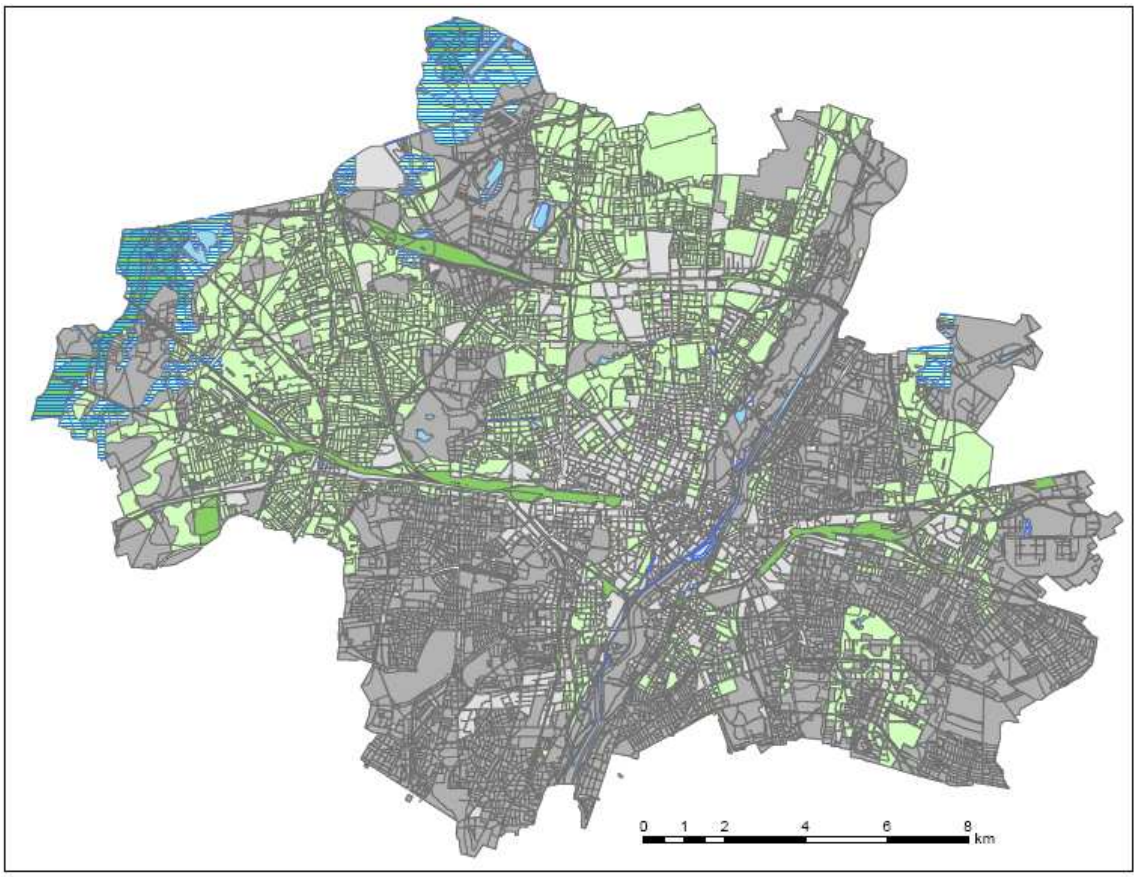
For planning decisions it must be kept in mind that a high potential as filter and buffer for harmful substances must not necessarily imply a high suitability for emitting forms of land use for several reasons:

- The evaluation allows no statement whatsoever about the pre-loading with contaminants. Soil might already be highly enriched with heavy metals so any further immissions would not be adsorbed.
- The change of land use often leads to a change of conditions as e.g. topsoil might be removed causing a decrease of the content of organic matter, pH-values might be altered, etc. A change of land use could therefore cause a desorption of heavy metals stored in the soil matrix.
- Extensive parts of the City of Munich are covered with highly permeable soils. Even though the filter and buffer capacity might be high only insufficient protection of the ground water is granted as water will infiltrate too fast for adsorption processes to take effect (cp. Lehmann et al. 2007). This factor is taken into account in a separate map not presented in this paper.
- Especially in the alluvial plain where high evaluation results are achieved, a high contamination risk must be assumed because the ground water table is close to the surface.
- In addition a fundamental conceptual shortcoming of this soil function has to be discussed: A high potential to filter and buffer heavy metals might be important for ground water protection – but conversely it means an enrichment of contaminants in the soil which actually contradicts the aim of soil conservation.

In a similar manner potentials for nine other soil (sub-)functions were evaluated and presented as maps with comprehensive textual explanations. In addition, some results were combined at the request of planners to aggregate more information within one map.

4.3 Soil as location for potential biotopes

Graph 2 shows such a synoptic map in which the potential of soil to provide good living conditions for specialised flora and fauna is highlighted. The best evaluation results are achieved for soils which offer either very dry or very wet conditions. Conserving soils with extreme conditions is a necessary measure to ensure high biodiversity in the city.



Graph 2: Evaluation results for "soil as a basis for life and habitat for plants and animals: potential as location for biotopes"
Applied evaluation methods: BayGLA (2003), TUSEC (Lehmann et al. 2007); modified
Legal basis: BBodSchG, art. 2 para. 2 subpara. 1 lit. a

"Very dry" conditions – i.e. areas with "very high potential as habitat for xerophilous species" in graph 2 – are assumed for soils with a naturally very low available field capacity (soil water available for plants) of less than 30 l/m² or for areas where such an environment is created by the current form of land use (railway grounds, gravel pits). Soils with an available field capacity of 30-60 l/m² are rated as having "high potential" as biotope for xerophilous species. This condition is fulfilled in extensive parts of the northern and northwestern municipal territory with shallow soils that emerged from the calcareous sediments of the Munich Gravel Plain.

"Wet" conditions are closely connected to the (former) influence of ground water. Soils classified as moors, fens or bogs – located mainly in the northern and western districts of Aubing and Feldmoching – are rated as having "very high potential" as habitat for hygrophilous species whereas "high potential" is assumed for semi-terrestrial soils (e.g. Gleysols) and terrestrial soils with an available field capacity of more than 220 l/m² (BayGLA 2003). The map shows locations at which biotopes for hygrophilous species would naturally develop if artificial measures – e.g. drainage for agricultural use – were given up. Renaturation measures on such locations can be recommended for the compensation of impairments due to building development at other sites as required in BNatSchG, art. 18 and 19, and BayNatSchG, art. 6 ("Eingriffs-Ausgleichsregelung").

Discussions with landscape planners in Munich led to the elaboration of an additional map in which this information is combined with data about the degree of anthropogenic influence (hemeroby). Abandoned railway grounds or gravel pits might be very good locations for xerophilous species and therefore have a high potential as biotopes. But from the point of view of soil conservation locations with naturally "dry" soils should be considered more worthy of protection than locations where these conditions are created

artificially by removing soil at the first place. The fact that only very few of these once extensively spread "poor grassland" areas (Magerwiesen) remained in the City of Munich gives them additional significance as natural heritage.

4.4 Limitations

Due to missing data and / or inadequate evaluation methods certain aspects could not be evaluated including the potential of soil as transformer of organic pollutants (cp. Hochfeld et al. 2002) and the capability of soil in the nutrient cycle.

Especially in urban areas human influence on soils and soil forming processes as well as the heterogenity of soils is high (Pietsch and Kamieth 1991, AKS 1997, Blume 2004). However, for an evaluation of soil functions on an overview planning level based on existing data these anthropogenic alterations can be taken into account only in a very generalised form. For the Thematic Soil Plan the influence of different forms of land use on the most important soil characteristics (pH-value, bulk density, content of coarse material, content of humic substances) is assessed and integrated in the evaluation procedures (cp. Stahr et al. 2003). Historic land use left its imprints on urban soils, too. These influences are even harder to assess as data is only available – if at all – in form of historic maps and texts. The localisation of specific land uses is therefore not always easy especially because historic maps usually do not have the necessary depth of detail concerning land use (Megele 1951).

Further research about the interrelations of soil and human activities is needed in order to be able to take anthropogenic alterations of natural soils into account adequately and thereby significantly increase the quality of urban soil evaluation. With regard to the assessment of the impacts planned land use changes might have on soils this is also an important contribution to providing a better and more comprehensive technical basis for Strategic Environmental Assessments.

5 IMPLICATIONS FOR URBAN PLANNING

5.1 Landscape Plan

The Thematic Soil Plan was elaborated in close cooperation with the municipal Department of Health and Environment (Referat für Gesundheit und Umwelt) and the Department for Urban Planning and Building Regulation (Referat für Stadtplanung und Bauordnung) which is also responsible for landscape and green space planning. Thus objectives of Munich landscape planners were taken into consideration throughout the evaluation procedure. Special attention was payed to some of their specific fields of interest, e.g. the potential of natural or semi-natural soils to provide good living conditions for xerophilous plants and animals and therefore to be worthy of protection as (potential) "poor grassland location" (cp. chapter 4.3).

Results of the soil evaluation procedure are shown as maps in the Thematic Soil Plan and can directly be used to detect areas which need special attention in the course of planning procedures either because of their ecological value (very high rating) or their vulnerability (very low rating for certain functions). It is not yet clarified if the contents of the Thematic Soil Plan will be added to the Landscape Plan as a new separate category (e.g. "priority area for soil conservation") or if they will be included in existing categories (e.g. "areas with restricted use to conserve and improve especially valuable natural inventory").

The aggregation of all evaluation results to a single figure is helpful for the implementation of these results in urban planning and the explanation and justification of planning decisions. Several different approaches for this complex step exist (Feldwisch and Balla 2006). Treating all evaluated soil functions and sub-functions equally (cp. Umweltministerium Baden-Württemberg 1995) is problematical because natural peculiarities and planning objectives can not be taken into account adequately. But prioritising specific functions and finding the appropriate weighting of the relative significance of each soil function constitute a major difficulty as well (Hochfeld et al. 2003). From a scientific point of view pros and cons can be found to legitimate or refuse high weighting for almost any soil function. Choosing the right methodology for an overall evaluation and subsequently for assessing the compatibility of soil conservation objectives with other planning targets seems rather a political than a technical decision. Therefore an overall evaluation map was elaborated as proposal but the actual integration of the Thematic Soil Plan in the Landscape Plan will be left to the responsible Department for Urban Planning and Building Regulation.

5.2 Zoning

Referring to chapter 3 contents of the Thematic Soil Plan can be integrated in zoning and preparatory land use planning on three levels:

- Areas with soils highly suitable as potential biotopes (cp. graph 2) but not yet protected can be excluded from future development by identifying them as "ecologically sensitive areas".
- The Landscape Plan as integral part of the Zoning Plan holds, amongst other things, information about areas with especially valuable natural inventory. Areas with valuable and / or vulnerable soils including soils worthy of protection as archives of natural or cultural history could be integrated in this category (see above).
- Soils with a high potential as biotopes or with special significance in the water cycle could be connected to regional or local green corridors or integrated in existing protected areas.

Another idea discussed with planners was the creation of "pedotopes" which could be protected according to the Nature Protection Act (BayNatSchG), art 9, in the same way as it is already common for "geotopes" (valuable geological archives of natural heritage) and "biotopes" (valuable habitats for rare species – cp. BayNatSchG, chapters IIIa and IV). A "pedotope" in this context could be defined as small area where soils are especially worthy of protection due to their rareness, their significance as natural archive or their ecological importance in a local or regional context.

5.3 Local Development Planning

It has to be kept in mind, that the evaluation of strongly altered sections in the city centre is merely based on repeatedly generalised, interpolated and complemented data from a conceptual soil map. So the presented evaluation results have to be seen as mere "indications" valid only at the targe scale of 1:25,000. For planning measures on a detailed level, e.g. for the elaboration of Local Development Plans, it might be necessary to provide more accurate input parameters by mapping soils in the field to ensure evaluation results of best quality (cp. Hochfeld et al. 2002, Faensen-Thiebes et al. 2006). In future, the survey of soil characteristics – and subsequent consideration of soil evaluation results – should be established as obligatory step for the elaboration of Local Development Plans. To minimise costs and effort such surveys could be combined with the already established collection of data about vegetation (Biotopkartierung), mechanical stability of the building ground (Baugrundeignung und Gründungsgutachten) and the present level of contamination (Altlastenuntersuchung).

In addition, binding regulations should be established for soil protection measures on construction sites and for the treatment and re-application of topsoil removed in the course of building development to ensure a preservation or even improvement of soil functions (cp. BUWAL 2001, BayStMUGV 2004) on parcel level.

5.4 Strategic Environmental Assessment (SEA)

The Thematic Soil Plan provides information for various steps of Strategic Environmental Assessments which have to be "carried out of certain plans and programmes that are likely to have significant effects on the environment" (SEA-Directive, 2001/42/EC, art 1). According to the Statutory Code on Construction and Building (BauGB, art 2 para 4) a Strategic Environmental Assessment has to be carried out for all urban land-use planning instruments (i.e. Preparatory Land Use Plan or Zoning Plan incl. Landscape Plan, Local Development Plans) – exceptions are defined in BauGB, art 13. So the "screening" if such plans are likely to have significant effects on the environment at all can usually be skipped (Busse et al. 2005, BayStMI 2004).

In a subsequent step the scope of the assessment of a certain plan must be defined in terms of time, extent, applied methods and required level of detail. The Thematic Soil Plan can help to decide which soil functions are of relevance in a proposed planning area and if the level of detail of the Thematic Soil Plan is sufficient at the required scale (e.g. for Local Development Plans, see above).

In the Environmental Report (SEA-Directive, art 5) both the current state and "likely significant effects" of certain plans and programmes are described for all relevant subjects of protection. It should summarise and evaluate the contents of the Landscape Plan as required by the SEA-Directive (Pröbstl 2006). The current quality of soils is shown in the maps of the Thematic Soil Plan, the impacts of planned land use changes (removal, sealing or compaction of soils; change of certain soil characteristics and subsequently of soil potentials) can be estimated following the descriptions in the accompanying textbook. Predefined standard

text elements for direct use in the Environmental Report are provided for all soil units and shall ease the argumentation for planning decisions (SEA-Directive, art 8).

The subsequent monitoring of the supposed significant effects (SEA-Directive, art 10) is also facilitated by the methods described in the Thematic Soil Plan.

6 CONCLUSIONS AND OUTLOOK

Relevant soil data including the evaluation maps of the Thematic Soil Plan will be kept easily accessible for all concerned departments in a currently developed, web-based soil information system. The next intended work step is the combination of quantitative and qualitative aspects of land and soil conservation for an ex-post-analysis of the ecological quality of soil which was lost to building development in the last years. For future planning decisions a monitoring system shall be established as another instrument to conserve the most valuable soils and thus contribute to finding compliant and sustainable solutions for future development of the City of Munich.

The Strategic Environmental Assessment seems to be an appropriate and important instrument for the implementation of soil conservation measures on all levels of planning. Even though the applicability is limited by the level of detail of the available basic data, the Thematic Soil Plan constitutes a good source of information and helps to take the qualitative aspects of soil – the "hidden" natural resource – into consideration in planning procedures for the first time in the City of Munich. The present Thematic Soil Plan can be improved by:

- Improvement and standardisation of evaluation methods (cp. Hochfeld et al. 2002, Ad-hoc AG Boden 2003) and especially of methods to correlate land use and soil characteristics (Stahr et al. 2003).
- Results of evaluations based on high-quality data from soil mapping campaigns (cp. chapter 5.4). Soil mapping in the field is especially recommended for planned land use changes in inner-city areas where evaluations are based on data from the conceptual map (Linder 1998) and therefore are likely to diverge from the actual situation on a specific plot of land. In addition blocks with especially "valuable" or "vulnerable" soils should also be given a closer look to verify the overview evaluation. Algorithms for the evaluation of urban soils on this level were developed and tested in the course of TUSEC-IP (Lehmann et al. 2007; cp. Landeshauptstadt München 2006). For easier application these methods were implemented in the web-based tool ILSE (Information on Land and Soil Information – http://ilse.grid-it.at/).
- Additional information on historic forms of land use for selective areas. While developed land is virtually never re-converted into agricultural land the establishment of residential areas, allotment gardens, public green areas or parks on strongly modified soils or artificially shaped terrain is quite common.
- More detailed data on the present hydrological situation especially in areas with semi-terrestrial soils that were formed under the influence of ground water. This would allow a better assessment of the capabilities of such soils in the water cycle and as potential biotopes for hygrophilous species.

The integration of soil into urban planning by means of a Thematic Soil Plan can only be one of several equally important steps to achieve comprehensive soil protection which comprises both quantitative and qualitative aspects, both preventive and remediating measures. Further need is for soil conservation by an extensification of agricultural use ("eco-farming") and garden use, minimisation of airborne contaminants from industry and traffic and soil-friendly synergies with of other nature protection measures (cp. BayStMUGV 2004; Blume 1992; Hepperle and Stoll 2006). If such regulations are to be widely accepted soil conservation on all levels needs accompanying information activities to raise public awareness about the significance of soil and its multitude of functions in the urban ecosystem.

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8 REFERENCES

AD-HOC AG BODEN – ARBEITSGRUPPE BODENKUNDE DER GEOLOGISCHEN LANDESÄMTER UND DER BUNDESANSTALT FÜR GEOWISSENSCHAFTEN UND ROHSTOFFE IN DER BRD: Methodenkatalog zur Bewertung natürlicher Bodenfunktionen, der Archivfunktion des Bodens, der Gefahr der Entstehung schädlicher Bodenveränderungen sowie der Nutzungsfunktion „Rohstofflagerstätte“ nach BBodSchG. Hannover, 2003.

AKS – ARBEITSKREIS STADTBÖDEN DER DEUTSCHEN BODENKUNDLICHEN GESELLSCHAFT: Empfehlungen des Arbeitskreises Stadtböden der Deutschen Bodenkundlichen Gesellschaft für die bodenkundliche Kartierung urban, gewerblich, industriell und montan überformter Flächen (Stadtböden) (2nd edition). Kiel, 1997.

BAUGB – BGBl. 1960, 341: Baugesetzbuch. Berlin, 2004.

BAYGLA – BAYERISCHES GEOLOGISCHES LANDESAMT [ed.]: Bodenschätzungs-Übersichtskarte von Bayern 1:25.000. Blätter 7834 und 7835. München, 1985.

BAYGLA – BAYERISCHES GEOLOGISCHES LANDESAMT [ed.]: Standortkundliche Bodenkarte von Bayern 1:50.000, München-Augsburg und Umgebung incl. Beiheft Bodenchemische und bodenphysikalische Analysenergebnisse. München, 1986.

BAYGLA – BAYERISCHES GEOLOGISCHES LANDESAMT [ed.]: Das Schutzgut Boden in der Planung. Bewertung natürlicher Bodenfunktionen und Umsetzung in Planungs- und Genehmigungsverfahren. München, 2003.

BAYNATSCHG – GVBl. 2006, 2: Gesetz über den Schutz der Natur, die Pflege der Landschaft und die Erholung in freier Natur (Bayerisches Naturschutzgesetz). München, 2006.

BAYSTMI – OBERSTE BAUBEHÖRDE IM BAYERISCHEN STAATSMINISTERIUM DES INNERN [ed.]: Der Umweltbericht in der Praxis. Leitfaden zur Umweltprüfung in der Bauleitplanung. Ergänzte Fassung. München, 2007.

BAYSTMUGV – BAYERISCHES STAATSMINISTERIUM FÜR UMWELT, GESUNDHEIT UND VERBRAUCHERSCHUTZ [ed.]: Arten- und Biotopschutzprogramm Bayern (ABSP). Stadt München. München, 2004.

BBODSCHG – BGBl. I 1998, 502: Gesetz zum Schutz vor schädlichen Bodenveränderungen und zur Sanierung von Altlasten (Bundesbodenschutzgesetz). Berlin, 1998.

BBODSCHV – BGBl. I 1999, 1554: Bundes-Bodenschutz- und Altlastenverordnung. Berlin, 1999.

BLUME, H.-P. [ed.]: Handbuch des Bodenschutzes. Bodenökologie und -belastung. Vorbeugende und abwehrende Schutzmaßnahmen. 3rd edition. Landsberg/Lech, 2004.

BNATSCHG – BGBl. I 2002, 1193: Gesetz über Naturschutz und Landschaftspflege (Bundesnaturschutzgesetz). Berlin, 2002.

BUSSE, J., F. DIRNBERGER, U. PRÖBSTL and W. SCHMIDT: Die neue Umweltprüfung in der Bauleitplanung. München, 2005.

BUWAL – BUNDESAMT FÜR UMWELT, WALD UND LANDSCHAFT: Bodenschutz beim Bauen. Leitfaden Umwelt Nummer 10. Bern, 2001.

FAENSEN-THIEBES, A., J. GERSTENBERG, M. GOEDECKE and U. SMETTAN: Karten zur funktionalen Leistungsfähigkeit von Böden in Berlin. In: Bodenschutz, 3/2006. Berlin, 2006

FELDWISCH, N. and S. BALLA: LABO-Projekt 3.05. Orientierungsrahmen zur zusammenfassenden Bewertung von Bodenfunktionen. Bergisch-Gladbach, Herne, 2006.

HÄBERLI, R., R. GESSLER and W. GROSSENBACHER-MANSUY: Vision Lebensqualität. Nachhaltige Entwicklung: ökologisch notwendig, wirtschaftlich klug, gesellschaftlich möglich. Zürich, 2002.

HENNINGS, V. [ed.]: Methodendokumentation Bodenkunde. Auswertungsmethoden zur Beurteilung der Empfindlichkeit und Belastbarkeit von Böden. Geologisches Jahrbuch, Sonderhefte, Reihe G, 1. Hannover, 2000.

HEPPERLE, E. and T. STOLL: Ressourcenplan Boden. Ein Konzept zum planerisch-nachhaltigen Umgang mit Bodenqualität. Umweltwissen 0633. Bundesamt für Umwelt. Bern, 2006.

HOCHFELD, B., A. GRÖNGRÖFT and G. MIEHLICH: Klassifikationssystem zur Bewertung der Leistungsfähigkeit und Schutzwürdigkeit der Böden als Entscheidungshilfe für die Raumplanung unter Berücksichtigung des Bodenschutzes. Hamburg, 2002.

HOCHFELD, B., A. GRÖNGRÖFT and G. MIEHLICH: Großmaßstäbige Bodenfunktionsbewertung für Hamburger Böden. Verfahrensbeschreibung und Begründung. Hamburg, 2003.

LANDESHAUPTSTADT MÜNCHEN [ed.]: Grundwassersituation im oberen Grundwasserstockwerk - Grundwasserflurabstand. München, 1993.

LANDESHAUPTSTADT MÜNCHEN [ed.]: Realnutzungskartierung – Karte der ökonomischen Grundstruktur 1:40.000. München, 1996.

LANDESHAUPTSTADT MÜNCHEN [ed.]: Erstellung eines Bodenschutzkonzeptes für die Landeshauptstadt München. Beschluss des Umweltschutzausschusses München vom 30.11.2000. München, 2000.

LANDESHAUPTSTADT MÜNCHEN [ed.]: Perspektive München – Leitlinie Ökologie. München, 2002.

LANDESHAUPTSTADT MÜNCHEN [ed.]: Flächennutzungsplan mit integrierter Landschaftsplanung. Erläuterungsbericht zum digitalen Flächennutzungsplan der Landeshauptstadt München. München, 2005.

LANDESHAUPTSTADT MÜNCHEN [ed.]: Soil Evaluation in Spatial Planning. A contribution to sustainable spatial development. Results of the EU-Interreg IIIB Alpine Space Project TUSEC-IP. München, Bozen, 2006.

LEHMANN, A., S. DAVID and K. STAHR: Handbuch zur TUSEC-Bodenbewertung (Technique of Urban Soil Evaluation in City Regions). Hohenheimer Bodenkundliche Hefte. Hohenheim, 2007 (in press).

LINDER, S.: Die Erstellung einer digitalen Konzeptbodenkarte für das Stadtgebiet München als Grundlage für die Entwicklung eines Bodeninformationssystems. München, 1998.

MEGELE, M.: Baugeschichtlicher Atlas der Landeshauptstadt München. – Neue Schriftenreihe des Stadtarchivs München, 3. München, 1951.

MOSIMANN, T.: Integration des Bodenschutzes in die Raumplanung. Ziele, Konzept und Methodik zur Bestimmung besonders schutzwürdiger Bodenflächen am Beispiel des Kantons Basel-Landschaft. Liestal, 1999.

PIETSCH, J. and H. KAMIETH: Stadtböden. Entwicklungen, Belastungen, Bewertung und Planung. Taunusstein, 1991.

PRÖBSTL, U.: The Environmental Report for the Preparatory Land Use Plan with Integrated Landscape Plan in Bavaria. This Approach will not be an easy one. In: UVP-Report, 20(4). Wien, 191-195, 2006.

SEA-DIRECTIVE: Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment. Official Journal L 197/30 of the European Communities, 2001.

STAHR, K., D. STASCH and O. BECK: Entwicklung von Bewertungssystemen für Bodenressourcen in Ballungsräumen. Hohenheim, 2003.

UMWELTMINISTERIUM BADEN-WÜRTTEMBERG: Bewertung von Böden nach ihrer Leistungsfähigkeit – Leitfaden für Planungen und Gestattungsverfahren. UM, 20/95. Stuttgart, 1995.

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Constructing a Green Network to Alleviate the Urban Heat-Island Phenomenon: Focusing on Daegu Metropolitan City in Korea

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1 INTRODUCTION

Modern cities, like living beings, change and alter their shapes somewhat every day. These changes are different from previous agrarian, with their low populations situated in decentralized areas societies, which adapted themselves to circumstances and made significant changes only over the course of decades. The changes of modern cities eventually cause aggravation to city environments due to pressure from frequent, purposeful, dynamic changes occurring over short times in centralized areas to increase citizens' comfort, productivity and efficiency(Su-bong Kim et al., 2006). Among these environmental problems occurring in cities, urbanization, especially including the change of the surface of the earth and the change of land usage alters various important factors of cities, and it leads to Urban Heat-Island phenomenon. Urban Heat-Island phenomenon, which increases the temperature of the central area of city,and damages citizens' health and the economy has become an important social issue. Compared to the past, industrialization, urbanization, and population increase are progressing in all areas to be more productive and efficient. Also, Urban Heat-Island phenomenon including city environmental problems is more common in more places than before. Recently, to solve environmental problems of cities with large areas, remote sensing and geographic information systems have been widely utilized. For Urban Heat-Island-related research, Kyong-hun Park and Sung-kwan Jung (1999) analysed Urban Heat-Island phenomenon and vegetation index using satellite images for metropolitan greenspace planning. Myung-hee Jo et al. (2001) analyzed urban surface temperature and the earth surface temperature according to spatial distribution characteristics. Young-ah Kwon (2002) researched the effect of urban parks on the temperatures of in and around them using satellite images. Gi-ho Kim (2004) studied green network construction for Urban Heat-Island mitigation based on the Dalseo district in Daegu Metropolitan City using remote sensing. Through the extraction of the surface temperature using remote sensing, distribution of Urban Heat-Islands of a metropolitan city can be quickly analysed, and also Urban Heat-Island mitigation effect can be provided quantitatively by analysing temperature distribution relativity according to components of the earth surface(Gallo et al., 1993).

Urban Heat-Island phenomenon repeats every year in metropolitan cities of Korea. Among cities, Daegu has higher temperatures than other cities in summer, and reached 40.0□ on Aug. 1. 1942, which is the highest temperature since meteorological observation began. When summer temperatures and the tropical night phenomenon are raised as social issues, Daegu is never excluded. Since 1995, Daegu has planted ten million trees to reduce Urban Heat-Island phenomenon, establish itself as an environment-friendly city, and solve social issues like citizens' health and the economy. In 1997, Daegu secured water in the Sincheon River, which passes north and south of city. It is thought that efforts such as city afforestation and hydroponic facility expansion have established the foundation for excluding Daegu as one of hottest cities of Korea in the future.

Therefore, this study aims at alleviating Urban Heat-Island phenomenon by establishing a green network as one of method of city planning based on existing city afforestation and hydroponic facility expansion, and decreasing summer temperatures in the city using temperature decreasing effect (Hyun-chan Sung, 1996) among right functions of biotop scattered in the city. Also it carried out an investigation to identify the current situation of Urban Heat-Islands and various kinds of city characteristics, to analyze the possibility of connection and wind corridor based on the condition of the earth surface, and to propose a green network construction project considering current situation.

2 RESEARCH METHOD

2.1 Present Condition of Research Target Place

Daegu is located in the southeast inland (east longitude 128° 21′ □ 128° 46′, and the north latitude 35°36′ □ 36°01′) of the Korean Peninsula. Palgong Mountain is located in the northern part of Daegu, Daeduk and Biseul Mountains are in its southern part, and the east and west sides are surrounded by hilly areas. So Daegu is basin-type city. Inside the city, the Sincheon River flows. The Gumho River in the north flows and combines with the Nakdong River and then flows toward the south. Daegu has a total of 884.46㎢ in area and is on average 40.69 m above sea level.

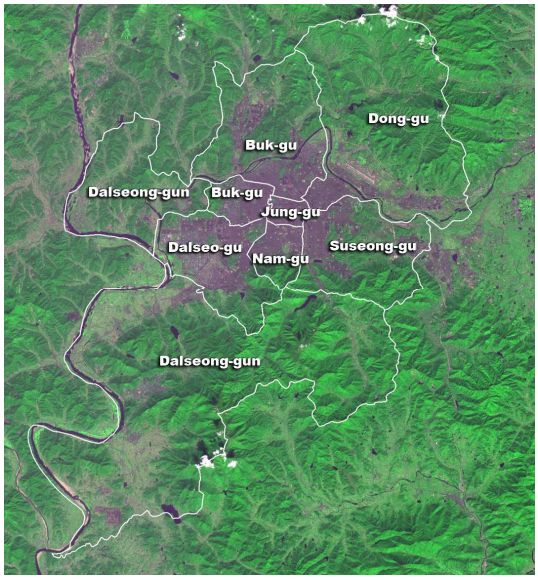

Figure 1. Present condition of Daegu Metropolitan City

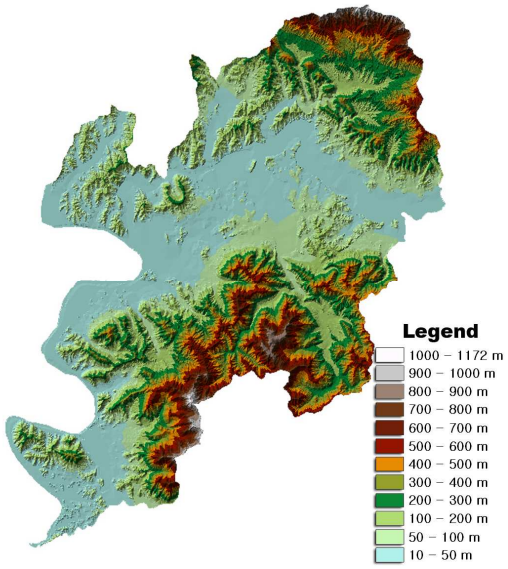

Figure 2. Altitude of Daegu Metropolitan City

2.2 Research Method

This study found out the current condition of Urban Heat-Islands to construct a green network in a way to alleviate the Urban Heat-Island phenomenon of the target area. Also, it identified the correlation with land cover, analyzed the connection with a green network, and implemented a wind corridor simulation.

First, the overall Urban Heat-Island phenomenon and wind corridor simulation of Daegu was analyzed, and then a target place where Urban Heat-Island phenomenon could be effectively alleviated through the construction of wind corridor was selected. Second, the Urban Heat-Island phenomenon, and the correlation between Urban Heat-Island phenomenon and land cover were analysed after arranging target places by districts. On the basis of this result, the possibility of a green network connection was also analyzed. Also, a more detailed wind corridor analysis than previous research was implemented. Third, the future construction of a green network and areas needed to secure a wind corridor in the target place were proposed based on the analyzed results.

The analysis of Urban Heat-Island phenomenon of Daegu and its target place was carried out based on Landsat 5 TM satellite images (Path/row:114/35) from Aug. 8th in 2004, and 1/5000 and 1/25000 digital map. The surface temperature of the earth was extracted by PG-STEAMER 3.0, ARC GIS 9.1, and AUTO CAD 2005 programs. In analyzed Urban Heat-Island phenomenon conditions, analyzed temperatures were divided into 5 levels and given weight classifying them into 10 groups. Then, a grid file of 10×10 m. comparable with land cover was produced. A grid file with 10×10 m, which can be compared with the Urban Heat-Island phenomenon condition, was produced through implementing land cover classification using PG-STEAMER 3.0, ARC GIS 9.1, and AUTO CAD 2005 programs, and referring field research, digital map of target places, satellite image data, and a land cover classification map of the Ministry of Environment. To analyze correlation between generated land cover and Urban Heat-Island phenomenon, SPSS 12 program was used and weight according to land cover was verified. Green network connection possibility was analyzed by producing a 1×1㎞ grid according to temperature based on the present condition of target places researched. For identifying cold wind generation and wind corridor (wind flow) of target places,

metropolitan analysis of Daegu Metropolitan City (spatial scale: 20×20 m) and target place analysis (spatial scale: 10×10 m) used land cover distribution and topography data as attribute data. And then the simulation using KLAM_21 developed in the German Meterological Office was carried out.

3 METROPOLITAN ANALYSIS AND MAIN TARGET PLACE SELECTION

3.1 Analysis of Urban Heat-Island Phenomenon of Daegu Metropolitan City

All objects with more than an absolute temperature 0o K on the earth emit heat energy corresponding to certain temperatures in the shape of electromagnetic waves so that temperature information of the object can be acquired by measuring emitted electromagnetic waves. Temperature extraction using satellite image data is based on thermal infrared from the earth surface so that it can differ from the temperature measured in the certain distance above the earth surface. Therefore, satellite image data is usually used for relative comparison among target areas, and analysis of Urban Heat-Island distribution patterns and characteristics of strength, rather than used for measuring the exact temperature of the earth surface.

In this study, the earth surface temperature was extracted to relatively compare the surface temperatures among target areas, and analyze current conditions of Urban Heat-Island phenomenon using digital number of Band 6 of Landsat 5 TM. Korea Advanced Institute of Science Technology suggested 4 models to extract the earth surface temperature from satellite images. Followings are the equations (Young-Ah Kwon, 2002) :

(i). Two-point linear model

Temperature(˚K) = 203.2 + 0.541176 × TM6

(ii). Linear regression model

Temperature (˚K) = 219.97218 + 0.525959 × TM6

(iii). Quadratic regression model

Temperature (˚K) = 209.830966 + 0.834313 × TM6 - 0.001372 × TM62

(iv). Cubic regression model

Temperature (˚K) = 206.127 + 1.054 × TM6 - 0.003714 × TM62 + 6.60655 × 10-6 × TM63

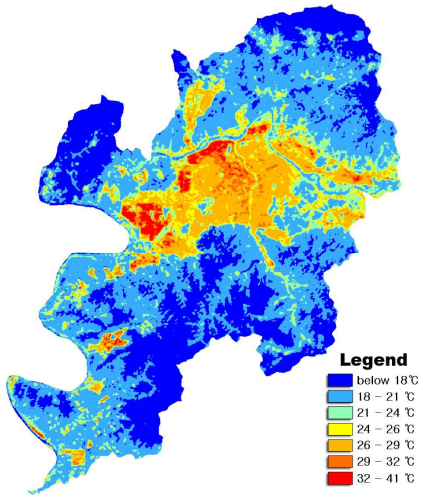

Figure 3. Present condition of Urban Heat-Island Phenomenon

The results of the above four equations present absolute temperature. Therefore, subtract 273.15 from the result to convert absolute temperature into Celsius.

C= K - 273.15

According to existing research on the earth surface temperature, spring and autumn have higher relativity with quadratic regression model among four models done by Landsat 5 TM band 6, summer with linear regression model, and winter with cubic regression model (Myung-hee Jo et al, 2001). To identify Urban Heat-Island phenomenon in summer, therefore, this study used the second equation, linear regression model

and Landsat 5 TM satellite image (Path/row :114/35 2004.8.8) of target areas, and analyzed the Urban Heat-Island phenomenon by utilizing PG-Streamer satellite image analysis program and Arc GIS 9.1.

For satellite image processing before analysis, geometrical compensation was carried out to compensate distorted phenomenon of satellite images based on 1/25000 digital map of starting point. Urban Heat-Island phenomenon of Daegu Metropolitan City was analyzed by compensated image.

As shown in the figure 3, industrial areas in Daegu, 3rd industrial complex of Buk-gu, Seodaegu industrial complex in Seo-gu, and Seongseo industrial complex in Dalseo-gu were analyzed as presenting very high temperature of the earth surface. Jung-gu areas centralized with commercial and business facilities shows a higher temperature than other areas.

Parks or school zones scattered in a mountainous district or central city, and river side such as the southern part of the Gumho River passing from east to west in the outskirts of the city and the Sincheon River flowing central city from south to north showed relatively lower temperatures.

3.2 Wind Corridor Analysis of Daegu Metropolitan City

This study was carried out focusing on constructing a green network as one of the methods of alleviating Urban Heat-Island phenomenon. Not only simple connection between green and water space, but also a green network can provide alleviation of Urban Heat-Island phenomenon and the spread of air pollutants as the area of a wind corridor.

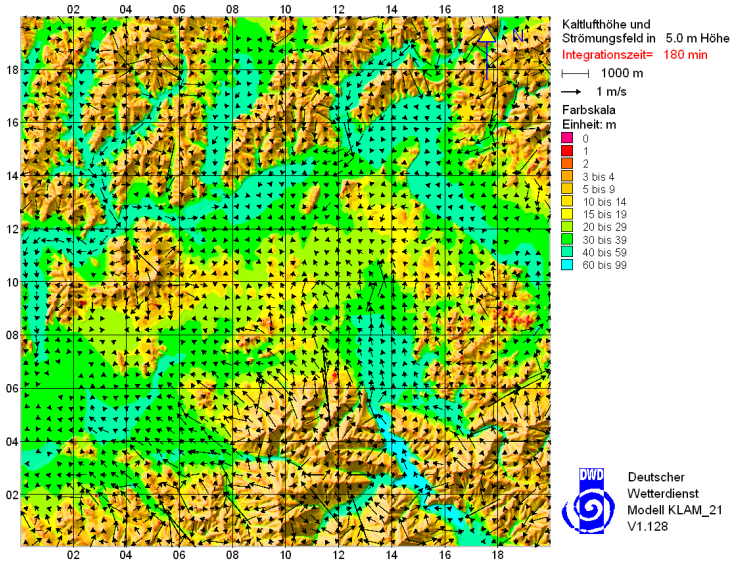

Figure 4. Wind Corridor Simulation of Daegu Metropolitan City (3hours passed)

From the judgement that a wind corridor is needed to be considered in planning a green network, the analysis of cold wind generation and a wind corridor considering spatial characteristics of the target area was implemented.

The wind corridor analysis was carried out with KLAM_21 model developed by The German Meterological Office which can operate simulation of cold wind generation and wind flow reflecting topographical chracteristics. Used attribute data was applied by processing land cover data and topographical data of the target place.

The KLAM_21 model has nine land cover classifications, which are high density residential area (1), low density residential area (2), forest (3), urbanization area (4), industrial area (5), park area (6), unpaved land (7), paved land (8), and waters (9). Average building height and density was decided according to designated land cover classification. For topographical data, altitude value of target place produced by processing 1/25000 digital map was used.

As basic setting, grid interval was 20 m. The standard of applying model is 5 m height above the ground in the 1000×1000 grid(20 km×20 km scale) including the central area of Daegu Metropolitan City.

The simulation of this model was implemented from 20:00 to 06:00 the next morning when cold wind is most actively generated.

In the result of the simulation, cold wind generated mostly in a mountainous area appeared to be flowing into the center of city through valley. However, it was identified that cold wind did not get into the center of city continuously. Some areas showed a smooth flow of wind, and especially the areas near river sides or mountainous areas presented distinct trends of smooth flow. As the area of flowing cold wind into the center of the city, Jung-gu and Nam-gu districts covering the Sincheon River and Apsan Mountain showed a high possibility of continuous wind flowing.

3.3 Select the Main Target Area

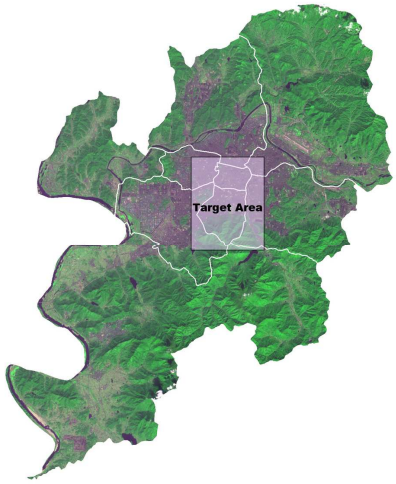

Figure 5. Location of Main Target Area

Urban Heat-Island phenomenon usually occurs in the center of a city. The main target area was selected based on the result of previously done Urban Heat-Island phenomenon and wind corridor analysis. The main target area was Jung-gu (the center of the city) and Nam-gu. Jung-gu is located in the middle of Daegu and was expected to show a very high level of Urban Heat-Island phenomenon, and Nam-gu is located next to Jung-gu and a green network can be constructed connecting the center of the city by linking greens in the outskirt of the city and the river. To improve efficiency of a green network and construct a wind corridor, a rectangular target area was selected measuring 9 km by 7 km which connects a river (Sincheon River) adjacent to the boundary between Jung-gu and Nam-gu into core green areas (Apsan and Duryu Park).

4 ANAYSIS AND STUDY OF MAIN TARGET AREA

4.1 Analysis of Urban Heat-Island Phenomenon

	Daegu Weather Station	Nam-gu AWS	Seo-gu AWS
Temp. of the earth surface	28.4□	28.4□	33.0□
Measured Temperature	32.2□	32.5□	32.7□

Table 1. Comparison of the earth surface temperature and measured temperature

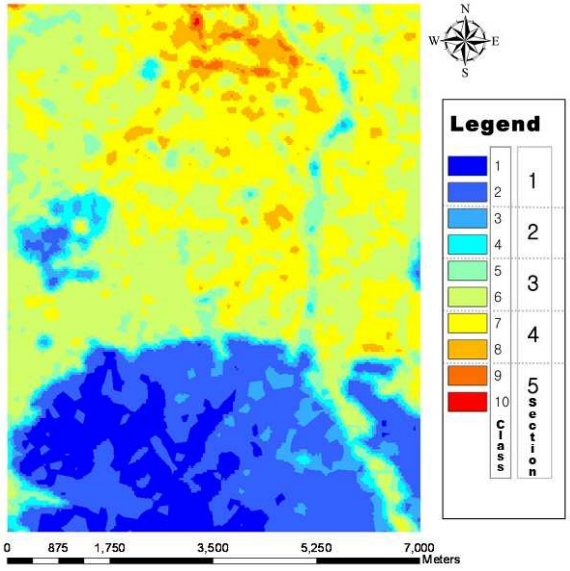

Figure 6. Analysis of Urban Heat-Island Phenomenon (Target Area)

As shown in the table 1, the earth surface temperature extracted from satellite images was compared with actually measured temperature. Seo-gu area showed almost no difference between the two temperatures; however, Nam-gu presented 4 differences. The satellite image has lower temperature than actually measured temperatures. Differing from the satellite image which measures the surface temperature, the actually measured temperature can have other variables according to the surrounding environments such as wind speed, humidity, the state of the earth surface, and artificial heat occurrence. Also, satellite images can have an average difference caused by limited resolution of the image.

In the existing research on Urban Heat-Island phenomenon, there is a study of implemented regression analysis with the actually measured earth surface temperature and satellite images. It calculated the temperature using regression equation with very convincing explanations. However, the target place of this study, Daegu, does not operate Automated Weather Station by Gu-distrcit. Also the main target places are located in Nam-gu areas only so there is not enough data to carry out regression analysis comparing the measured earth surface temperature. Also, it is assumed the temperature does not have much meaning in this study.

As compared with the actually measured temperature, the earth surface temperature from satellite images presented a little difference. However, this study used the earth surface temperature from satellite images to compare relative temperature among areas according to land cover of metropolitan area. Therefore, temperatures extracted from Landsat 5 TM were divided into 5 phases with ultra high, high, medium, low, and ultra low temperature sections. For more detailed analysis, each temperature section was classified into two weights, so 10 classification grid file were produced.

Temperature Section	Ultra High		High		Medium		Low		Ultra Low	
Phase	5		4		3		2		1	
Weight	10	9	8	7	6	5	4	3	2	1

Table 2. Weight Application on the Earth Surface Temperature

As presented in Figure 5, Jung-gu located in the center of the city shows more high temperature areas than Nam-gu. Neighborhood parks and greens including Dalseong and Duryu park, the Sincheon River area, and the mountainous area including Apsan Park presented relatively low temperatures.

4.2 Land Cover Classification

4.2.1 Land Cover Classification

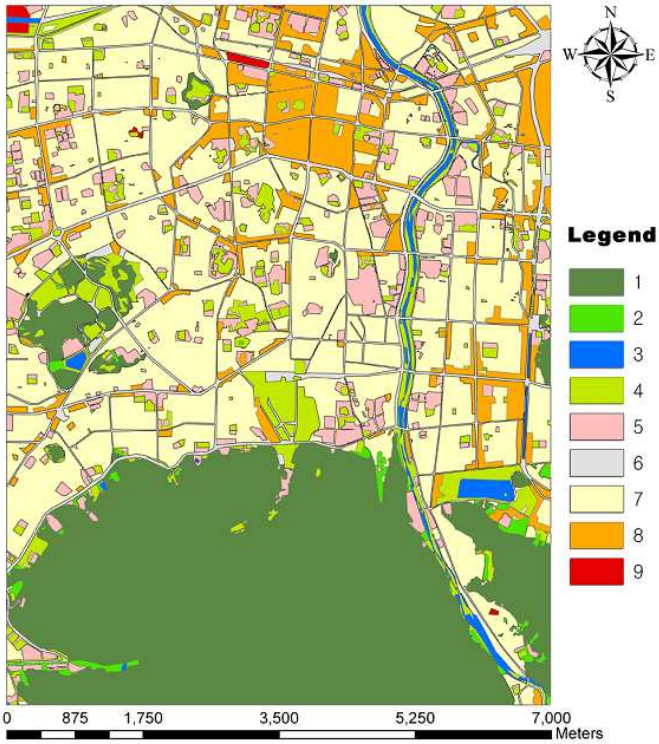

Figure 7. Land Cover Classification of Main Target Areas

To find out the effects of land cover state on Urban Heat-Island phenomenon, this study referred to land cover classification of the Ministry of Environment, and carried out land cover classification considering temperature effects on target areas. Land cover is classified into 9 categories. The standard of classification was the state of land cover and temperature change according to land cover.

Considering the effects on temperature, re-classified items were given weight. The weight becomes low if classified land cover has an important factor decreasing temperature, and the weight becomes high if it has temperature increasing factors.

1	2	3	4	5	6	7	8	9
Mountainous area and city forest	Farming area and grassland	Water area	Leisure complex, Other grassland and Other bare land	Apartment Complex and Public facilities area	Traffic area	Residential area	Commercial area	Industrial area

Table 3. Weight by Land Cover Classification

4.2.2 Correlation Between Land Cover Classification and Temperature

To verify weight of land cover classification set according to the degree of effect on the temperature, correlation with present condition of Urban Heat-Island was analyzed. The land cover map and Urban Heat-Island present condition map have different spatial resolution. To compare them spatially accurately, they were converted into raster file consisting of 630,000 cells to unify spatial resolution of 10×10 m. Correlation analysis was implemented using statistical analysis program, SPSS 12.0.

	Stat	TEMP	LANDCOVER
TEMP	Pearson Coefficient of Correlation	1	.898(**)
	Significance Probability (both sides)		.000
	N	630000	630000
LANDCOVER	Pearson Coefficient of Correlation	.898(**)	1
	Significance Probability (both sides))	.000	
	N	630000	630000
** A coefficient of correlation is significant in 0.01 level (both sides)			

Table 4. Correlation between Land Cover and Temperature

In the results of analyzing correlation of 630,000 cases, a coefficient of correlation was 0.898 in both sides.

This result represented that static correlation of increasing amount of temperature weight as land cover weight increases was shown high.

As the weight increases, therefore, land cover classification having effects on temperature set by this study can be considered as a factor of increasing temperature

4.3 Analysis of Connection Possibility of Green Network

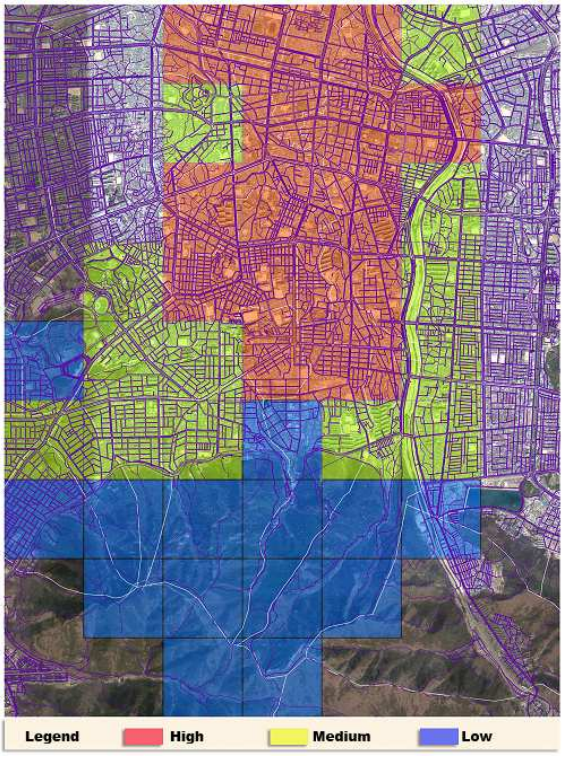

Figure 8. Temperature division of 41 districts

To analyze connection possibility for proposing a green network in the target area, this study planned to carry out possibility analysis by comparing temperatures and considering land cover state based on administrative districts (Dong) of target area of 7×9 km. However, comparative analysis was not able to be carried out due to dimension differences among administrative districts. So 41 grids with 1×1 km size

including Jung-gu and Nam-gu area were produced and they were drawn after classifyng into high, medium and low temperature zone.

In the result, Jung-gu area, the center of the city, mostly accounted for high temperature zones. Dalseong Park and the Sincheon River area, even located in the middle of city, and near Apsan Parks of south area showed medium temperature zone. Duryu Park area and Apsan Mountain area represented low temperature zone. This looks like a typical type of Urban Heat-Island phenomenon. Although there are places which have high or low temperatures, places located more closely in the center of the city have higher temperatures on average.

The river (Sincheon) side area, even though located in the middle of city, areas with a certain amount of greens and parks represented relatively low temperatures.

As overall target area was examined, the Apsan area located in the south is a core area of constructing a green network. Due to the Apsan Beltway, there are many places cut. However, it is considered that green network of north and south direction based on the Camp Walker area using roads and river axis, and passageway of central city direction (north), linking spot region can be constructed.

It is also thought that the east and west direction network from Camp Henry (Daebong Park) to Sincheon passing through Duryu Park, Camp Henry and Daemyung 2 Park can be constructed. The east and west direction of Jung-gu connecting Dalseong Park and Jung-gu neighborhood park, and linking with Sincheon can be constructed.

4.4 Analysis of the Wind Corridor

A more detailed analysis than overall Daegu Metropolitan City was implemented by setting a basic set value of grid interval as 10 m, writing 700×900 grid which is the same interval as previously analyzed Urban Heat-Island present condition and land cover classification, applying the standard of model to 5 m height above the ground , and implementing simulation from 20:00 to 06:00 the next morning when cold wind is most actively generated. After considering all the results from simulation, the rear part of Camp Walker in Apsan, Songhyun water reservoir area, and the entrance of the GaChang Valley area (Padong) were shown with a very high wind flow. Suseong Bridge in the Sincheon area was shown as the most proper place to introduce winds to the center of the city.

Therefore, increasing the connection on the consideration of the rear part of Camp Walker and the Suseong Bridge area in constructing a green network can help cold wind generated in the Apsan area flow into the center of the city.

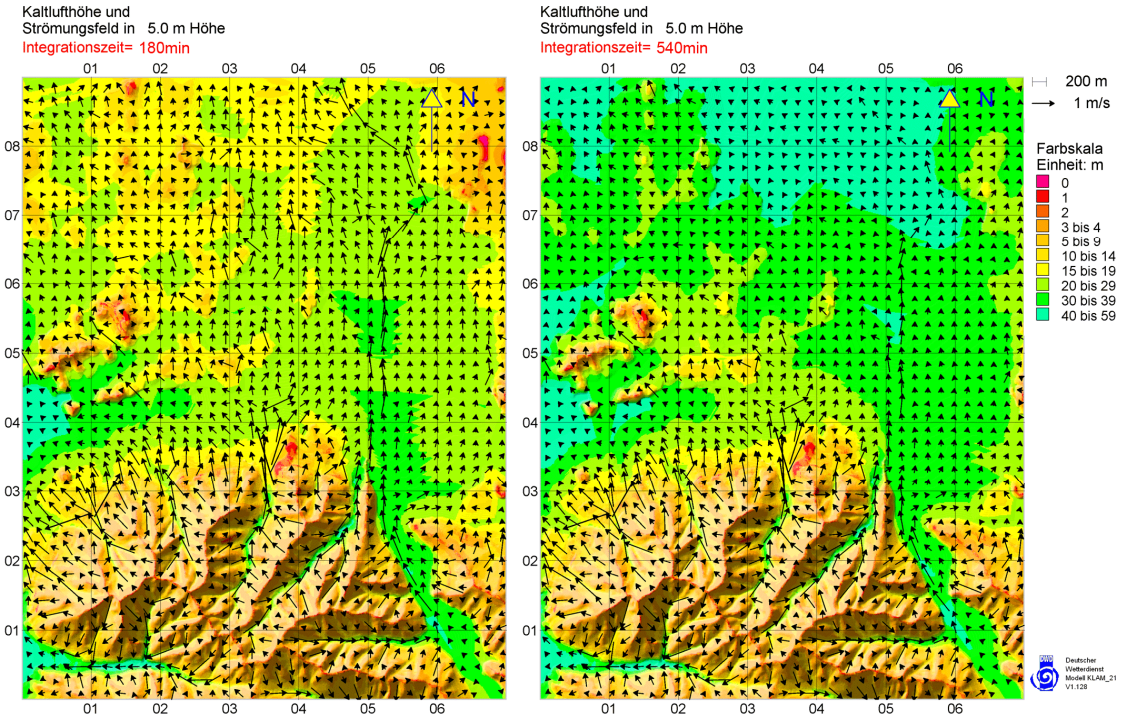

Figure 9. Wind Corridor Simulation of Target Area (3 hours passed, 9 hours passed)

5 CONCLUSION AND PROPOSAL

This research aims at improving the urban environment by reducing the temperature of the city through constructing a green network, as one urban planning approach to alleviate Urban Heat-Island phenomenon among city environmental problems. So it proposed a green network construction through the case studies carried out based on the target area showing Urban Heat-Island phenomenon.

Urban Heat-Island phenomenon represented relatively high in the industrial and commercial areas. In the residential area, the conditions differ from highly-populated areas, non-residentail areas of spot area (park), and so on according to neighboring environment (land cover). Places like the 3rd industrial complex of Buk-gu, Seodaegu industrial complex of Seo-gu, Seongseo industrial complex of Dalseo-gu, and Jung-gu area represented relatively high temperatures of the earth surface. Neighborhood parks, school zones, and river sides like the Gumho River passing from the east to the west in the outskirts of the city and the Sincheon River flowing through the central city from south to north showed relatively lower temperatures. In the target areas, Jung-gu has more high-temperature areas than Nam-gu. Neighborhood parks and greens including Dalseong Park and Duryu Park, the Sincheon River area, and mountainous areas including Apsan Park showed relatively very low temperatures.

In the land cover classification, it was classified as 1. Mountainous area and city forest, 2. Farming area and grassland, 3.Water area, 4. Leisure complex 5. Apartment complex and public facilities 6. Traffic area, 7. Residential area, 8. Commercial area and 9. Industrial area. As a result of analyzing correlation of the earth surface temperature, a coefficient of correlation in both sides showed 0.898. Land cover classification affecting the temperature set in this study is an important factor which increases temperature as weight increases.

Green network connection was analyzed based on the Urban Heat-Island phenomenon and land cover classification. Based on the results, a green network of Jung-gu and Nam-gu on the consideration for the green network of the whole city proposal to alleviate Urban Heat-Island are as follows.

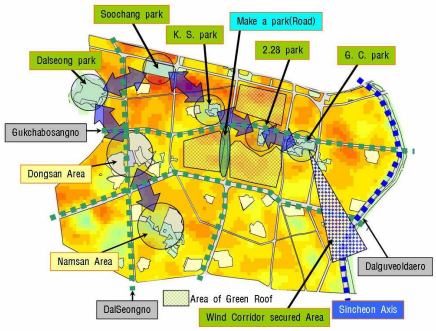

Figure 10. Green Network Concept of Jung-guq

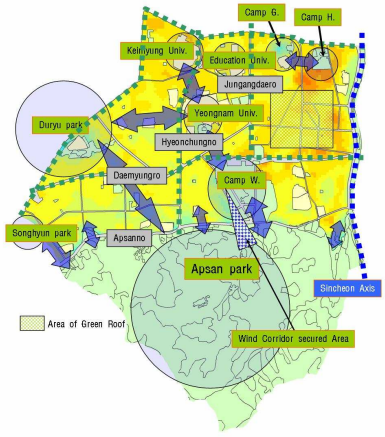

Figure 11. Green Network Concept of Nam-gu

1. In the Jung-gu area, the following is proposed; setting Dalseong Park as a spot and construct a green network by connecting parks neighboring central city and Sincheon River, securing maximum greens and biotop in and around Jung-gu, proposing changing parking lot into water permeable material, establishing wind corridor secured area in the between Dongduk road and Samduk Elementary School to secure wind passage, proposing changing roads in the central city to park, and establishing overall Jung-gu green axis by setting Gukchaebosangno and Dalgubeoldaero as east and west axis, and Dalseongro as north and south axis.

2. In the Nam-gu area, connect Duryu Park and Songhyun Park located near Nam-gu area with Nam-gu, make three US armies and Keimyung University park and connect Daemyung water reservoir, establish the north and south axis using Hyeonchungno, Jungangdaero, and Sincheon riverside, set the east and west axis

using Daemyungro, and connect spot area of neighboring area. It is hard for Nam-gu office area to secure spot area so that the introduction of Green-Roof is proposed.

Developed central city showed very insufficient with spot areas. Except parks, schools and neighboring areas represented low temperatures. Therefore, it is needed to utilize school areas and positvely introduce Green-Roof to secure spots insufficient in the city.

This study was significant by examining the Urban Heat-Island phenomenon of target places, identifying the correlation between land cover and Urban Heat-Island present condition, proposing a detailed green network plan, and analyzing cold wind generation and wind corridors.

However, it did not cover the whole Daegu area so that area excluded in this study can have a low connection. Wind corridor analysis did not carry out verification of the whole target area due to lack of weather data. The green network proposed in this study was to alleviate Urban Heat-Island phenomenon so that other functions of a green network such as passageway of organisms can be deteriorated.

In the future, research on overall green network construction is needed to be carried out continuously through time-series Urban Heat-Island phenomenon and wind corridor analysis including Daegu and its neighboring areas.

6 APPRECIATION

This research was implemented as a part of establishing web-based wind information systems (R-01-2006-000-10543-0), specialized fundamental research of the Korea Science and Engineering Foundation.

7 REFERENCE

Gi-ho Kim, Su-bong Kim, Eung-ho Jung. 2004, A Study on Green Net-Work Construction for Urban Heat-Island Mitigation in Dalseo District, Daegu Metropolitan City. Journal of the Environmental Sciences 13(6):527-535.

Su-bong Kim, Eung-ho Jung, Gi-ho Kim. 2006. Analysis of Street Trees and Heat Island Mosaic in Jung-gu, Daegu. Journal of the Environmental Sciences 15(4):325-332.

Kyung-hun Park, Sung-kwan Jung. 1999 . Analysis on Urban Heat-Island Effects for the Metropolitan Green Space Planning. Journal of the Korean Association of Geographic Information Studies.2(3):35-45.

Hyeon-chan Sung. 1996 . Formulation of Green Network in Kyonggi-do. Gyeonggi Reserch Institute Publications:13

Myung-hee Jo, Kwang-jae Lee, Woon-soo Kim. 2001. A Study on the Spatial Distribution Characteristic of Urban Surface Temperature using Remotely Sensed Data and GIS. Journal of the Korean Association of Geographic Information Studies. 4(1):57-66.

Young-ah Kwon. 2002. The influence of urban green areas on ambient air temperature in Seoul. Doctoral dissertation. The Graduate School of Konkuk University.

Gallo, K. P. et al. 1993. The use of a vegetation index for assessment of the Urban Heat-Island effect. International Journal of Remote Sensing 14(11):2223-2230

John R. Jensen. 2005. Introductory Digital Image Processing (‘geometrical compensation’, 249-277). Sigma Press, Seoul.

Towards Integrated Regeneration Policies and Brownfields Advocacy in the Czech Republic

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1 INTRODUCTION

By the end of the 1990's a majority of Central European countries were faced with growing problems related to brownfields. Unfortunately, there was little understanding of the novelty among policymakers. Some countries were more fortunate than others to obtain assistance on revitalizing their brownfields. The Czech Republic was among those to receive assistance in encouraging brownfield reuse from several independent and outside actors. Until 2003, a majority of local institutions did not address the subject of brownfields and therefore, the size of the problem was unknown and data was nonexistent.[10] In short, brownfields were not a national priority. International programs and assistance has visibly changed this situation and as a result there is now financing to carry out brownfields research and prepare brownfields programs.

Today, brownfield regeneration in the Czech Republic is starting to draw local and international investors' interest. This paper will review the results of programs from 1997 to 2003 by analyzing data published by CzechInvest, a national investment promotion agency. Since 2006 CzechInvest has made its data available to the public, thereby substantially increasing transparency. The CzechInvest data reveal that half of identified brownfield sites are located in small communities below 2000 inhabitants. Since these brownfields are located on the periphery they tend to be superfluous to the market. Small- and medium-sized local authorities need help from regional or district agencies to at least mitigate the threat that brownfields sites pose to the public.

Local communities have the power to deliver a sustainable Urban Agenda. First, local governments need to be empowered and educated on the tools available to them. [11] The responsibilities of local authorities can be divided into two categories. The first category consists of a specific set of administrative tasks, as stipulated by the state. In general, the state provides local governments with assistance in compliance. The second category is trickier because they are self-regulated and carried out by the local elected government. The setting of an urban development agenda falls under this category. Unfortunately, for the second category, officials are not required to meet specific qualifications or go for continuing education.

This lack of skills on the part of the local authorities is one of the main barriers to developing a workable urban regeneration strategy. Build up of local capacity (through coferences, educational campaigns, etc) have significantly increased the capacity of local policymakers and planners[12] and have even resulted in policy changes at all levels of government. Unfortunately, this improvement in policy has not yet resulted in the integration of brownfields regeneration into a wider context of Integrated Urban Regeneration. Furthermore, necessary remediation programs are often neglected by structural funding programs, which must, by definition, comply with the Lisbon Strategy's emphasis on economic growth. Therefore, for environmental clean-up programs to take place, the regional or national government need to take responsibility for funding and setting up the management structure. This is not happening and this paper will offer some insight as to why.

EU membership focuses attention on national policymaking and has resulted in an increase in development-orientated policies. Therefore, this paper examines some of the funding programs that are available for brownfields regeneration in the Czech Republic, in particular Structural Funds (SF). We conclude the paper with policy recommendations and an analysis of what is missing in Czech policy.

[10] *See* Jirina Jackson and Yaakov Garb, "Facilitating brownfield redevelopment in Central Europe: overview and proposals", Institute for Transportation and Development Policy (ITDP), www.itdp.org
[11] See the OECD Economic department paper 499/June 2006: "Improving public efficiency in CR regions and municipalities" for a description of the Czech local authorities and their powers.
[12] See for example the last Czech brownfields conference organized by the Czechinvest http://www.czechinvest.org/web/pwci.nsf/evn/12B293FDFF45B123C12571C60052B8FC?OpenDocument

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2 INTERNATIONAL EFFORTS TO RAISE AWARENESS AND INCREASE LOCAL CAPACITY

International actors and international programs have significantly helped to raise awareness of brownfields in the Czech Republic on the national policy level. As early as 2003 brownfields were placed on the National Development Plan 2004-6, a document that sets priorities for structural funding programs.

International efforts to support brownfield reuse were aimed at various beneficiaries. Upon reflection it is clear that not all intervention efforts achieved the same level of success. For instance, initiatives targeting local governments were mostly unsuccessful at changing policy or instigating local action and projects. This was mainly because at the time of intervention, local governments lacked capacity and did not receive help in filling knowledge-gaps. There was also a lack of financial backing to realize projects. In contrast, projects that targeted the national-level development agency and two local NGOs resulted in policy changes and implementation successes.

It is interesting to note that the EU financed programs had very limited national policy impact until the Czech government promulgated Decree 1100 in mid-2005. Decree 1100 required a National Brownfields Strategy to be delivered by the Ministry of Industry (MPO). By then the MPO had already had some experience with brownfields regeneration and was implementing a national and EU funded programs supporting industrial use brownfields regeneration. After some initial uncertainty, the MPO realized that in order to deliver such a strategy it would have to follow the recommendation of the PHARE project and that they would need the following:

- Data
- Sectoral and stakeholder cooperation and input
- Institution that can execute the preparing and delivering of the strategy.

CzechInvest (www.czechinvest.org) was appointed to be the executing agency. The long awaited brownfields strategy (by now more than one year late) is expected to be unveiled in Summer 2007 as a part of the CzechInvest project Brownfields 3000. Brownfields inventory data that were gathered by the CzechInvest over the year 2006 will help not only to support this Brownfields strategy formulation, but also to publicize the subject and support absorption of brownfields projects financed from the various structural funds. CzechInvest chose data parameters that would help to highlight the country's larger brownfields sites that fall under an Objective 1 in Czech Republic's 13 Regions. In each of these regions now more than 200 brownfields were identified and registered. The entry parameters for each site were stipulated to be a minimum of 2 Ha and a minimum of 500 m2 for each building. Over 3000 brownfields were identified, hence the title, Project Brownfield 3000 (see Box 1).

BOX 1 – Project Brownfields 3000

CzechInvest was appointed to prepare and deliver a nationally supported brownfields reuse support action. This is why the CzechInvest introduced the project „Brownfields 3000".

Project „Brownfields 3000" was developed as a response to a study on inventorying brownfields that was carried out by CzechInvest in 2006. The main goals of this project are first, to guarantee a supply of successful projects; second, to guarantee public co-funding for projects; third, to initiate suitable amends to legal framework; and forth, to initiate and assist preparation of realizable projects.

The study on inventorying provided data on 3096 brownfield sites which cover 11 060 Ha and a build up area of 22 609 Ha. The study found that 40% of brownfields sites were previously used for agriculture, 30% were used for industry, 10% for state-owned buildings, 6% for the military, 4% for housing, and 10% for other.

Demographic analyses of the brownfield sites reveal that smaller communities often have the most brownfield sites. The Brownfields 3000 study specifically found that 51% of the communities have up to 2000 inhabitants, 27% of the communities have between 2 000 and 10 000 inhabitants, 13% of the communities have between 10 000 and 50 000 inhabitants, and 9% of the communities have more than 50 000 inhabitants.

Environmental damage is also a grave problem for many of the communities studied. Brownfields 3000 revealed that 40% of the brownfield sites can be assumed to be contaminated, 6% of the sites have confirmed

environmental damage, 53% of the sites have no damage, and in 1% of the sites it is undetermined whether there is damage.

The outcome of this project is a comprehensive Czech Strategy for regeneration of brownfields and the setting up of an implementation system that would enable its deliverance. The main goal of such a strategy is to support brownfield reuse and prevent sites from turning into brownfields.

*Prepared from information provided by the CzechInvest, www.czechinvest.org

2.1 Locally driven efforts to drive brownfields regeneration

Various international initiatives have gradually improved Czech stakeholders' ability to understand the importance of the brownfield issue. Unfortunately, this increased understanding has not yet resulted in concrete brownfield reuse. For example the Czech Ministry of Environment (MZP) have been lucky enough to have the same leadership for 8 years, which is a quite unusual for a Czech national institution. In 2003-4, on the grounds of promoting sustainable development, the MZP took the initiative and attempted to bring together all stakeholders with knowledge and a stake in brownfield development. The MZP financed its first ever research on brownfields and set up a coordinating working party with other ministries. Unfortunately, the Working Party remained inactive due to lack of political will. On the positive side, the research paper and MZP's initiative have resulted in research funding for brownfields related priorities not only at the MZP but also at the brand new research program of the Ministry of Regional Development (MMR).

The lack of sectoral cooperation and a lack of understanding have meant that research projects are often redundant and have incompatible methodologies for the inventorying of brownfields. Although, some of these inventories successfully produced analyzable data on the actual state of brownfields in a given administrative area. These activities have also pushed the MPO/CzechInvest to hold onto the leadership of brownfield issues.

The first research results available in late 2005 were interesting mainly because they confirmed estimates of findings that were included in the closing report of a PHARE-financed project. In that report it was hypothesized that a majority of brownfields in the Czech Republic are not former industrial sites. Brownfields in the Czech Republic are a much broader socio-economic issue that requires wider access to public funds. The reason, as explained above, is that a lot of brownfields are not strategically located, and therefore, public intervention is needed to either revitalize them or to provide for environmental clean-up.

Data collections efforts have revealed that in smaller communities it is misleading to ignore plots less than ½ hectare. For instance, when all the known brownfields were identified in the Votice administrative district of Czech Republic, out of ca. 80 brownfields, only one was of an industrial origin. Around 50% of identified brownfields were smaller than ½ Ha. Furthermore, the smaller these brownfields were, the more infrastructure was built on the site. As Box 2 shows, in smaller communities even a small brownfield can pose a threat to the public.

BOX 2 Catastrophe driven brownfield demolition program

In the Czech Republic the issues of mitigation program for brownfields have did not come up until the 2007. In early 2007 some local thieves were helping themselves to metal from a brownfields site which stood in a middle of a small community. Unfortunately after having its structural supports sufficiently impaired the building collapsed on the thieves, spilling over onto the pavement. One of the thieves lost its life. Public outcry against the danger to the public from the dilapidated brownfields sites has reverberated throughout the media. The following week at another location a similar scenario occurred. This time two thieves died. Community leaders protested and regions complained that they did not have any funds to provide for public safety. Government acted swiftly and all the regions were promised ca. 300 000 euro each to deal with public danger and emergency issues on brownfields properties.

3 EU STRUCTURAL FUNDS AS A CATALYST

European Union programs have served as a substantial catalyst national level policy reform. Several policies were developed in line with particular Structural Fund (SF) demands. These policies have not only given the framework for future programs, but also pressured the Czech government to accept a new way of making

policy and delivering strategies[13]. These various development-orientated policies have paved the way for urban regeneration and brownfield regeneration.

To have correct policies, strategies and priorities at national, regional or even at the local level is not all that is needed. It is also necessary for the actual brownfields revitalization to occur. Policymakers in the Czech Republic realized this during the first wave of structural programming 2004-2006. The ability of local beneficiaries to absorb the available programs benefits was another matter. This will be dealt with in a later section of this paper.

3.1 The EU initiative for the urban agenda

The EU's broadening of the scope of Objective 1 to include the urban dimension have allowed the brownfields issue to be moved from a singular, disconnected subject (where it lingered for a number of years) to be integrated into the wider context of urban regeneration. Within this context of urban regeneration, there is more room for the issue of brownfields to be integrated with other issues and into broad partnerships across sectors. Reusing or cleaning up a single brownfield cannot significantly impact the social or economic situation of a locality. Therefore, programs on integrated urban regeneration should emphasize partnerships, support of private businesses initiatives. Only within the broader integrated urban regeneration approaches can all the aspect of brownfields regeneration be properly achieved. The Integrated urban regeneration programs for Czech cities above 50.000 inhabitants are part of the 7 Regional Operation Programs for the period of 2006-13. Only time will tell if these programs actually hit their targets.

Although the authors believe that it would be more effective to embed the brownfield issue directly into the EU drive for urban regeneration, as stipulated in Objective 1, we do have some concerns that moving brownfields under the exclusive domain of urban regeneration would result in the issue being neglected at the Czech national level. Furthermore, urban development is currently the responsibility of local authorities and it is unlikely they would willingly give up their authority to national level actors. We are also concerned that the national level currently lacks understanding of urban regeneration and does not yet know how to provide support to local authorities. Only by giving local authorities the proper training can Czech local authorities compete at the EU-level for funds to conduct urban regeneration.

3.1.1 Initial efforts to use Structural Funding for brownfields (2004- 2006)

As explained above the pro-brownfields policies and priorities in the Structural Operational Program in the Czech Republic enabled various brownfields regeneration projects. Some pilot brownfields regeneration projects were even funded by PHARE and ISPA. But these projects were few and far between and the capacity to lead such projects were often lacking. Projects often suffered from false assumptions about project preparation timing and underestimation of technical complexities. All these knowledge-gaps backfired and reduced the effectiveness of structural funding programs carried from 2004-2006. In hindsight it is clear that had substantial technical assistance, education and project preparation support been offered as early as 2003, there would have been much more brownfields revitalization.

The failure to use the structural funds for regeneration of brownfields properly was most obvious in the implementation of operational program for Prague, the JPD2. The JPD2 was an Objective 2 program and allowed for broad urban regeneration activities. Brownfields were excellently stated as a priority and sufficient funds were allocated. However due to an absolute lack of capacity on the part of local authorities, the project has failed to result in the revitilization of brownfields. Fortunately, the real estate market in Prague is buoyant and on-the-rise, and so brownfield revitalization in Prague will probably be paid for through market forces.

3.1.2 The 2007- 2013 Structural Funding programs and their brownfields priorities

During 2007-2013 twenty-five operational programs were prepared in the Czech Republic (double what they were in the previous period). Apart from the expense extravagance of having 25 managing and 25 monitoring agencies, Structural Funding Operational Programs are also burdened with too many priorities. With an average of 4 main goals per program and 4 priorities to each of the goals, there are at least 400 various priorities (although some of these priorities are location-specific). There are 15 Operational

[13] See also the OECD report requested by the Czech government „Organizing the Central State Administration Policy and Instruments" OECD 2006, www.oecd.org, Czech Republic country page

Programs to consider with a minimum of 60 main goals and around 250 priorities to choose from. Although this will prove difficult for applicants, there are positive ramifications for brownfields since brownfield revitalization is applicable to many of the priorities. Apart from sectoral programs, which have useful brownfield priorities, the Czech Republic has 7 Regional Operational programs (ROP) at the levels of NUTS[14] and 2. The need for brownfield regeneration for each of the regions varies considerably.

The absorption initiatives for the Industry Operational Program (OP) have already started with the inventorying and promotional activities carried out by CzechInvest. This time most of the programs also include project preparation funding. The other brownfields regeneration possibilities are, as already stated, embedded in the 7 Regional Operation Programs and also in the Rural Development Program (financed from the EAFRD fund). There are possible brownfield-orientated programs also in the Operational Program Environment and at the national and regional level. Capacity Building programs at the national level are missing. Until now, these types of programs have only been regional-driven, thereby hindering a coordinated dissemination of such knowledge. Therefore, it is likely that the long-awaited "Brownfields Strategy" will stress more capacity-building issues.

4 CONCLUSION

This paper shows that sustainable land use needs to be addressed in broader terms in urban regeneration policies. To bring brownfield sites back into productive use the Czech Republic needs to make brownfields a cross-cutting theme that links across all land use-related policy areas. For properties where revitalization is not possible, at the very least it is necessary to enact mitigation measures so that threats to the environment and society are reduced. The topic of brownfield should not belong to one ministry, or to one-single level of government, be it local, regional, or national. For sustainable land use policies and urban regeneration to take place, coordination between all actors, across all sectors and policy levels, needs to occur.

5 POLICY SUGGESTIONS

- Shift the policy approach away from solving individual brownfield problems to integrating brownfields into the broader theme of integrated urban/regional regeneration;
- Assist regions and local authorities to understand their brownfields problems, especially issues related to environmental mitigation measures;
- Provide additional assistance to stakeholders and local authorities in building capacity and assisting them to gain skills so that they will be able to deliver an integrated urban approach;
- Address the astounding reality that 78 % of identified brownfields are located in communities below 10 000 inhabitants and that these communities generally will not have the experience or administrative capacities to provide technical assistance to the owners (72% of these properties are privately owned. Most of these properties are located in less attractive locations, making it unlikely that the market will demand urban revitalization.)
- Support urban development educational programs focused mainly on local authorities.

[14] NUTS stands for "Nomenclature of territorial units for statistics"

🏆 *reviewed paper*

URBAN PLANNING versus REAL ESTATE DEVELOPMENT in Attica

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ABSTRACT

The city of Athens, economic, political and administrative capital of Greece since 1833, has been developed upon ancient settlements of 2000 years and more without regulating planning and principles. The distribution of economic activities in urban tissue has been determined by a "laiser faire", under the influence of continuous political pressures. Market, with successive changes, has formed a functional "situation of balance", in the thematic level as well as in their areal distribution.

This has led to an Urban Status where Land Uses configure Land Prices and vice versa. New areas with Functional Structures have been developed, that determine land prices forced by Market needs.

For this reason, Athens constitutes a suitable territory for research of urban activities distribution as it is shaped without regulation but it is formed by the free offer and demand of space for the installation of urban activities.

This allocation is fixed from

a) their "functional requirements"

b) their essential "environmental compatibilities" and mainly,

c) their "land prices".

Our research aims to show

- initially how Greek legislation has taken into consideration the city's existing Functional structure and then
- how the "allocation freedom" that is provided, shapes the Urban web of Athens municipality and accordingly real estate development.

1 THE FUNCTIONAL STRUCTURE REVEAL

The Urban Activities are allocated in urban space in a way that would serve their co-function in the city. The functional picture of the city is determined by 38 economic activities. City's Functional Structure will be revealed via the existing linear correlations of the medium annual employment in economic activities. The presence of economic activities is recorded in 6.024 Building Squares of the Athenians municipality. Functional Structure will be revealed by a Principal Components Analysis on the previous described matrix. The structure is concreted by 15 Components which consist thematic groups of Economic activities, shown in Table 1. It is obvious that the 15 components, revealed by the Principal Components Analysis are composed by activities that co-function in urban space.

2 THE ENACTMENT OF LAND USES ALLOCATION IN RELATION WITH THE EXISTING FUNCTIONAL STRUCTURE.

The planning legislation in Greece is determined by two basic tools.

A)The Presidential Decree of 1985 that determines 8 main categories of land uses that can co-exist in Urban areas, and

B)"Urban Plans" that are legislated for specific areas and determine the previous Decree's categories of land uses, allocation in these areas.

The 3 main categories of land uses that are composed by economic activities are the following:

a) Urban Centers - where residence, hotels, hostels and rest tourist settlements, commercial shops, offices, banks, insurances, public institutions, administration buildings (in the neighborhood centers only administration buildings of neighborhood level are allowed), restaurants, refreshment stands, amusement centers, assemblage public domains, cultural buildings, education buildings, religious domains, social

security buildings, low harmful effect professional laboratories, parking, petrol service stations, athletic and commercial reports domains and medium mass transports domains, are allowed.

b) No Environmentally harmful industry – manufacture - This category includes low and medium harmful effect industries - manufacture that can co-exist with residence.

c) Environmentally Harmful industry – manufacture - This category includes industries - manufacture that cannot co-exist with residence, because of the noise and the environmental pollution they cause.

The fact that until 1989 an "Urban Plan" for Athenians municipality has not been legislated has led to the free allocation of economic activities without broad Urban Planning criteria. This has led to the frequent readjustment of urban functions allocation in a continuously reshaped urban tissue.

In order to achieve the comparability between the enacted groups of economic activities from "Urban Plans" with the Functional Structure Components that resulted from P.C.A. [15] that was mentioned before, we group the Components according to the content of Land Uses Presidential Decree. These groupings are shown in Table 2:

1988 Census

1988 FUNCTIONAL STRUCTURE

Functional Structure Components		Economic Activities	NSSG Codes	Loadings	Eigenvalues	%Variance
1	Personal Products distribution	Leather and furs Industries	d29	0,802	3,63	9,32
		Clothing and footwear Industries	d24	0,769		
		Rest Industries	d39	0,618		
		Wholesale Trade	d61	0,539		
2	Commercial Centers	Banks and rest Economic Institutions	**d81**	**0,670**	**2,04**	**5,24**
		Brokers and representatives	**d63**	**0,588**		
		Retail Trade	**d64**	**0,522**		
		Retail Trade	**d65**	**0,468**		
		Transactions of Affairs	**d83**	**0,460**		
3	Oil Industries	**Industries of Oil and Mine products**	d32	0,837	1,77	4,55
		Insurances	d82	0,595		
4	Equipment Industries	**Industries of products from tyre and plastic material**	**d30**	**0,746**	**1,43**	**3,68**
		Industries of Furniture and goods of furnishing	**d26**	**0,627**		
		Industries of Timber and Cork	**d25**	**0,583**		
5	Permanent Products Industries	Tobacco industries	d22	0,824	1,33	3,42
		Printing, Publications and relevant activities	d28	0,783		
6	Education and Recreation	**Education**	**d93**	**0,760**	**1,28**	**3,3**
		Services of Recreation and Culture	**d97**	**0,618**		
7	Chemical And Textile Industries	**Chemical industries**	d31	0,804	1,19	3,05
		Textile Industries	d23	0,794		
8	Building Materials Production	**Basic Metallurgic Industries**	**d34**	**0,684**	**1,14**	**2,93**
		Industries of not metal mining products	**d33**	**0,600**		
		Manufacture of electric machines, appliances and remaining tyres	**d37**	**0,425**		
9	City's Mechanic Department Services	Manufacture of metallic products	d35	0,615	1,12	2,88
		Manufacture of machines and appliances	d36	0,615		
10	Paper and Carrier Means Production	Paper Industries	d27	0,762	1,08	2,78
		Manufacture of Carrier means	d38	0,706		
11	Services and Transports	**Restaurants and Hotels**	**d66**	**0,595**	**1,06**	**2,73**
		Transports	**d71**	**0,535**		
		Personal Services	**d98**	**0,485**		
12	Hygiene Services	Services of Hygiene and Cemeteries	d92	0,871	1,04	2,69
13	Communication and Social Security	**Communications**	**d73**	**0,744**	**1,03**	**2,66**
		Social Security	**d96**	**0,722**		
14	Food Industries	Drinks Industries	d21	0,769	1,02	2,63
		Industry of Food except drinks	d20	0,550		
15	Rentings	**Renting**	**d85**	**0,726**	**1,00,**	**2,57**
		Mobile Renting	**d84**	**0,632**		

Extraction Method: Principal Component Analysis. □ Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 11 iterations.

Table 1

These Components composition, based on the proposed groupings of Land Uses Decree is realized in order to investigate if causal relations exist between the city's existing shaped structure with the present Land Values.

We realize that the Greek legislation without taking into consideration the already formed Functional Structure maintains, in a vaguely way, the real Functional structure, as it has been revealed from P.C.A., the

[15] P.C.A.-Principal Components Analysis.

conformation of which, ensures the best function of their synthetic activities, as well as city's total function.

1988 Census

1988 FUNCTIONAL STRUCTURE

Notions of Economic Activities based on the 88 decree		Functional Structure Components		Economic Activities	NSSG Codes	Loadings	Eigenvalues	%Variance
1	Functional Centers	2	Commercial Centers	Banks and rest Economic Institutions	d81	0,670	2,04	5,24
				Brokers and representatives	d63	0,588		
				Retail Trade	d64	0,522		
				Retail Trade	d65	0,468		
				Transactions of Affairs	d83	0,460		
		16	Rentings	Renting	d85	0,726	1,00,	2,57
				Mobile Renting	d84	0,632		
		12	Services and Transports	Restaurants and Hotels	d66	0,595	1,06	2,73
				Transports	d71	0,535		
				Personal Services	d98	0,485		
		6	Education and Recreation	Education	d93	0,760	1,28	3,3
				Services of Recreation and Culture	d97	0,618		
		13	Hygiene Services	Services of Hygiene and Cemeteries	d92	0,871	1,04	2,69
		14	Communication and Social Security	Communications	d73	0,744	1,03	2,66
				Social Security	d96	0,722		
2	Not environmentally harmful industry	1	Personal Products distribution	Leather and furs Industries	d29	0,802	3,63	9,32
				Clothing and footwear Industries	d24	0,769		
				Rest Industries	d39	0,618		
				Wholesale Trade	d61	0,539		
		5	Permanent Products Industries	Tobacco industries	d22	0,824	1,33	3,42
				Printing, Publications and relevant activities	d28	0,783		
		15	Food Industries	Drinks Industries	d21	0,769	1,02	2,63
				Industry of Food except drinks	d20	0,550		
3	Environmentally harmful industry	3	Oil Industries	Industries of Oil and Mine products	d32	0,837	1,77	4,55
				Insurances	d82	0,595		
		4	Equipment Industries	Industries of products from tyre and plastic material	d30	0,746	1,43	3,68
				Industries of Furniture and goods of furnishing	d26	0,627		
				Industries of Timber and Cork	d25	0,583		
		7	Chemical And Textile Industries	Chemical industries	d31	0,804	1,19	3,05
				Textile Industries	d23	0,794		
		8	Building Materials Production	Basic Metallurgic Industries	d34	0,684	1,14	2,93
				Industries of not metal mining products	d33	0,600		
				Manufacture of electric machines, appliances and remaining tyres	d37	0,425		
		9	City's Mechanic Department Services	Manufacture of metallic products	d35	0,615	1,12	2,88
				Manufacture of machines and appliances	d36	0,615		
		11	Paper and Carrier Means Production	Paper Industries	d27	0,762	1,08	2,78
				Manufacture of Carrier means	d38	0,706		

Extraction Method: Principal Component Analysis. □ Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 11 iterations.

Table 2

The composition of Functional Structure components, grouped according the 1985 Land Uses decree[16], are allocated in Athenians municipality body as shown below:

Urban Centers are allocated with

- zoning layout in the municipality's centre,
- axially in the beginning parts of central road axes, from municipality's centre, that lead to suburbs with intense to the corresponding activities employment, and
- oil drops form (showing the tendency of centres creation) in municipality's total area (map 1).

Not environmentally harmful industries, are allocated with

- zoning layout in the municipality's centre, and its Eastern department in the borders with municipalities, in which intense employment in manufacturing activities are recorded (map 2).

Environmentally harmful industries are allocated with

- zoning layout in the western department of municipality's central commercial triangle,
- axially in the beginning parts of central road axes, from municipality's centre, that lead to suburbs with intense to the corresponding activities employment, and
- zoning layout in the Eastern department in the borders with municipalities in which intense employment in the manufacturing activities is recorded (map 3).

[16] of 1988

3 THE RELATION OF ACTIVITIES AREAL POSTS WITH MUNICIPALITY'S LAND VALUES.

For the ascertainment of land values effect in city's Functional Structure, that is to say in the relative posts of economic activities groups allocation, the objective land values will be used as they were determined by the Ministry of Finance in1985.

The land values[17] mapping is based on the more characteristic prices, that are determined more analytically as follows:

1. From 60-90 Euro per square metre.
2. From 90-120 Euro per square metre.
3. From 120-180 Euro per square metre.
4. From 180-240 Euro per square metre.

The lower prices, have been recorded in the northerner, western and southern department of the municipality, while the higher prices have been recorded in its Eastern department and in city's centre.

From the study of land uses areal posts that were calculated in 1988, concerning the already determined land values, we realise that:

A) Urban Centres in which activities that require central position and accessibility for their better possible function, are included. They are allocated in the Athenians municipality with the criterion of "best possible place" and no concerning land values, such as condensations are recorded in regions with wide spectrum of prices differentiation (from 60- until 240 Euros per square metre).

B) Not environmentally harmful industries, are allocated for the most part in the regions with lower land values (60-90 Euro per square metre), but also with scattered form in the "more expensive regions" (180 until 240 Euros per square metre). This fact that proves that these activities are allocated in plots that are selected with other criteria beyond those of land values..

Relative research has ascertained that the choice of any economic activity allocation, is many times based on the existence of ground owner for his own use.

C) Environmentally harmful industries are allocated in the same way as Urban Centres, thus they present intense condensation in the "cheap" western municipality's department (from 60 until 90 Euros per square metre), but also in the central[18] and western[19] department where land values are high (120-240 Euro per square metre). The possibility of choosing such a wide scale of allocation on areas with so different land values, shows that even Environmentally harmful industries are allocated with beyond strict land values criteria, since as it is obvious, the Functional facility contributes in profits increase, despite the bigger initial settlement cost.

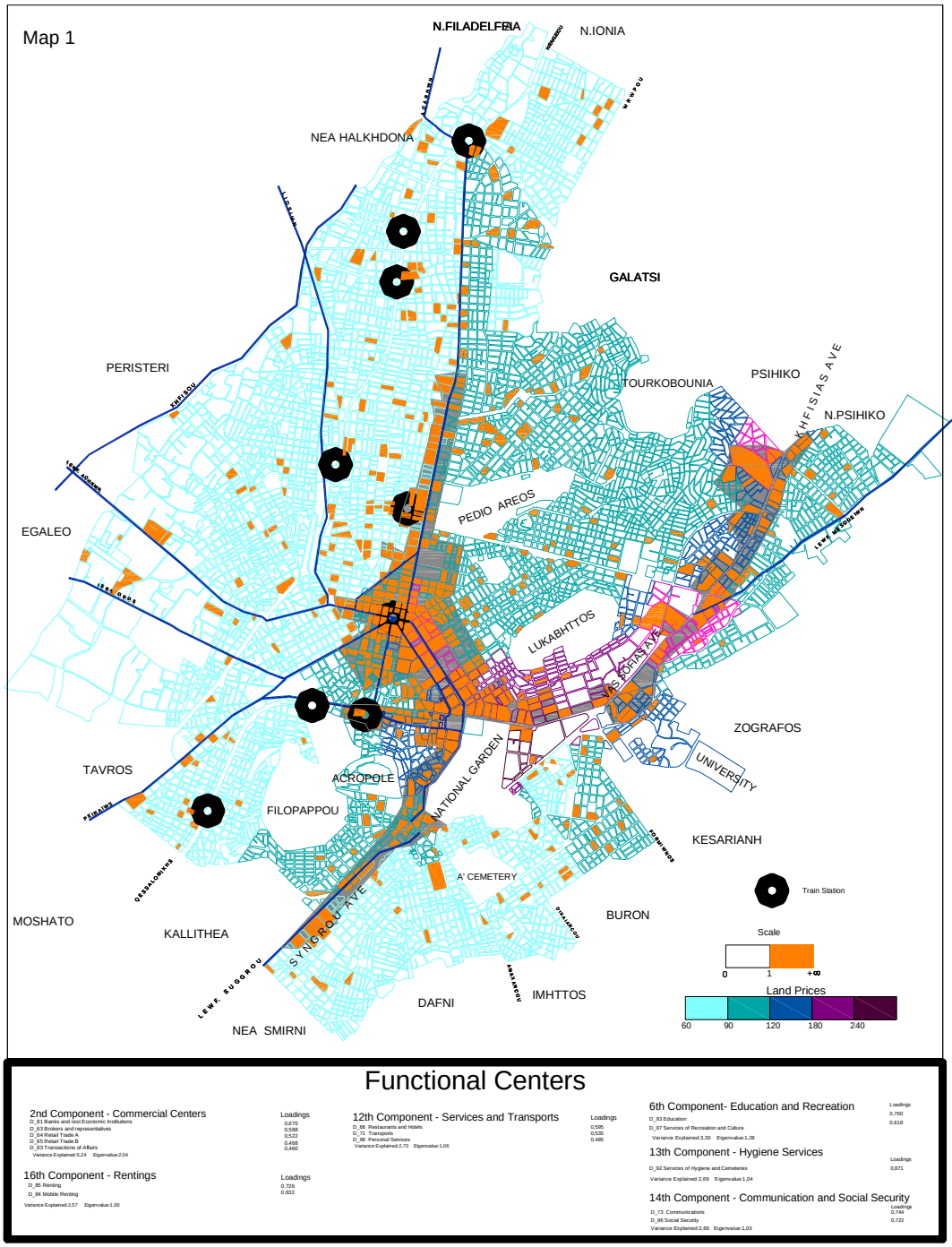
Regarding to restrictions lack in activities allocation, such as the first Urban Plan that determined their areal posts[20], the criterion that determined their allocation, was this of the best possible function in the frames of the wider rational city's operation[21].

This is proved by the fact that there has not arised a "rule" that certain city's functions are allocated in regions with certain land values. Fault Regulating Plan the criteria of functions allocation and their areal changes are except land and floor values centricity, accessibility from central road axes, adjacency with additional and "compatible" functions, more costumers possible attendance e.t.c., are those that determine activities allocation and in general the forces relative with the shaped markets function.

We realise that an "internal functional rule" exists, which organises the city with the criterion of optimal function achievement and that finally land values do not dictate the municipality's Functional Structure, but up to a point result from the already shaped functional status. This "internal functional rule" is co-drugging land values, based on the possibility of surplus values achievement from each activity's function.

[17] of 1988
[18] With zoning layout.
[19] At central axes roadside areas.
[20] It was enacted in 1989.
[21] Research has ascertained that 64% of employment in economic activities allocation is based on their linear relations.

Deductively city's function, the market forces and the best possible functions operation rules, that contribute in the functional specialisation and the economic activities segregation, are those that determine land values and no reverse.



Functional Centers

2nd Component - Commercial Centers

	Loadings
D_83 Banks and /ext Economic Institutions	0,670
D_63 Brokers and representatives	0,588
D_64 Retail Trade A	0,522
D_65 Retail Trade B	0,468
D_83 Transactions of Affairs	0,460

Variance Explained:5,24 Eigenvalue:2,04

16th Component - Rentings

	Loadings
D_85 Renting	0,726
D_84 Mobile Renting	0,632

Variance Explained:2,57 Eigenvalue:1,00

12th Component - Services and Transports

	Loadings
D_66 Restaurants and Hotels	0,595
D_71 Transports	0,535
D_98 Personal Services	0,485

Variance Explained:2,73 Eigenvalue:1,06

6th Component- Education and Recreation

	Loadings
D_93 Education	0,760
D_97 Services of Recreation and Culture	0,618

Variance Explained:3,30 Eigenvalue:1,28

13th Component - Hygiene Services

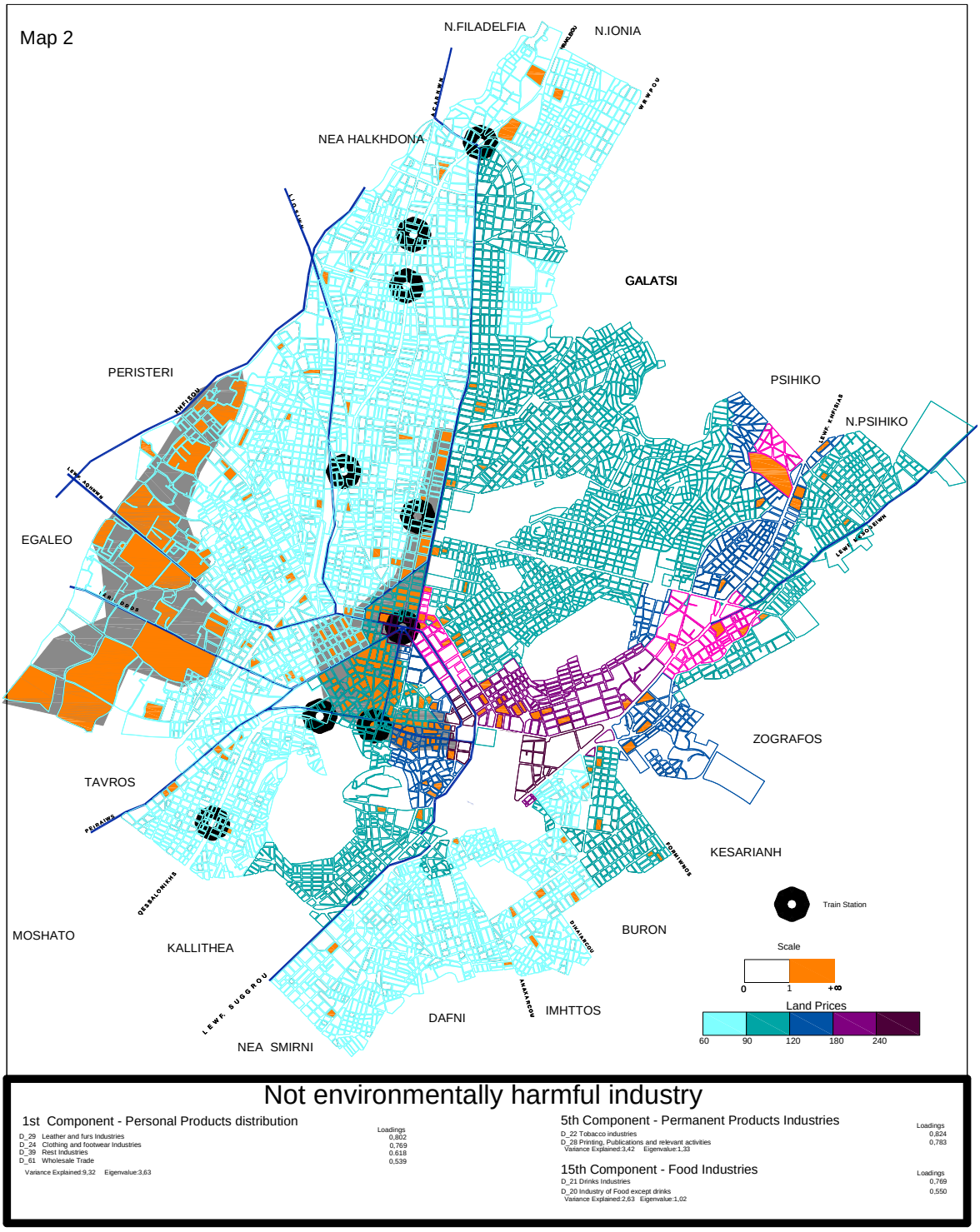
	Loadings
D_92 Services of Hygiene and Cemeteries	0,871

Variance Explained:2,69 Eigenvalue:1,04

14th Component - Communication and Social Security

	Loadings
D_73 Communications	0,744
D_96 Social Security	0,722

Variance Explained:2,66 Eigenvalue:1,03



Not environmentally harmful industry

1st Component - Personal Products distribution

		Loadings
D_29	Leather and furs Industries	0,802
D_24	Clothing and footwear Industries	0,769
D_39	Rest Industries	0,618
D_61	Wholesale Trade	0,539

Variance Explained:9,32 Eigenvalue:3,63

5th Component - Permanent Products Industries

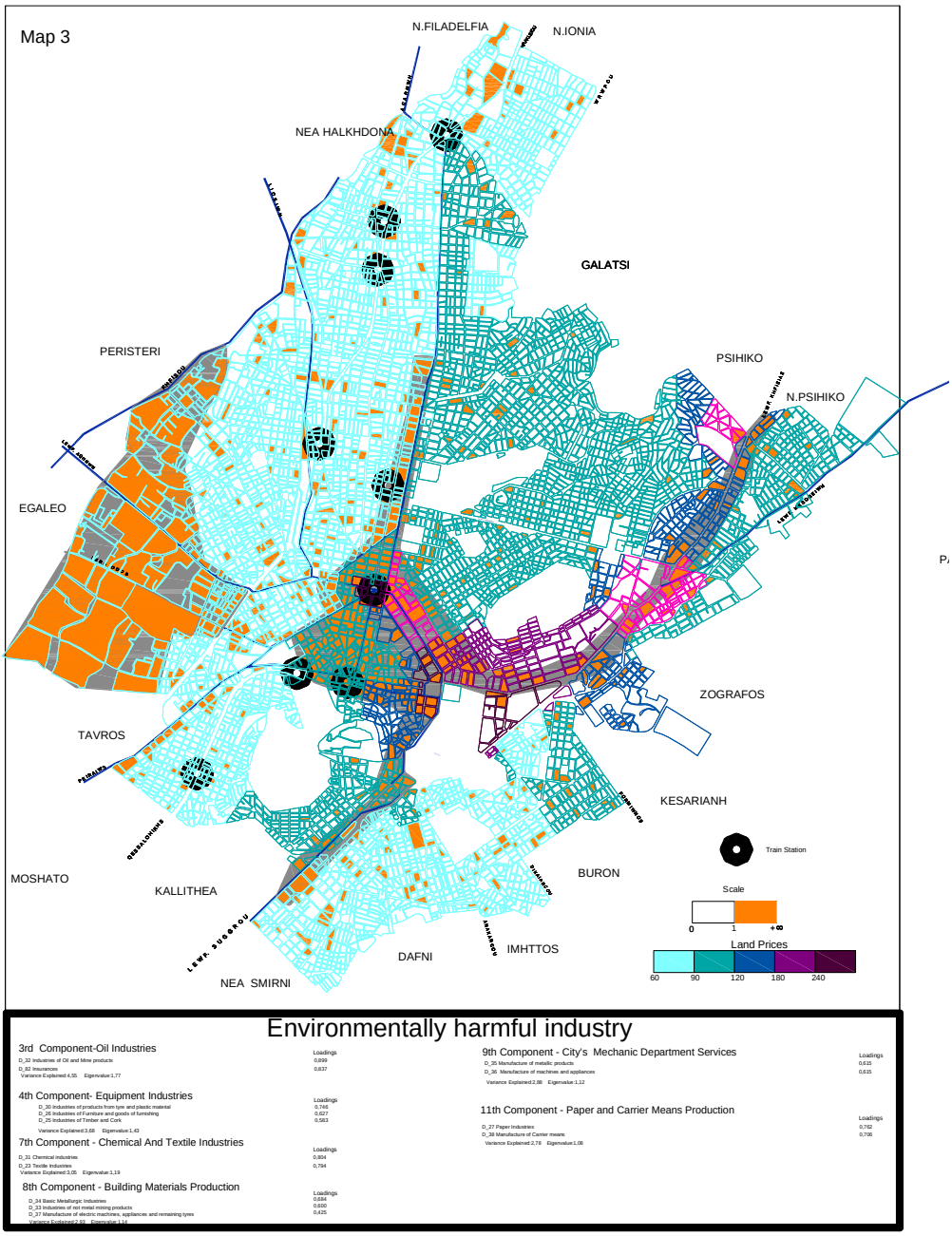
		Loadings
D_22	Tobacco industries	0,824
D_28	Printing, Publications and relevant activities	0,783

Variance Explained:3,42 Eigenvalue:1,33

15th Component - Food Industries

		Loadings
D_21	Drinks Industries	0,769
D_20	Industry of Food except drinks	0,550

Variance Explained:2,63 Eigenvalue:1,02



4 REFERENCES

1. Tsouderos (J), Organic Sectorization of Urban space, Athens 1990, Urban and Regional N.T.U.A. Department's Publications.
2. Berry (B.J.L.), Do variations in urban form affect environmental quality, IIASA, 1974, SCHLOSS LAXENBURG, Austria..
3. Tsouderos (J), Etude Evolutive de l'Industrie Urbaine, Doctorat a l'Universite Louis Pasteur a Strasbourg 1989..
4. N.S.S.G.-National Statistical Services of Greece Athens 1997.
5. Statistical Package for Social Sciences, Norusis (M, J), SPSS/PC+, SPSS inc.Illinois, 1986..
6. Ciceri M), Marchand (B), Rimbert (S), Introduction a l'analyse de l'espace,Masson, Paris 1977.
7. Berry (B.J.L.), City Classification Handbook, Methods and Applications, Wiley 1972, New York..
8. Census of economic activities of 1988 of National Statistical Services of Greece.

5 COMMENTS

Based on the 2 reviewers' feedback we have enhanced the relative parts of our paper. We add 2 additional responses to the 1st reviewer which we don't think it's necessary to add in the final paper, and these are the following:

1) Our aim is not to study the difference of land values between 1985 and today's actual prices, but the relation of land values with Urban land uses allocation.

2) We include the basic terms of Principal Components Analysis in order to make the paper easier to comprehend.

The Principal Components Analysis seeks a linear combination of variables such that the maximum variance is extracted from the variables.

- The Rotated Component Matrix determines what the components represent in relation with the variables.
- Loadings are the correlation coefficients between the variables and components.
- Varimax rotation is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a component on all the variables in a component matrix, which has the effect of differentiating the original variables by extracted component. Each component will tend to have either large or small loadings of any particular variable.
- The % of Variance column gives the ratio, expressed as a percentage, of the variance accounted for by each component to the total variance in all of the variables.
- Each Eigenvalue for a given component measures the variance in all the variables which is accounted for by that component.

Grid analyses in Prague urban planning

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1 ABSTRACT

Understanding of spatial aspects in a city can be significantly supported by grid analyses. The paper is focused to implementation of grid analyses into the town planning procedures in Prague. Analyses and visualisation of town landscape morphology is the core part of grid creation and derivation from the primary terrain and 3D vector data to the grid surface dataset covering the built structures and/or green. Town surface grid data are ideal input for surface visualisation – hillshade built-up area for visualisation the spatial structure and density or the near-real visibility analyses with taking the on-the-surface objects into account. Grid analyses are applied also to the transportation modelling, mostly for walking relation studies as the refinement of gravity or other types of accessibility models. In the near future, using the grid models for modelling the town processes – i.e. development scenarios or value or quality changes in time - is seen as very promising.

2 INTRODUCTION

Spatial analyses have traditionally been the essential part of urban planning in Prague. Due to the planning subjects are physical or virtual objects best represented by vector data model, analyses methods normally do not need take rasters much into consideration. Majority of spatial analyses for planning are based on simple overlay, intersect or buffer functions in connection with more-less advanced database and cartographical postprocessing. Traditional orientation to vector data model also may acted as a kind of curtain blocking thinking of planners from use of other techniques. In connection with new requirement on refinement and completion of standard analyses with detailed surface analyses or distance analyses, use of grid data model has been inevitable.

First applications of grid model were connected with transport planning, for optimisation of walking distances to the public transport stops. As the planners tasks during the time shifted toward studying the land in a rather detailed scale, the problem of discrepancy between traditional rough “circle buffer” method for distance estimation and the real pedestrian network distances was not further possible to ignore. As the topological quality of input pedestrian network data did not allowed use the vector network analyses without demanding data topological cleaning, grid analyses have been successfully used instead. Further applications have been connected with viewshed analyses in urban built-up areas. Grids, in this case, helped effectively overcome problem with TIN building in the vast city areas. Both transport and surface modelling has fast become used commonly and its outputs have been often required. Latter tests are dedicated to the first steps to the dynamic modelling of town development, starting with grid analyses of specific spatial qualities as the “index of centrality” etc.

2.1 Walking distance analyses

Information on real or near-real accessibility of local destinations is essential especially when locating public services. As move in the city is possible on the road or pedestrian network, the distances between origins and destinations depends on geometry and the flow properties of the network. Traditionally, distances are approximately represented as the rings with the centre in public service destination. Taking the area population as the criterion, according to our tests, average difference between ring – buffered population and network analysed population living in the “same” distance from public transport stops in Prague is about 25%. Ring estimation is always too optimistic.

Practical methodology of walking distance analysis in Prague planning is based on estimation of addresses or population living at these addresses, which fall into the defined walking distance from the destination. The most often, destinations are public transport stops, however, accessibility of schools, kindergartens or similar services is also calculated.

Input data for the analysis is the pedestrian network (polylines), stops (points) and addresses (points). Pedestrian network data does not need to be topologically clear which is helpful for the preparation. The topological errors in the data may be within the tolerance of expected grid resolution. To enable distance

calculation, network must be constructed in a way, which ensures that all origins and destination points lies on the network. Usually, the custom script by Michele Lundeen from http://arcscripts.esri.com/details.asp?dbid=13012 is used for this data tuning. The completed network is then converted into a grid. Normally, resolution of 1m is used. If the input data topological quality is poor, better grid result is given if some small buffer (1m) is generated around the network polylines before making grid.

Once having the input grid, the distance analyses may be calculated. Optimal method for such calculation is Cost Distance function, designed for spreading modelling on the surface of heterogeneous resistance. For walking distance only two values of resistance are used – 1 for network, "no data" for other surfaces. The value representing network has in fact meaning speed of move in m/s. In fact value 1 is interpreted as 3,6 km/h, which is also good approximation for walking speed. Cost distance method calculates the value of time necessary to get from the destination (stop) to the particular cell within a grid along the network. If destination layer contains more origins, the time to the nearest origin is calculated. For more complex analyses, which calculates also with e.g. time losses by transfer or waiting, the distance must be calculated for each destination separately. Recalculation and combination of these grids should be then provided by map raster algebra operations. If the value representing the network in input data is set to 1 and input speed was interpreted as 1 m/s, the analysis result also means the distance in meters.

Matching the distances to the addresses is calculated by Neighbourhood statistics function. Distance value of underlaying grid cell is attached to the particular address point. Summary statistics for calculation addresses or population within acceptable walking distance (usually 300 or 500 m) is then provided by standard SQL database queries.

fig. 1: Network classified according to the calculated distances from the origins. Address classification is covered into the calculation.

2.2 Surface modelling

Planning of the new development should always evaluate its anticipated impacts. Usually, environmental or functional impacts are being assessed. In places, where the spatially-landscape values are the subject of protection, it is necessary to model also potential impacts to the local panorama and the relation between development project and the surrounding built up structures.

While visibility analyses in an open landscape depend more less on configuration of terrain, in cities, evaluation of sight impacts requires to cover all physical structures on the surface. Input data preparation is then the key for the success.

In Prague, the TIN terrain model of the area of the whole city and close surrounding has been maintained with the height accuracy from 40 cm in the edges to 4 cm by the river in the town centre. For the major part of built up area also the vector 3D model of buildings and green is available. The height accuracy of the 3D model varies also from 20 to 40 cm. Areas of growth green are modelled as the groups of schematic trees consisted of set of 3D polygons of trunk and treetop. Third part of the model is bridge model of the same technology as the buildings. The 3D model is saved in ESRI 3D shapefile format.

For the further processing, 3D vector data is necessary to convert into 2D data representing the footprints of 3D polygons and exclude all vertical features. To do this task, simple VBA script has been written. The result of transformation is 2D shapefile. Attribute table consists all attributes inherited from the original 3D model layer + new calculated fields: minimal height of feature (MinZ), maximal height of feature (MaxZ), average height of feature (AvgZ), slope of feature in degrees (Slope) and aspect of feature in degrees (Aspect). The transformation was applied to all 3D building, 3D green and 3D bridges source layers.

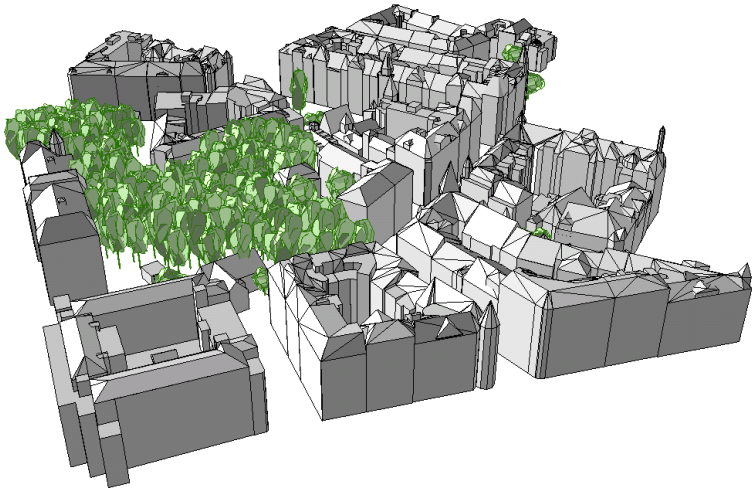

fig. 2: 3D source data for grid calculation

As construction of 3D model can not be topologically clear in a sense of 2D topology, the result of 2D conversion may contains overlapping features. Therefore, 2D data must be further processed. First, 2D topology must be cleaned in a way that the result will not contain any overlaps or gaps between neighbouring features. In a second loop, all features must be accommodated with attributes of the feature with the highest height (stored in attribute MaxZ) if the area of a feature falls within two original features. The process of topology cleaning has not been automated so far and it is provided by conversion of shapefiles to the ESRI Coverage format and applying the Clean function on the coverage. Matching the attributes of the "highest parent features" has not been automated as well. It is assumed to develop VBA script, which will loop the features calculating its centroid and then selecting source features from the parent layer, which intersects the centroid and finally selecting that one with the highest value in the MaxZ attribute and storing it in the attribute table of topologically clean layer.

fig. 3: Converted 2D data classified by the max height of feature

First attempts of viewshed analyses were based on the idea to add the buildings to TIN. The standard method of TIN editing, based on extrusion of building footprints gave good results for the small-scale analyses, but proved as unfeasible when attempting to model city-scale impacts. The main obstacle was the size of the TIN data, and following PC computation power limits. For this reason, grid model was used instead. TIN model was converted into a 1 m terrain grid. Secondly, transformed 2D data of 3D model of buildings were converted to the same resolution grid and the same operation was provided for the data of green and bridges. As all heights were given in absolute figures, the map algebra operation of replacing the values of surface values with the values of building and green was applied. In the ESRI scripting environment, the conditional (con) function was used:

output=con(IsNull[building], [terrain], [building])

The operation was done using by ESRI ArcGIS Desktop and Spatial Analyst extension. Because of the data size, the whole model is in fact set of 135 rectangular grid tiles. Manipulation with the grids and application of Math algebra and spatial analyst functions is handled by the set of Python scripts.

After calculation of all grids, merge function was used for merging all tiles into a single grid. The size of such grid is 3 GB. It covers the area of cca 600 km2 with 1 m resolution. The result represents surface grid model of the town surface and it is very useful for many purposes. Alternatively, as shown on the pictures, the surface grid model without green has been elaborated as well.

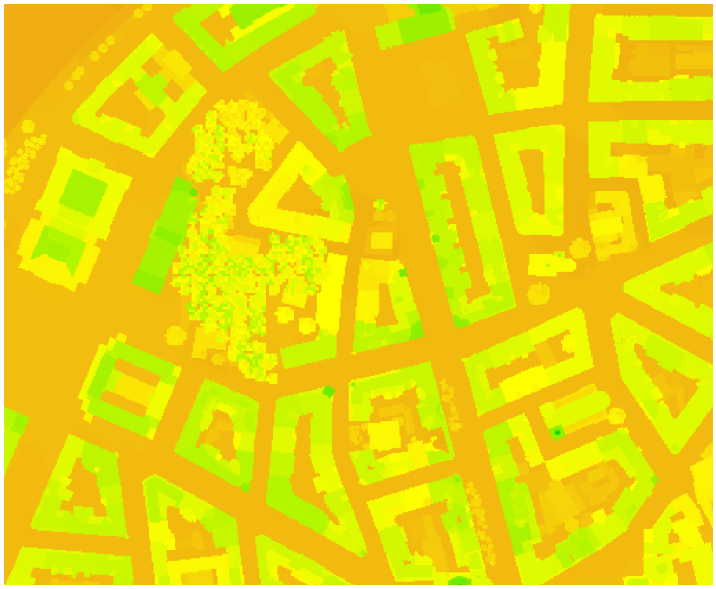

fig. 4: Detail of output 1m grid (combination of terrain, buildings, green)

Modelling viewsheds using the surface model instead of simple terrain model makes model results useful for practical implementation. In real world the visibility of objects depends on many other temporary and fuzzy aspects, i.e. seasonal state of green, fences, street objects and many others, however, the decisive influence have the built up structures covered very successfully with the model. The current representation of green leads to overestimating of its sight blocking effect, therefore, viewshed analyses are usually provided both with and without green influence.

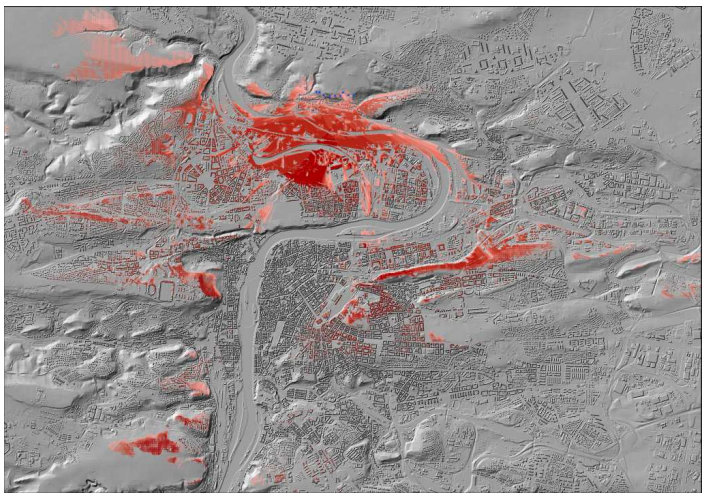

fig. 5: Example of large-scale viewshed analysis

As a side effect of surface model preparation it has been developed also an additional map product – hillshade structure map of city. The map has been generated by hillshade function with shadow rendering option. Detail building structures are well displayed in 1 m resolution, while 5 meters grid without shadow rendering is ideal for explaining and presenting the town structures in a city-wide level.

fig. 6: Detail of 1m hillshade grid with shadow rendering

3 MODELLING THE TOWN CENTRAL PLACES

Transformation of the classified vector data into grid opens the door for detail examination of location within the polygon boundaries. So far, the whole area of a single polygon was treated as homogeneous piece of space, while we can find many different qualities which representation by strict vector objects is a bit limping. For example density of population, expressed by the census units often does not reflect the substantial differences in density distribution within this zones. Also, discussed travel distances cannot be reliable when applied to the polygons of development sites.

Need to overcome the limits of vector representation for analyses of detail spatial and functional structure of the city, led in Prague to use grid models also for analysis of master plan land use data. The task was to search for the places in the city, which spatial and functional location has the physical attributes of the city centre location. Behind the task there was need to look at the city structure with a new perspective and try to find out the nature of relation between real town centres and geographically central places in a city. The results of analysis were then used for modelling one aspect of investment attraction.

The subject of analysis was evaluation of rate describing how centrally within built-up structure the place is located as well as how many central functions the location carries. As central functions were considered functions and services usually located in a city centres, as banks, offices, retail and high-density housing. On the other side, disturbing functions as industry, warehouses, transportation and logistic terminals etc. were treated as "anti-central" functions with a negative impact to the neighbourhood from the point of view of their chance to become an attractive town centre.

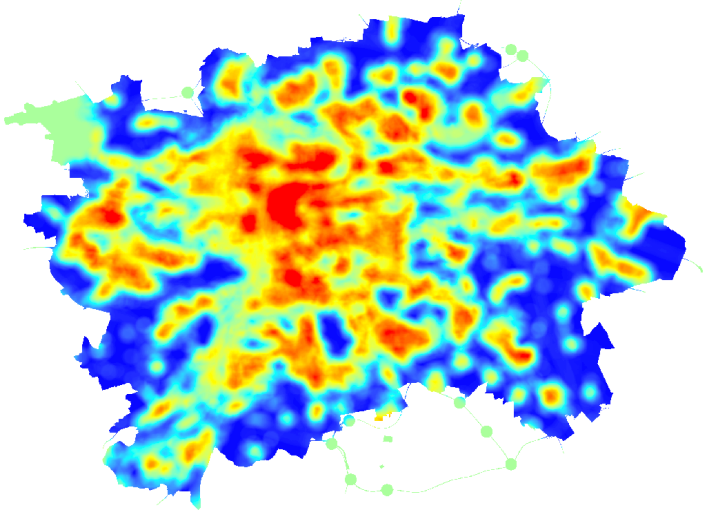

fig. 7: Grid representing index of functional centrality (400 m resolution)

Master Plan functional regulation zones data has shown as ideal input to the evaluation, as functional regulation is in fact synthesis of spatial typology and functional role of the place. The level of central functions is reflected by so-called mixed use-functions differentiated according to the intensity and structure of individual mostly public service sub functions. For the analysis elaboration, to each functional regulation class (type) the value form –10 to +10 was matched according to its supposed centrality potential. The pure residential zones were considered as of weak positive potential, while potential of industrial and natural zones was assessed as negative.

Using this value, grid of 20 m resolution was generated. Evaluation of centrality was based on evaluation of average value of centrality potential within 400 m neighbourhood area. The size of neighbourhood was defined as the walking distance to the local centres. Calibration of the model using by neighbourhood from 200 to 2000 meters proved that analysing of larger neighbourhood leads to excessive generalisation and scrapping of the local differences, while smaller neighbourhood size is not sufficient for generation local core spots.

The method was the starting point for further steps toward more complex town development model.

4 REFERENCES:

[1] Andy Nelson: Accessibility, transport and travel time information, in Modelling across geographic scales, Activity 2.5, 2000, http://gisweb.ciat.cgiar.org/cross_scale/download/2.5_web.pdf

[2] Young-Hoon Kim, Sanjay Rana, Steve Wise: Exploring Multiple Viewshed Analysis Using Terrain Features And Optimisation Techniques, Paper University of Sheffield, Sheffield, http://eprints.ucl.ac.uk/archive/00000191/01/kim.pdf

[3] Paul M. Torrens: Geosimulation, informational website, http://www.geosimulation.org/geosim/

[4] Antonio Colonna, Vittorio Di Stefano, Silvana Lombardo, Lorenzo Papini, Giovanni A. Rabino: Learning Cellular Automata: Modelling Urban Modelling, paper, http://www.geocomputation.org/1998/89/gc_89.htm

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A model for the assessment of the impact of Strategic Policy Documents on urban and environmental planning.

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ABSTRACT

Local authorities are regulated by a huge number of planning documents developed in different periods, with various purposes and different scales. In most cases recent, local plans do not take in to account other plans (transport, environmental, etc.) completely developing opposite objectives. The use of GIS allows a synchronized interpretation of current planning documents (policy, objectives, rules, constraints).

Generally Strategic Policy Documents are reports describing a guidance for certain actions without a spatial location. In these documents the geographical description is vague in nature.

This property does not allow to assess the impact of these documents on environmental features and plans.

A sort of translation of policy statements in geographical elements has been developed.

The aim of this paper is on one hand to produce an integration of planning documents, on the other hand to compare planning system with spatialization of policy documents in order to increase the efficiency and the effectiveness of strategic action.

1 INTRODUCTION

For a long period planning activities have been unconsciously neglected generating a great pressure on the territory (Alberti et al. 1994). Especially during the last twenty years this scenario produced an increase of attention to natural resources in order that they can be used with wisdom and parsimony, with the consciousness that they are not inexhaustible and their capacity to regenerate themselves is much sloweer than our ability to destroy them. Planning activity therefore has become necessary and essential for every social decision (Alexander, 1992). During the last years agencies with planning competences have remarkably increased; accordingly local authorities are overregulated by a huge number of planning documents.

Administrative functions related to the government of the territory are attributed to elective institutions (e.g. municipalities, provinces, metropolitan areas, Regions), each with the respective competences. In the same way sectoral institutions (e.g. monuments and fine arts bureau, basin agency, consortium of communes in mountain areas, industrial development agency, national and regional parks) discipline the territory by means of plans with prescriptive potentiality, in most cases, greater than elective institutions. Actions of public agencies or private companies (e.g. national agency for electricity management, national agency for highway management, national agency for railway management, telecommunication companies), not referring directly to specific regions, can meaningfully modify main territorial features. Furthermore these interventions have to be coordinated with a high and differentiated number of plans. In a lot of cases a plan of an institution cannot be coherent with a plan of another institution, and some actions admitted by a plan can be forbidden by another. Nowadays technical instruments which allow to manage the presence of more plans on the same territory are practically absent. A theoretical-administrative and practical-managerial problem of adaptation and integration of the respective policy occurs.

Experimentation of new methods for territory management in order to resolve all conflicts generated by a huge number of planning documents is gaining remarkable interest between researchers, practitioners and public administrators. An overall interpretation of all in force plans (politics, objective, rules, constraints), through a new analysis tool, can highlight overlaps, compatibilities and conflicts of plans.

These three categories of plans mentioned above follow consolidated methods producing a certain number of maps with precise scales. Often planning documents have a part represented in cartographies, in a lot of cases more detailed, and another part in text documents describing maps, defining planning strategies and establishing rules in order to put the plan into practice.

Often, programming documents do not have relations with cartographic representation because, generally, they are a sort of guidance for political actions realized by means of program implementation. This paper

aims to establish a methodology of spatialization economic programming documents comparing them with the integration of planning documents.

2 DIFFERENT TYPOLOGIES OF PLAN

A plan defines criteria, rules, methodologies, general and specific objectives, verifying of internal and external coherence with other plans at different levels. Each type of plan carries out a precise function and it is developed following the directives determined from instruments at an upper level.

On the whole this type of hierarchy can be synthesized as follows:

- EU directives;
- National Plans;
- Interregional (territorial or sectoral) Plans;
- Regional (territorial or sectoral) Plans;
- Provincial (territorial or sectoral) Plans;
- Inter-municipality Plans;
- Urban Plans;
- Urban Design.

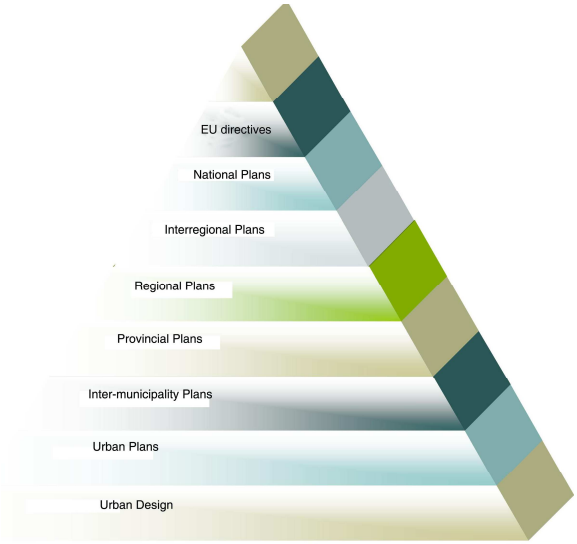

Fig.1 Plans Hierarchy.

Plan indications start from more general instruments reaching more specific ones (top-down); while as far as it is concerned, transformation needs plan indications to go from more specific instruments towards more general ones. This double flow obliges the municipalities, as the minimal planning unit, when acknowledged also by a single citizen proposal, to verify if transformation is allowed from an upper level plan.

In theory the indications included in the upper level plan ought to have deep analysis and the realization in the lower level. On the contrary, the lower level adapts itself, critically acknowledging the indication of the higher plan. In absence of agreement with the local authorities the National level preserves the power to localize interventions also in contrast with the local authorities decisions and their territorial plans.

Other kinds of plans are more partial and/or sectoral, considering parts of territory.

While on one hand the existence of a huge typology of plans can be considered of vital importance for correct planning and territory management, on the other hand a heterogeneous system of plans without any relation has been realized from various subjects.

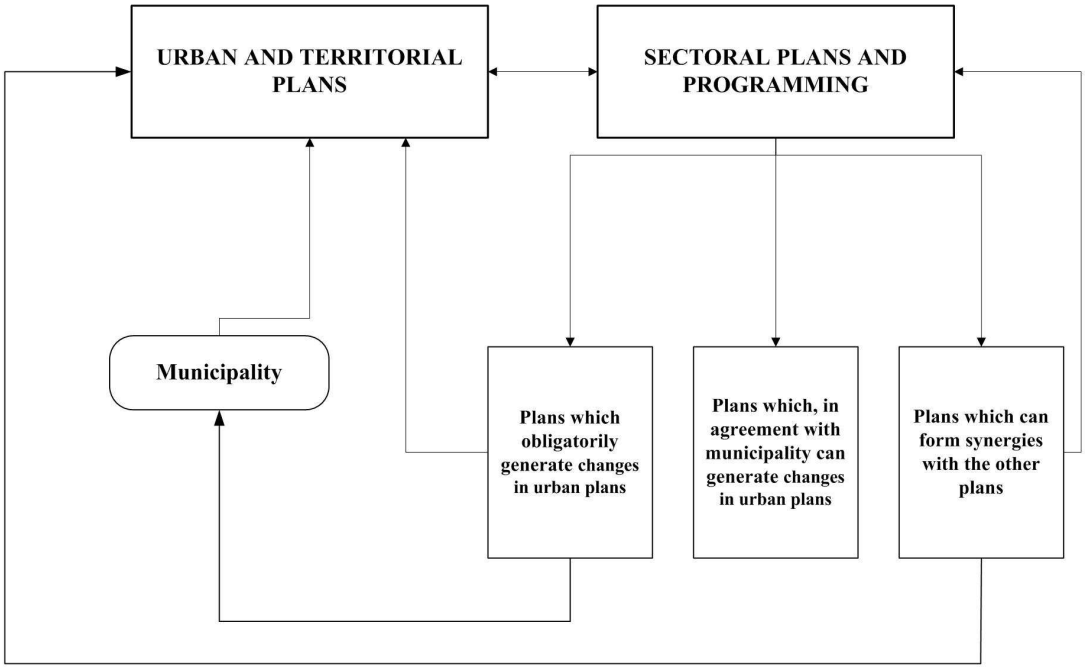

Fig.2 Main categories between plans and programs.

It is possible to distinguish three categories between plans and programs:

- Plans which obligatorily generate changes in urban plans (territorial, landscape, basin and parks plans);
- Plans which can generate changes in urban plans in agreement with the municipality (quarry, energetic, health, school and mobility plans);
- Plans which can form synergies with other plans (Urban renewal programs).

Italian planning system under certain aspects is a little confused because the various planning instruments are weakly coordinated.

Every the plan is not developed like a part of relation series which can find on the territory the coordination and multi-sectoral interdependences generating a remarkable increase of waste of natural resources, financial and social consequences.

Most of these plans provokes an enormous problem of coordination generating a gap in policies and process integration.

For instance, a transportation program which does not take into account preservation of natural heritage, forests and wildlife can solve some accessibility problems generating environmental fragmentation problems.

The first step of this work can be synthesized in the following points:

- summarizing the overall planning system;
- distinguishing plans elaborated from elective institutions from other plans;
- classifying plans according to implementation possibility;
- relating plans from hierarchical and functional points of view.

These four points synthesize the procedure to integrate the huge number of planning documents developed in different periods, with various purposes and different scales. Afterwards GIS implementation allows a synchronized interpretation of these documents (policy, objectives, rules, constraints).

3 PLANNING DOCUMENTS GIS IMPLEMENTATION

The first step in GIS implementation was the research of a semantic matching among all the concepts included in planning documents. Summarizing all legend items, 630 terms have been counted, most of them describing zones with the same feature (e.g. Historical centre, zone A, ancient centre, preserved cultural heritage zone, etc.).

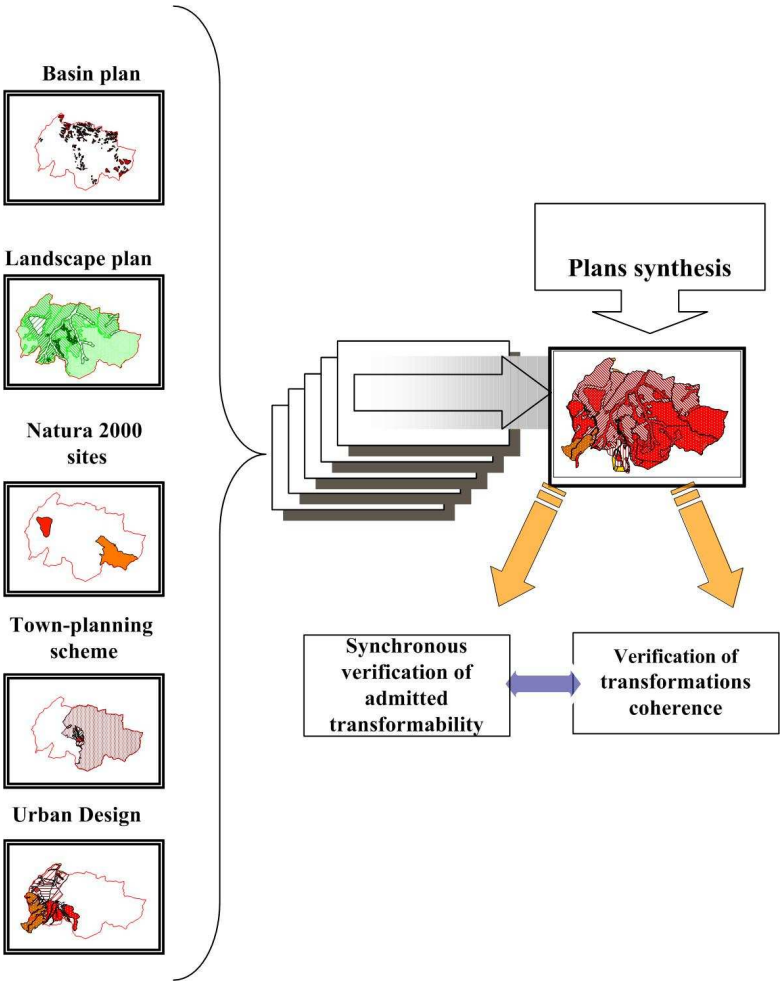

Fig.3 Scheme of plans synthesis

The problem of semantic matching has been faced using ontology; in this way integration of geographic information is based primarily on its meaning (Fonseca et al., 2000).

Implementation has been developed in a study case considering basin plans (from R4 high risk to R1 low risk), landscape plans (from A01 high value of wildness to A06 low value of wildness), nature 2000 sites, town planning schemes and urban design.

The simple entity relationship model does not fit urban planning documents management, because each zone has different features and consequently diverse attributes. Afterwards in the same attribute table more heterogeneous data are included which do not respect normal forms of databases. The more suitable model in GIS implementation of planning documents is an object-relational one, used in geodatabase. In this model the more useful property is the inheritance based on sub-class and super-class concepts. Sub-class entities are super-class specialization inheriting super-class attributes. In this way the super-class consists of the most common zone used in all planning documents and sub-class describes in a deeper way only one type of attributes referred just to one kind of zone.

In order to identify the incompatibility between plans topological rules have been applied to sub-classes.

The more used topological rule is: the polygons “must not overlap with”, in other words overlaps between the sub-classes of two feature classes with incompatible norms.

Topological rules matrix is organized in the following way:

- the names of the feature classes are inserted in the first row and the first column;
- the names of sub-classes related with every feature classes are inserted in the second row and the second column;
- a symbol has been reported in matrix cells, in cases where the topological rule is required to highlight incompatibility between the planning instruments;
- different colour of symbols indicates absolute incompatibility (red), or partial incompatibility (orange), a deep evaluation is required.

		Basin plan					Nature 2000	Landscape plan					
		R1	R2	R3	R4	AS		A01	A02	A03	A04	A05	A06
town-planning scheme	Zone A (Historical Areas)												
	Zone B (consolidated Town)												
	Zone C developments zones)		■	■	■	■	■	■	■	■	■	■	
	Zone D (Industrial areas)		■	■	■	■	■	■	■	■	■	■	
	Zone E (Rural Areas)						■	■	■	■	■		
	Craft made areas		■	■	■	■	■	■	■	■	■	■	
	Depurator		■	■	■	■	■	■	■	■	■	■	
	Hamlet		■	■	■	■	■	■	■	■	■		
	Subsidized housing		■	■	■	■	■	■	■	■	■	■	
	Parking			■	■	■	■	■	■	■	■	■	
	Green areas			■	■	■		■	■	■	■	■	
	New Road network		■	■	■	■	■	■	■	■	■	■	
	Council-house building		■	■	■	■	■	■	■	■	■	■	
	Tourist areas		■	■	■	■	■	■	■	■	■	■	

Fig.4 Topological rules matrix

Next figure highlights a development zone (Zone C) completely within a high risk (R4) zone. Conflict is highlighted in table and on the map.

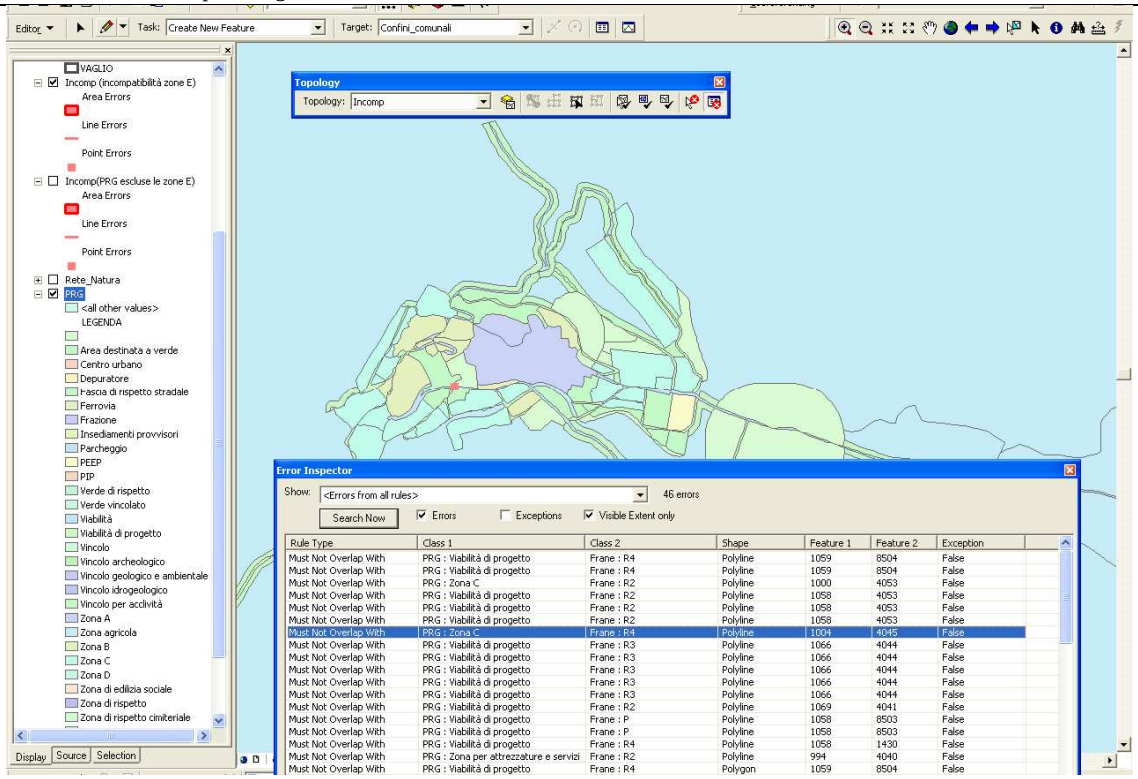

Fig.5 Conflict between plans

4 SPATIALIZATION OF POLICY DOCUMENTS

Generally Strategic Policy Documents are reports describing a guidance for certain actions without a spatial location. In these documents the geographical description is vague in nature. This property does not allow to assess the impact of these documents on environmental features and plans. Only in a few cases the intervention of programming documents is referred to geographical features; in almost all cases policies are based on statements.

A sort of translation of policy statements in geographical elements is necessary to develop.

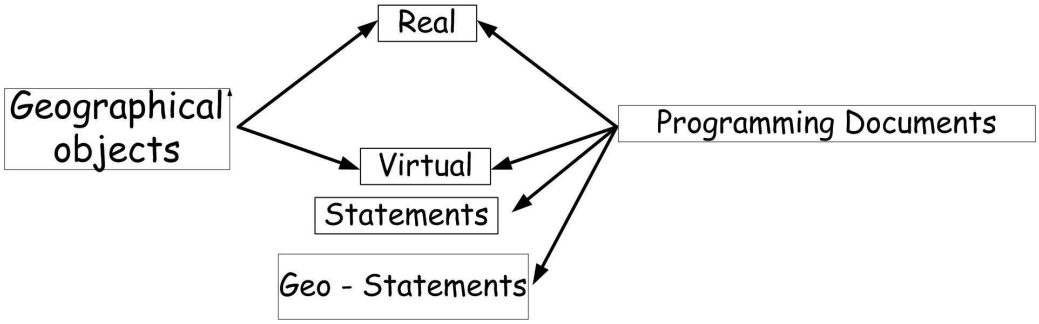

Fig.6 Programming documents and geographical information

A simple analysis of the ordinary and extraordinary actions of socio-economic programming was not enough to identify the exact intervention location. Inspections and interviews to local managers have been carried out in order to define local a intervention framework.

The preliminary studying of programming documents has been carried out with the objective to realize an effective synthesis of main contents, trying to homogenize information different in each document and with a different detail level.

On one hand this activity has allowed to carry out the first evaluation concerning the degree of coherence between actions and vocations, potentialities and specific expectations of territorial context; on the other hand it has allowed to verify the coherence between choices of socio-economic programming.

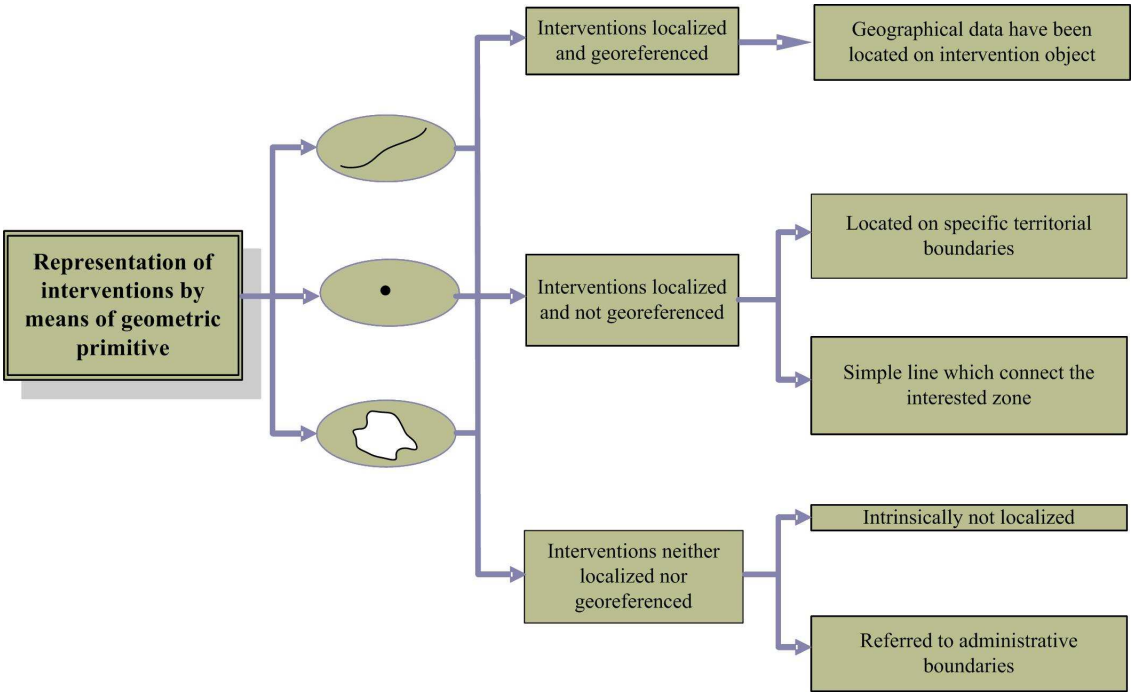

Fig.7 Programming documents and geographical information.

Representation of the interventions by means of geometric primitive has been faced in the following way:

- interventions localized and georeferenced: geographical data have been located on intervention object, or on the whole indications of infrastructures for mobility route;
- interventions localized and not georeferenced: geographical data have been located on specific territorial boundaries (e.g. downtowns, industrial areas, census zones), or in case of linear data with unknown path intervention they can be represented by a simple line which connects the interested zones;
- interventions neither localized nor georeferenced: geographical data do not fit these kind of interventions because they are intrinsically not localized (education programs) or in some cases can be referred to administrative boundaries (e.g. Regions, Provinces, Municipalities).
- Next figure shows an example of policy documents spatialization. All the interventions, with a lot of attributes (financing typology, amount, etc.), have been compared with planning documents.

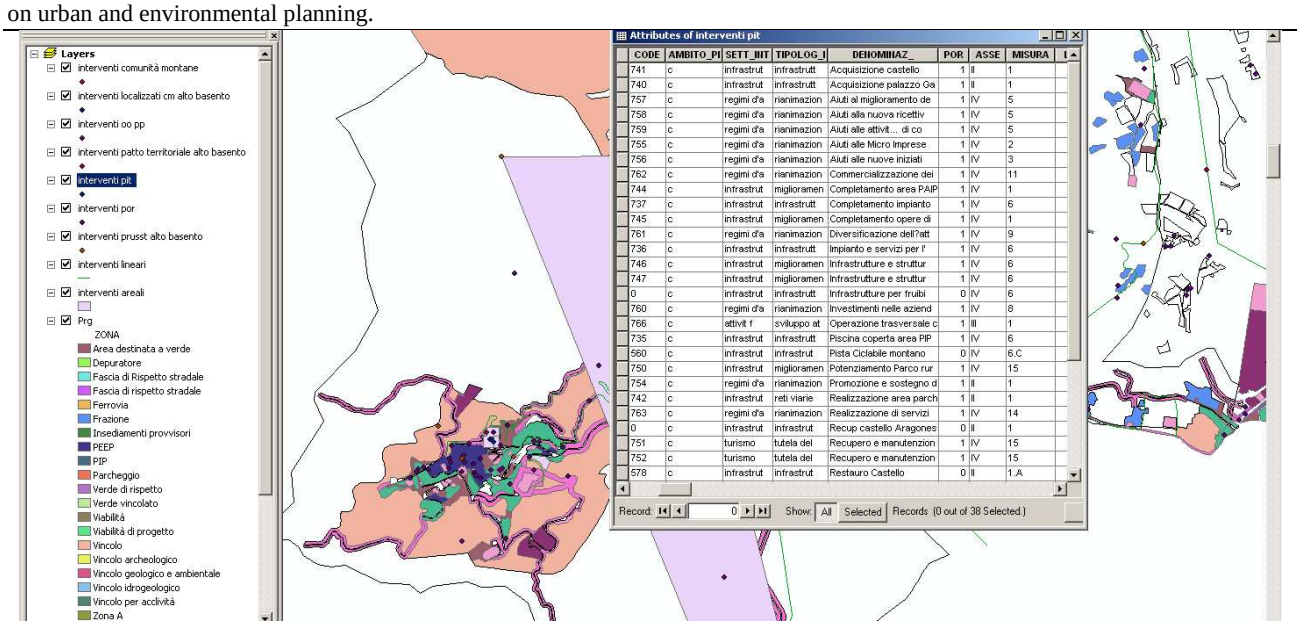

Fig.8 An example of policy documents spatialization compared with planning documents.

The main problem is that often planning of a local authority contradicts planning of another one, because some intervention admitted by a plan cannot be admitted by the others. For this reason a specific matrix of verification has been realized. This instrument of verification is essentially finalized to:

- estimate in a synchronous way the real possibilities of territory transformation;
- estimate congruency and interactions between territorial and sector al policy of plans.

The matrix is based on the principle of reducing intervention prescriptions in order to facilitate their management.

The matrix crosses interventions (admitted, not admitted or absent) with plan rules for each Aij Area.

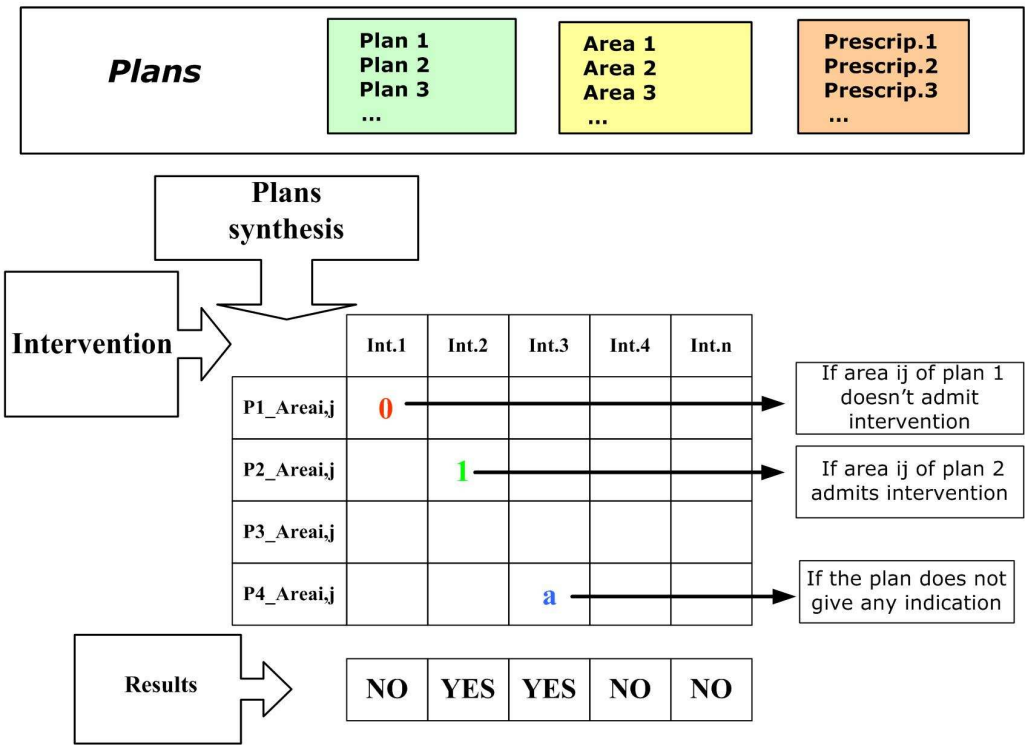

Fig.9 Scheme of transformations verification.

In a more detailed way:

- 1 if the norm in the Aij area of the Plan i admits intervention;
- 0 if the norm in the Aij area of the Plan i does not admit intervention;
- a if the norm in the Aij area of the Plan i does not give any indication;
- A if the Plan is absent.

The positive YES or negative NO result derives from automatic verification, column by column, of the presence of 0 at least in one cell. It means that one of the many coexistent plans on that portion of territory does not admit the chosen intervention.

Results highlight the real possibility of territory transformation concerning all in force plans underlining the conflicts. In fact, having previously classified the plans in hierarchical order, the matrix highlights which of the considered plans results not coherent with the prescription of upper level plans.

5 CONCLUSIONS

Spatialization process considerably improves programming efficiency and effectiveness, allowing an immediate examination. Figure 10 shows how it is possible to immediately verify if a program for road network improvement concerns areas with a low level of accessibility, or in the same way if a program for risk mitigation involves only zones with high risk level.

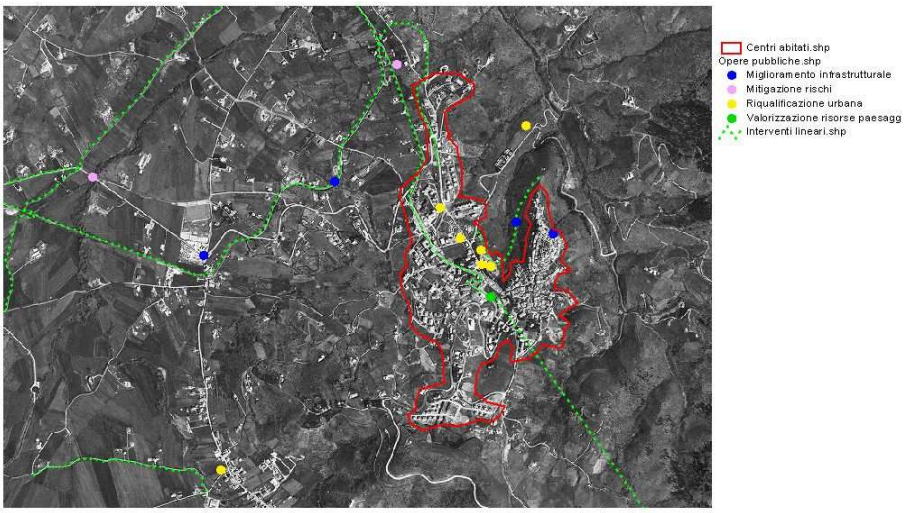

Fig.10 Spatialization verification.

The evolution of planning theory distinguishes planning processes in three main groups (Hall, 1992). The first one is based on the concept of Master plan, the second follows the system approach by McLoughlin (1969), the third is based on the idea of planning as a continuous participation in conflicts. The spatialization of policy documents for certain aspects can be viewed as a renewed rationality in planning processes.

In planning theory a general agreement exists in seven requirement of the rationality in the strategic planning:

1. a better knowledge in coherence of management objectives (the term strategic means consistent with general objectives system);
2. a better knowledge of resources in order to choose more appropriates and effective means in comparison with objectives;
3. a better knowledge of the complete effects of the decision;
4. a better knowledge of compatibility of decision with other decisions of the same decisional subject;
5. a better knowledge of compatibility of decision with other decisions of subjects which operate in the same field;

6. a better knowledge of costs and direct results involved in subject decision;

7. a better ability in estimating the relationships between the costs and results (agreed as effects in comparison with objectives).

In these seven statements the term knowledge appears more frequently. The possibility to analyze strategic documents also in geographical components have to be considered as a huge increase of knowledge. For instance the third statement in spatial term can allows a better external effects evaluation. Point four and five highlight coherence , compatibility, redundancy and duplication. Some assessment ambiguities can be occur in analyzing strategic documents only considering the agency or organization which promotes them. Spatial aspects can highlight some redundancies generated from geographical proximity of some programs developer from different departments or local authorities.

Franco Archibugi (2000, 2002) in his planology theory states that a new approach to planning discipline needs an integration of physical and socio-economic planning. Often the overcoming of the system approach has led to the idea of plan as a set of constraints obstructing development. In recent times the demand of flexibility has grown, but Wenban-Smith (1987) considers flexibility in a range from spring steel to overcooked spaghetti. Stiffness is a useful tool to pursue the main plan objective, but many times planners exceeded with flexibility producing unspecified and unrecognizable plans.

From a certain point of view, the method adopted for the present work may overcome prejudices regarding the planning discipline, often observed.

6 REFERENCES

Alberti M., Solera G., Tsetsi V., (1994), La città sostenibile, F. Angeli,

Alexander, E.R. (1992) Approaches to Planning: Introducing current planning theories, concepts and issues. Amsterdam: Gordon & Breach.

Fonseca, F., Egenhofer, M., Davis, C., and Borges, K. (2000) Ontologies and Knowledge Sharing in Urban GIS. Computer, Environment and Urban Systems 24(3): pp. 232-251.

McLoughlin, J. B. (1969) Urban and Regional Planning: a Systems Approach, Faber & Faber, Great Britain

Hall P. (1992), Urban and Regional Planning, Routledge

Archibugi F. (2002), Planning Theory: Reconstruction or Requiem? Planning Studies Centre

Archibugi F. (2000), Introduction To Planology :The paradigm shift in social sciences Planning Studies Centre

Wenban-smith A. (1987), The evolution, Purposes and Performance, of the British Planning System: a practitioner view, in Willis Contemporary Issues in Town Planning, Geographical Journal, Vol. 153, No. 3

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A Project on Railway Stations Revitalisation using the PPP approach (RARE/Interreg IIIB CADSES 5C105)

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ABSTRACT

Railways areas in urban centres are attractive locations which have a large potential for development. Transfer of railways activities in the periphery provides an opportunity for revitalisation. The community initiative INTERREG III and especially Transnational Cooperation Programme CADSES provides the opportunity of addressing the development of railways areas in urban centres on a transnational level. Public private partnerships are useful tools in this effort. However know-how is limited. Hence cautious preparation and capacity development is required. The CADSES project RARE combines several partners from 5 EU countries, comparing and developing possible PPP solutions for certain locations

Key words: Real Estate Development, Public Private Partnerships (PPP), Railway Stations, Transnational Cooperation

1 INTRODUCTION

Railways stations are a familiar picture in every larger European City. In the last decades however the tendency is to transfer railway activities from the urban centres to the periphery. The vacant or underused areas are a valuable asset in the congested urban centres, where free spaces are scarce and demand is high. The regeneration of these areas is beneficial to everybody.

The EU project RARE combines the strengths from public and private partners from 5 European Countries which try to find ways and develop concepts for the regeneration of these areas taking in account the economic, environmental and social needs and circumstances within the urban fabric.

The partners of the RARE project are:

- Euroconsultants SA, Thessaloniki Greece as Lead Partner;
- Hellenic Railways Real Estate Organisation GAIAOSE SA, Athens Greece;
- National Railways Company "CFR" S.A., Bucharest Romania;
- Hellenic Railways Organisation OSE SA, Athens Greece;
- Urban Planning Institute of the Republic of Slovenia, Ljubljana Slovenia;
- City of Karlsruhe, Karlsruhe Germany;
- Thema Consulting, S.R.O., Praha Czech Republic.

The outputs of the projects include institutional assessment of the institutions involved and pre-feasibility studies for selected sites.

1.1 The transnational approach

The community initiative INTERREG III for the Period 2000-2006 was addressed to transeuropean co-operation intended to encourage harmonious and balanced development of European territory, as a mean to economical growth and a stronger European competitiveness. Out of the three strands (A, B, C) of the Community Initiative Interreg III, CADSES (Central, Adriatic, Danubian and South-Eastern European Space) belongs to the B strand, addressing trans-European cooperation on a transnational level. CADSES aims at achieving higher territorial and economic integration within the co-operation area, promoting more balanced and harmonious development of the European space.

The RARE project during its initial development phase decided to place the project within the CADSES framework for the following reasons:

- The revitalisation of railway stations is an issue present in most European and especially East-European cities, thus making it a genuine transnational topic;

- CADSES offers a unique funding opportunity for bringing together actors and stakeholders from several European countries (EU member states, Accession countries and third countries);
- The framework of transnational cooperation can act as an incubator for real estate development in order to acquire the necessary political backing and citizens' approval.

1.2 Project Cycle Management Principles

In the field of Development Cooperation and Aid Delivery the European Commission adopted the "Project Cycle Management" (PCM) as its primary set of project design and management tools (based on the Logical Framework Approach).

In the RARE project the focus was set early on using Public Private Partnerships (PPP) for the development of proposals for the revitalisation and mobilisation of railway stations and areas in urban areas. Especially in the field of PPP many institutions and stakeholders in the CADSES area are entering a "terra incognita", thus providing a fertile ground for transnational cooperation. For that reason proved tools from the field of Development Cooperation were utilised as described in Chapter 2.

1.3 Developing the PPP

The RARE project planned the development of 3 pre-feasibility studies in Athens, Brno and Ljubljana, as the first step in the development of a PPP project.

While the 3 locations mentioned are quite different from each other and the approach to each city is a different, it was beneficial to all partners to develop a common guideline to escort them through the study development.

This guideline has been prepared to assist in preliminary activity preparation. It has two parts:

- pre-feasibility context and
- Pre-feasibility study documentation – detailed content.

The requirements for information in a pre-feasibility study document can vary considerably. For this reason, this guideline provided a generic model for the study.

During conduction of the pre-feasibility studies, Athens demonstrated the highest degree of maturity, hence leading to the development of detailed Terms of Reference and a Public Call for Tenders in January 2007.

2 ASSESSMENT OF THE OPERATING ENVIRONMENT AND CAPACITY DEVELOPMENT OF THE INVOLVED ORGANISATIONS

The tools of Stakeholder Analysis, Benchmarking and Organisational Assessment and Capacity Building were used trying to answer the following questions:

- Who is involved in the urban revitalisation process in railways areas?
- What is the performance of the operating environment (marketing, planning and contracting)?
- Which are the capabilities of the leading institutions (e.g. cities or railway companies) and what capacities should be developed?
- What is the "space" defined by the above mentioned factors for concrete projects to be developed?

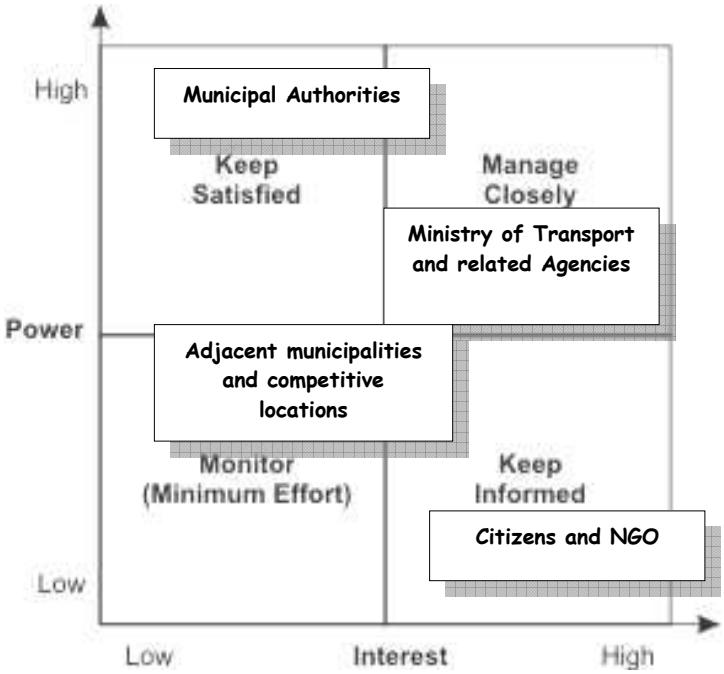
2.1 Stakeholder Analysis

Stakeholder Analysis is the technique used to identify the key people who have to be won over. According to the EU Project Cycle Management Guidelines, Stakeholder Analysis addresses:

"Any individuals, groups of people, institutions or firms that may have a significant interest in the success or failure of a project (either as implementers, facilitators, beneficiaries or adversaries) are defined as 'stakeholders'".

A basic premise behind stakeholder analysis is that different groups have different concerns, capacities and interests, and that these need to be explicitly understood and recognized in the process of problem identification, objective setting and strategy selection.

While every city and setting form their own distinctive and unique landscape it was possible to draw some general conclusions and summarise stakeholders and possible policies towards them. Graph 2 shows an overview of the positioning of typical stakeholder classes identified by all the RARE partners.



Graph 2: Stakeholders Power/Interest Grid (Source: Manktelow, 2005)

2.2 Benchmarking

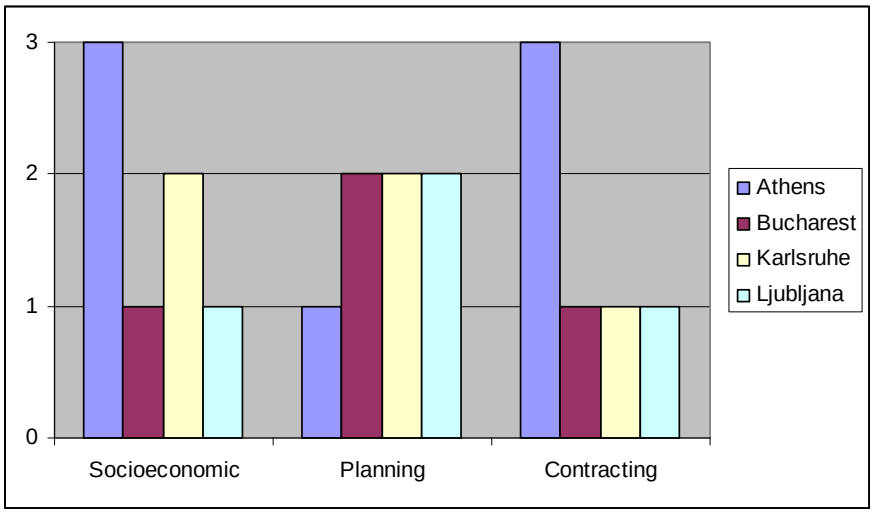
Benchmark Analysis deals with the performance improvements of organizations through identification and formulation of benchmarks, comprehension of performances and adaptation of practices and processes within the operating frame of an organization.

Within the RARE project, different organizations are engaged in the process of railway revitalization. While the characteristics of the partners are different, they all face similar constraints and threats in their efforts. This fact offers the opportunity for the definition of comparable indicators and the extraction of lessons for the compilation of the Pre-feasibility studies.

It was decided to proceed and examine 39 benchmarks indicators in the following 3 categories:

- Block 1: Socioeconomic indicators as an illustration of the market dynamics for real estate;
- Block 2: Planning of railway areas revitalizations as an illustration of the flexibility of the planning system;
- Block 3: Contracting and concessions as an illustration of the maturity of the legal and contractual framework for the Implementation of PPP.

A summary of the benchmarking delivered the picture depicted in Graph 3 for Athens, Bucharest, Karlsruhe and Ljubljana. In a scale of 1 (low) to 3 high Athens scored high in the market demand due to the Metropolitan area of 5 million inhabitants and the vivid economic growth. The recent PPP legislation also offered a supportive framework for contracting while the slow and bureaucratic planning system requires a careful planning for the avoidance of permits and land use regulations delays. In the other cities the medium grades of the rather efficient planning systems are either signs of mature planning systems or recent administrative reforms in order to attract investments and land use changes. However in most cases public procurement and concessions remain the usual vehicle for contracts, thus limiting the experience and acceptance for PPP models.



Graph 3: Benchmark Assessment Athens, Bucharest, Karlsruhe and Ljubljana (Source: 5C105 RARE, 2006)

2.3 Organisational Assessment and Capacity Building

Institutional capacity assessment is required to:

- Help identify appropriate stake holding partners and assess their capacity to deliver services and manage change;
- Identify and design relevant and feasible project interventions, which take account of absorptive capacity and effectively support related institutions and organisations to deliver a sustainable stream of benefits; and
- Support an assessment of good governance issues (including organisational adequacy, accountability and transparency);

It would be beyond the scope of this paper to try to present all the findings of the Organisational Assessment and Capacity Building concepts outlined during the project. Illustratively Project Partner 2 GAIAOSE identified the following general strategies:

- Supplying additional financial and physical resources;
- Helping to improve the organizational and technical capabilities of the organization;
- Helping to settle on a clear strategic direction;
- Protecting innovation and providing opportunities for experimentation and learning;
- Helping to strengthen the bigger organizational system;
- Helping to shape an enabling environment;
- Creating more performance incentives and pressures.

For GAIAOSE, it was decided to develop a concept based on Strategy 2 “Helping to improve the organizational and technical capabilities of the organization”.

3 PUBLIC PRIVATE PARTNERSHIPS IN GENERAL

Public – Private Partnerships (PPPs) are types of cooperation between the public and the private sector, to finance, manufacture, renovate, manage and maintain public infrastructure and provide services, in those sectors of national economy, where the market liberation is either impossible or undesirable. The participation of the private sector is being held either by the form of a Partner cooperating with the implementation body, or by the form of a services Provider to the public sector. This technique is already being implemented in the EU, the new member states included. Today PPP projects are mostly Large-scale infrastructure projects or services. The goal is to expand to medium-scale projects. A Large-scale project is defined as having a very high construction cost and a very long construction period (e.g. 6-10 years), the revenues inflow is scheduled for after the construction is finished and finally the project financing will only succeed with the participation of both public and private sector

3.1 PPP in General

The common contents of PPP Types are the long-term legitimate relationship, the full or partial private financing in complex patterns; the presupposition that the main role of the private sector partner is to assure the project financial parameters while public sector's is to assure the public interest determining goals quality and pricing policy; the risk transfer from the public to the private sector partners, combining their best capabilities for mutual benefit ('making the best out of'). The PPP types vary according to the size of risk included and its distribution among the partners, the required degree of each partner's specialization in contracts negotiations, the potential consequences for taxpayers and finally the financing details. There are three basic PPP Types: Concession, Joint Venture and Hybrid.

3.2 Basic PPP institutional arrangements

In Concession, the private partner is in charge of the project exploitation/maintenance/management for the whole concession period, is responsible for every construction/renovation/expansion, is self-financed during the concession period, is responsible for the provided services, determines their value and directly collects the money from the services users and finally may initially pay an amount of money to the state. On the other hand the public sector is responsible for the configuration of the performance criteria, reassures that the above criteria are respected by the private sector, sets the prices and the quality and finally holds the ownership of the public assets. The concession period (which lasts more than 25 years) is based on the contract requirements. Concession is the most common PPP type/category in everyday life. In Joint Venture, the Partners are equally responsible and owners of the provided services/projects. Joint Venture represents an alternative to the pure privatisation, as private sector's participation is less than 100%. The Partners form a new company or they are co-owners of an existing one that is independent from the public sector. The public sector represents the final regulator & an active shareholder of the company, can participate in the profits distribution of the project, and reassures the greater political efforts acceptance, while the private sector often takes the responsibility to deal with everyday project management. The Hybrid PPP forms (B.O.T., O.M., O.M.M) will be later presented.

3.3 Basic PPP forms

During the last 20 years of PPP implementation on international level, various PPP forms have been developed. Their differences mainly derive from the "job allocation" between the public and the private partner, the distribution of the risks among them and who finally owns the property of the assets-service. The most common PPP Forms are:

- B.O.T. (Build-Operate-Transfer)
- B.O.O.T. (Build-Own-Operate-Transfer)
- D.B.F.O. (Design-Build-Finance-Operate)
- B.T.O. (Build-Transfer-Operate)
- B.O.O. (Build-Own-Operate)
- B.B.O. (Buy-Build-Operate)
- L.R.O. (Lease-Rehabilitate-Operate)
- B.O.L.T. (Build-Own-Lease-Transfer)
- O.M. (Operation/Maintenance Private Services Contract)
- O.M.M. (Operation/Maintenance/Management Private Services Contract)

3.4 3Basic PPP types

Experience shows two basic types pf PPP emerging:

- **Fixed supply and demand projects**: those projects mainly concern the construction, completion and/or management of basic infrastructure networks (water supply, waste water treatment, urban regeneration projects etc.) Those projects have an assured high demand and need immediate implementation. However certain factors such as the absence of mature preparatory studies and zoning issues cause delays. Additionally those projects have to face the need for public acceptance,

legal obstacles concerning billing agreements and the ever present risk of political changes at the municipal level;

- **Added value projects**: Those project concern to a large extent the exploitation of the public real estate property along with investments in environmental management. Those projects differ significantly from the former category. However they still need particular attention in the initial phase, in the clarification of property claims and the assurance of public acceptance and municipal participation over the envisaged PPP period of 25-30 years.

4 THE REAL ESTATE MARKET AND PUBLIC PRIVATE PARTNERSHIPS

4.1 PPP and Real Estate Development

PPPs are a popular tool for the development of a large array of Brownfield sites. Railway areas in urban centres have an additional appeal to private investors through their centrality and in many cases guaranteed visitors frequency.

This Chapter describes the ideal standard for a PPP project, focusing on the six main components of Brownfield sites and their potential for PPP. These six components are: land ownership, financial aspects, risks, value for money, maintenance and operation and PPP type. Public action can heavily influence the six components, hence optimizing their PPP potential, if so desired.

The preferred PPP model depends on the project characteristics. For example in Athens a concession approach was selected, being the most durable under the present framework and capacities. At the same time the sites elected were not affected by any serious contamination from railway operation, thus making the risks for the private investor more predictable. This does, however, not imply that other PPP models or full public execution of the project would not be adequate alternatives. Accordingly, in all cases the project manager has to weigh the various project characteristics and the effects they have on the selected execution model. Another important aspect to consider is the interdependency between characteristics.

4.2 Checklists and project optimizing actions

There is not one universal system to reach “the best PPP model for Railway areas revitalization projects”. Also, it cannot be said that private involvement will certainly and always add value to the project. The public project owner must go through various considerations before deciding whether to develop the project in a public or a PPP form. Before deciding what form will best fit the project, one should first gain insight into the project characteristics and the physical and organisational capacities and limits.

As a next step one should investigate the possibilities for increasing the project potential through PPP or public execution. If the characteristics do not meet the PPP marginal values to be successful, it is possible to influence the project characteristics in an early stage, so that a PPP becomes a possibility for the project which would result in potential extra value. It is important to keep in mind that PPP is not the project objective in itself. It is a means to reach the objective of increasing the project value. A PPP should be established only if it adds value to a project.

The definition of Value indicators for real property PPPs is a useful tool. Real property partnerships between the public owner and private developers depend heavily on the match between the local community’s needs and the assets available on the site. The following value indicators should be considered when evaluating real property partnerships:

- The characteristics of the city: A thorough evaluation of local economic and demographic conditions will provide important details about growth prospects, emerging industries, and likely responses from the private sector;
- Former or current mission of the site: The site’s mission must be considered to determine how and what kind of real property partnerships will fit within that mission;
- Available capacity: Available capacity should be identified by a real property assessment at every site. That which is least critical to the Railways mission should be targeted for real property PPPs;

- Criteria for success: Determining public owner goals when deciding whether to pursue real property PPPs is critical. Goals are an essential part of planning, negotiating, evaluating, and managing PPPs. Nonexistent or vague criteria for success will only hamper the development of PPPs;
- Potential uses. Based on these first four stages, the most promising matches between local private-sector demands, available public owner facilities, and public owner goals can be identified and pursued;

Indicator	Relevant Question(s)	Relevant Variables
Characteristics of the city	What are the relevant economic and demographic conditions in the city?	Projected economic growth, Projected employment growth Projected growth industries Projected population growth Projected labour force growth Average education Office/industrial vacancy rates Price/square foot of office space Distance to metropolitan area Major local university Major local employers Special development incentives
Former or current mission of the site	What are the installation's major land, construction, and infrastructure assets?	Buildings Type of service conducted Equipment Available workforce Land Utilities
Available capacity	How can current installation assets be consolidated, relocated, or restructured to accommodate a PPP? What assets can be used for the PPP?	Buildings, free spaces, Equipment, Rights and Servitudes
Criteria for success	Is the PPP in consonance with the public owner goals? Are there other benefits to the PPP? Does the PPP meet the criteria for success as outlined by the relevant bibliography?	Public owner mission at installation Catalyst for change Statutory basis exists Detailed business plan Coherently organized structure Stakeholder support
Potential uses for site assets	What types of private enterprise should be encouraged to engage in a PPP?	Qualities of potential businesses should be consistent with installation assets capabilities

Table 1: Value Indicators for Assessing Potential PPPs (Source: 5C105 RARE, 2006)

Genuine PPP real estate development models occur, if both of the following conditions are met:

- the private partner bears the construction risk, and
- the private partner bears at least one of either availability or demand risk.

Within the objects examined within INTERREG IIIB CADSES Project 5C105 RARE these conditions are clearly met (i.e. construction and demand risk are borne by the non-public partner).

By comparison the allocation of risks in the Athens and Ljubljana cases could be identified as follows:

	Construction Risk	Availability Risk	Demand Risk
Athens	Private partner	Mixed (the public partner has still to provide some of the necessary framework conditions)	Private partner (however related to the Availability Risk and development of adjacent competitive sites)
Ljubljana	Private partner	Private partner	Private partner(however no mention is made regarding general public partner decisions that might affect the demand)

Table 2: Allocation of Risks in Athens and Ljubljana (Source: 5C105 RARE, 2006)

4.3 The case of the Railway Station of Peloponissos-Pireas (SPAP) in the Athens Metropolitan Area

Within the RARE project on of the developed feasibility study concerned the Railway Station of Peloponissos-Pireas located at the port of Pireas with one of the highest passengers' frequency of over 10 million passengers a year.

Graph 4: Railway Station of Peloponissos-Pireas (SPAP) (Source: 5C105 RARE, 2006)

The study was conducted in 2 phases. The first phase included the assessment of the operational and technical needs of the Railways and the first development concept. The second phase included the market research and the review and assessment of older concepts and development studies. The subjects covered where technical and operational specifications of the Railways, landing permits specifications, environmental regulations and the overall development plan of GAIAOSE SA.

The study focused on the development and evaluation of alternative scenario based on the above mentioned issues including:

- Location information on the station addressing the greater area, accessibility and urban planning specifications;
- Market research on the greater area concerning competitive activities and potential uses;
- Definition of a spectrum of options for development;
- Development of 2 final Scenarios;
- Indicative illustration of the financing assumptions and models for the envisaged development plan.

In February 2007 a call for tenders was launched and the process is expected to be finalized soon.

5 CONCLUSIONS

Railways areas in urban centres are attractive locations which have a large potential for development. Public Private Partnerships are a useful tool at the hands of the Public Project Owner, especially when designing "added value" projects.

Successful PPPs pose however a novel approach in many European cities, demanding thus a long period of preparation and analysis. In the RARE project, development cooperation tools were employed in the initial phase in order to communicate to the involved partners the requirements of a railway area revitalisation project and the limitations of their operating framework.

"Easy" straightforward projects were preferred in this initial phase in order to strengthen the capacities of the involved partners, while maintaining a level of success. Thus institutional and political acceptance can be secured and the benefits visualised to the general public. For example concession types on attractive central locations were promoted in order to facilitate the succour implementation of the envisaged real estate PPP developments.

Last but not least the INTERREG cooperation framework provided a supportive shell for the development of the PPP concepts through the comparison of approaches within several countries and basically through the provision of "legitimisation" within a European cooperation programme.

6 REFERENCES

INTERREG IIIB CADSES Project 5C105 RARE, Project Reports, Thessaloniki, Greece 2007

KANAKOUDIS, PAPOTIS, SANOPOULOS, GKOUTZIOS, BINDER, SWARD, BIELINIS and FERNANDEZ VILLAMANDOS. "PPP success and suitability factors (PPP-SSF)", OPEN DAYS 2006–European Week of Regions & Cities, International Conference, EC – DG Regional Policy, CD-proceedings, Brussels, Belgium, 2006

KANAKOUDIS, SANOPOULOS, and PAPOTIS, "The progress of the legislative framework ruling PPPs in EU", OPEN DAYS 2005–European Week of Regions & Cities, International Conference, EC – DG Regional Policy, CD-proceedings, Brussels, Belgium, 2005

Deloitte Consultancy B.V., PPP and Brownfield Revitalization, Sites in Northwest Europe, REVIT Project, 2005

EC: "Report on the Public Consultation on the Green Paper on PPPs & Community Law on Public Contracts and Concessions" [SEC(2005) 629]

EC: "Green Paper on PPPs and Community Law on Public Contracts and Concessions" [COM (2004) 327 final May 2004]

Eurostat proposals on accounting treatment of PPPs [CMFB and Eurostat news release (STAT/04/18) February 2004]

Richard Abadie and Adrian Howcroft (PricewaterhouseCoopers): "Developing PPPs in New Europe", May 2004

British Columbia (Ministry of Finance): "An Introduction to PPPs", June 2003

Heiko Abel and Martin Ruesch: BESTUFS (Best Urban Freight Solutions) – Deliverable D2.4 Best Practice Handbook Year 4 (2003) Part I, "PPPs in urban freight transport", 2003

EC: Guidelines for successful Public – Private – Partnerships, March 2003

Department of the Environment, Heritage and Local Government: Policy Framework for Public Private Partnership (PPP) in Ireland, November 2003

United States Ministry of Defence, Real Estate Public-Private Partnerships, Washington DC, 2002

Ceri Davies and Phil Jones: "Infrastructure Projects Financing through PPP in Greece", EDEXY (Hellenic Municipal Financial Services Company SA), 2001

🏆 *reviewed paper*

Wissen und Kreativität als Treiber urbaner Entwicklung - Braucht die Stadt neue Räume?

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1 EINFÜHRUNG

Traditionelle Wirtschaftstheorien erklärten Wachstumsunterschiede im Wesentlichen mit unterschiedlichen Investitionen in Produktionsfaktoren wie „Arbeit“ und „Kapital“. Neuere Erklärungsmodelle heben dagegen Investitionen in Forschung und Entwicklung sowie Humankapital als Schlüsselgrößen für langfristiges Wirtschaftswachstum hervor. „Kreativität“ scheint genauso wie „Wissen“ zu den neuen Rohstoffen der postmodernen Produktion zu gehören und wirkt dementsprechend als Standortfaktor in den Städten. Im Zeichen dieser Entwicklung ändern sich die städtischen Lebenswelten, die räumlichen Strukturen der Städte und die Anforderungen der Akteure an urbane Räume. Die neuen Wachstumstheorien, nach denen wirtschaftliches Wachstum im Wesentlichen in den wissensorientierten Dienstleistungsbereichen und in den mit ihnen verbundenen Wirtschaftsbereichen zu erwarten ist, werden in zunehmendem Maß als eine Grundlage für wirtschafts- und stadtentwicklungspolitische Ansätze in deutschen Städten wahrgenommen. Der Beitrag erläutert den ökonomisch-technologischen Strukturwandel und den Bedeutungsgewinn von „Wissen“ und „Kreativität“ in dessen Kontext. Er erläutert kommunale Anpassungsstrategien und skizziert Ansätze der kommunalen Wirtschaftsförderungspolitik und wirtschaftsorientierten Stadtentwicklungspolitik für den Umgang mit den Ressourcen „Wissen“ und „Kreativität“.

2 ÖKONOMISCH-TECHNOLOGISCHER STRUKTURWANDEL

In den Industrienationen zeichnet sich seit Jahrzehnten ein sektoraler Strukturwandel ab. Er äußert sich in einer Abnahme der Anteile von Erwerbstätigen und Bruttowertschöpfung im Landwirtschafts- und Industriesektor und einer Zunahme dieser Anteile im Dienstleistungssektor und bestätigt Fourastiés Drei-Sektoren-Hypothese (Fourastié 1963). So nimmt die Industriebeschäftigung in Westdeutschland seit den 1970er-Jahren ab. Einzelne Industriebranchen sind dabei unterschiedlich vom Beschäftigungsrückgang betroffen. In Deutschland zeigt sich seit Jahren eine Abnahme vor allem bei arbeits- und lohnintensiver Produktion. Dies ist im Wesentlichen darauf zurückzuführen, dass sich die Arbeitskostendifferenz zwischen Hoch- und Niedriglohnstandorten seit den 1970er-Jahren erheblich vergrößert hat (McKinsey/PTW 2005). In jüngerer Zeit werden aber auch Bereiche, die das „Rückgrat“ der industriellen Produktion in Deutschland darstellen, hiervon erfasst. So sind Beschäftigungs- und Wertschöpfungsanteile in der Chemischen Industrie, in Maschinenbau und Elektrotechnik in den 1990er-Jahren erheblich zurückgegangen. Neben der negativen Seite des Beschäftigungsabbaus ist aber auch eine mittelfristig positive Seite mit dieser Entwicklung verbunden: Die verbleibenden Bereiche sind durch ihre erhöhte Produktivität wettbewerbsfähiger.

Der ökonomische Strukturwandel ist auch Ausdruck eines tief greifenden Wandels der Unternehmensstrukturen. (Groß-)Unternehmen konzentrieren sich in zunehmendem Maß auf ihre Kernkompetenzen, sodass der Bezug von Vorleistungen und die Verflechtungen zwischen den Unternehmen erheblich gestiegen sind. Mit zunehmender Technologiekompetenz und Kostenvorteilen in anderen Ländern ist das Outsourcing mit einer zunehmenden Verlagerung von Tätigkeiten an Standorte außerhalb Deutschlands verbunden. Zunächst betraf dies vor allem die Fertigung, zunehmend sind solche Prozesse aber auch in Forschung und Entwicklung und bei informationsorientierten Dienstleistungen zu beobachten. Also in Bereichen, in denen die Ressourcen „Wissen“ und „Kreativität“ eine besondere Rolle spielen. Damit schwinden die Chancen, den Wegfall von Arbeitsplätzen in der Fertigung durch die Schaffung zukunftsträchtiger Arbeitsplätze in anderen Bereichen auszugleichen. Zumindest bedarf es aber gezielterer Anstrengungen, damit neue Arbeitsplätze in wisssensorientierten Bereichen entstehen.

Auch Innovationen beeinflussen den Strukturwandel. Sie führen zu Produktivitätssteigerungen, die mit Veränderungen in der relativen Preisstruktur verbunden sind. Damit verändert sich auch die Nachfrage nach Waren und Dienstleistungen. Auf Nachfrageverschiebungen reagieren die Produzenten und Dienstleister mit veränderten Produktionsstrukturen, die sich auch in gewandelten Beschäftigungsstrukturen zeigen. Bedrohlich wird dieser Prozess, wenn ein erheblicher Innovationsstau besteht – sei es, dass Unternehmen den Innovationsprozess „verschlafen“ oder dass innovationsfeindliche Anreizstrukturen dazu beigetragen haben, überkommene Strukturen zu konservieren – und sich dann in kurzer Zeit große Teile der

Wirtschaftsstruktur verändern (vgl. Ragnitz 2002). „Wissen“ und „Kreativität“ sind die zentralen Treiber von Innovationsprozessen.

Die Folgen des ökonomischen Strukturwandels (Arbeitsplatzverluste, neue Qualifikationsanforderungen, Veränderung der Branchenstruktur, Flächenverbrauch, Altlastensanierung usw.) zeigen sich gerade auf lokaler und regionaler Ebene. Mit dem ökonomischen Strukturwandel umzugehen gehört daher zu den Hauptaufgaben kommunaler Wirtschafts- und Stadtentwicklungspolitik. Die Städte und Regionen sind jedoch von Ausmaß und Zeitpunkt her unterschiedlich von dieser Entwicklung betroffen. So kommt es, dass sich vor allem in altindustrialisierten Räumen, die frühzeitig mit dem ökonomischen Strukturwandel konfrontiert waren, seit Jahren neue Muster der kommunalen Wirtschaftspolitik und wirtschaftsorientierten Stadtentwicklungspolitik entwickeln. Mit unterschiedlichem Erfolg werden dort Strategien, Konzepte und Maßnahmen zur „Bewältigung“ des Strukturwandels erarbeitet. „Wissen“ und – in jüngster Zeit „Kreativität“ – sind zentrale Begriffe neuartiger Strategien und Konzepte der kommunalen Wirtschafts- und Stadtentwicklungspolitik.

3 VON DER INFORMATIONSGESELLSCHAFT ZUR WISSENSGESELLSCHAFT – UND WEITER?

Der tief greifende technologisch-ökonomische Strukturwandel, der alle (ehemals) hoch industrialisierten Länder betrifft, und die mit diesen Prozessen verbundenen Veränderungen von Standortmustern und Raumstrukturen wurden in den letzten 15 Jahren durch unterschiedliche Begriffe beschrieben: „Dienstleistungsgesellschaft“, „Informationsgesellschaft“ „Wissensgesellschaft“ sind Begriffe, mit denen versucht wird, die prägenden Strukturen der Wirtschaft und damit auch wirtschafts- und sozialräumliche Veränderungen zu beschreiben. Angesprochen werden damit zugleich zwei unterschiedliche Phänomene, zwischen denen in vielerlei Hinsicht Bezüge bestehen. Wirtschaft und Gesellschaft befinden sich in einem kontinuierlichen Wandlungsprozess. Es gibt keinen stabilen Status, der sich auf einen eindeutigen Begriff reduzieren ließe. Die „Wissensgesellschaft“ ist damit immer auch „Informationsgesellschaft“, „Dienstleistungsgesellschaft“ und „Industriegesellschaft“ zugleich. „Wissenstätigkeiten“ sind immer auch „informationsverarbeitende Tätigkeiten“. Ihre Bedeutung für den Wertschöpfungsprozess nimmt sowohl im Dienstleistungs- als auch im Industriesektor zu.

Neue Gesellschaftsbegriffe werden vor allem dazu benutzt, die Richtung des Wandels zu beschreiben und Bereiche zu identifizieren, die sich entweder bereits als prägend herausgebildet haben oder in absehbarer Zeit prägende Kraft erhalten werden.

Beschrieben wird dabei immer ein Wandel in mehrfacher Hinsicht, so dass häufig unscharf bleibt, welcher Aspekt der Veränderung im Vordergrund der Betrachtung steht. Mit den Gesellschaftsbegriffen werden sektorale und funktionale Veränderungen gekennzeichnet, implizit aber auch die Veränderung der Bedeutung von Produktionsfaktoren thematisiert.

Mit dem Wandel in Richtung einer „Wissensgesellschaft“ wird in erster Linie das Phänomen beschrieben, dass die Ressource „Wissen“ eine immer größere Bedeutung gewinnt. Mit „Wissen“ ist dabei die Sammlung und Aufbereitung von Informationen zum Zweck der zielorientierten Nutzung, kreativen Verarbeitung und deren erfahrungsgestützter Bewertung gemeint, die im Regelfall durch die Kommunikation mit anderen Wissensträgern unterstützt wird (vgl. Grabow/Floeting 1998).

Schließlich werden mit den Gesellschaftsbegriffen unterschiedliche Arten und Intensitäten der räumlichen Verankerung verbunden: Am deutlichsten wird das bei der Diskussion um die „entankerte“ Informationsgesellschaft und die regional verankerte Wissensgesellschaft (vgl. Krätke 2004).

4 DIE ROLLE VON “WISSEN” IN EINER WISSENSBASIERTEN VOLKSWIRTSCHAFT

Die politischen und wirtschaftlichen Diskurse zur Modernisierung in Deutschland werden zunehmend bestimmt vom Leitbild der „wissensbasierten Volkswirtschaft“ (Lehner 2005) – dies als Reaktion auf die verblassende „große Hoffnung des 20. Jahrhunderts“ (Fourastié 1963), die Dienstleistungswirtschaft, die ebenso wie das verarbeitende Gewerbe in immer stärkerem Maße von Verlagerungen betroffen ist. Zentrale Elemente sind die Verbreitung von Wissen (z.B. durch lebenslanges Lernen), der Zugewinn an neuem Wissen (durch Bildungsangebote, Forschung und Entwicklung) und dessen Anwendung im täglichen Leben

(z.B. in Form von Technologienutzung, Produkt- und Prozessinnovationen) (vgl. Commission of the European Communities 2005: 19 ff.). Im Umfeld der OECD entstand das Konzept der „wissensbasierten Volkswirtschaft". Dessen Kerngedanke: Wissen ist im Überfluss vorhanden, die Fähigkeiten, es zu nutzen, reichen aber nicht aus (Lundvall und Johnson 1994). Seit der Lissabon-Strategie der EU (2000) orientiert sich – dem Wort nach – auch deren Politik darauf, Europa zur „wettbewerbsfähigsten und dynamischsten wissensbasierten Wirtschaft der Welt" zu machen (vgl. Commission of the European Communities 2005). Selbst von Seiten der EU wird aber eingeräumt, dass bislang „… bei der Umsetzung der Lissabon-Strategie nur mäßige Erfolge verzeichnet werden [konnten]" (http://europa.eu.int/growthandjobs/index_de.htm; 13.6.2005). So sind Investitionen in die wissensbasierte Wirtschaft in der EU bisher sehr ungleich verteilt, und die Vergabe von EU-Fördermitteln ist von einer Fokussierung auf die wissensbasierte Wirtschaft noch weit entfernt. Veränderungen deuten sich aber bei der Vergabe von Beihilfen an. Hier soll, neben einer angestrebten Reduzierung der Mittel, eine „Konzentration auf wesentliche Bereiche" erfolgen; unter diesen werden explizit genannt „Innovation, Forschung und Entwicklung im Dienst der Wissensgesellschaft" (Aktionsplan staatliche Beihilfen 2005).

Für den Bedeutungsgewinn von „Wissen" als Ressource gibt es eine Vielzahl von Hinweisen:

- Der Umfang des „produzierten Wissens" vervielfacht sich immer schneller.
- Die Halbwertzeit des Wissens verkürzt sich immer weiter, d.h. einmal erworbenes Wissen verliert in immer kürzerer Zeit seinen Nutzen und muss durch neues Wissen ersetzt werden (vgl. Grabow/Floeting 1998).
- Durch die Fortschritte im Bereich der Informations- und Kommunikationstechnik wachsen die Möglichkeiten des Zugangs zu kodifiziertem Wissen.

Es ist dadurch leichter sich an andernorts gemachten Erfahrungen und Entwicklungen zu orientieren. Gleichzeitig „wachsen" die für die Wissenserzeugung, Wissensverarbeitung und den Wissensaustausch relevanten Räume (Globalisierung der Wissensstrukturen). Der Wissensaustausch wird immer internationaler. Wissenserzeugung findet in globalen Netzwerken statt (Bender 2004). So nimmt nicht nur die Zahl der Forschungs- und Entwicklungseinrichtungen von Unternehmen außerhalb des Stammlandes zu. Diese Einrichtungen wandeln sich auch funktional hin zu selbständigeren Einheiten im Rahmen einer unternehmensinternen Forschungsvernetzung (vgl. Bathelt/Glückler 2002). Damit wächst auch in wissensorientierten Bereichen der Ökonomie die Konkurrenz (vgl. Floeting/Hollbach-Grömig 2005).

- Die Qualifikation von Beschäftigten steigt kontinuierlich und die Ausdifferenzierung von Qualifikationen wächst (vgl. Grabow/Floeting 1998).
- Der „Wissensgehalt" von Produkten (technologisches Wissen, Design usw.) nimmt nicht zuletzt aufgrund der Individualisierung von Konsummustern zu und ist besonders für Produkte, die in den ehemals hoch industrialisierten Ländern hergestellt werden, die allein über Lohnkostensenkung nicht erfolgreich sein können, von entscheidender Bedeutung für die Marktfähigkeit von Produkten.
- Die neuen Technologien ermöglichen veränderte Unternehmenskonzepte. Auch Prozesse der Wissensgenerierung und -verarbeitung erfolgen in zunehmendem Maß globalisiert arbeitsteilig (vgl. Floeting/Henckel 1993).

Die Erkenntnis, dass sich bestimmte Wirtschaftsbranchen in bestimmten räumlichen Bereichen mit spezifischen Standorten konzentrieren, ist nicht grundsätzlich neu (vgl. Marshall 1920). Auch der besondere Einfluss von Entrepreneurship und technologischem Wandel auf die kontinuierliche wirtschaftliche Entwicklung (Schumpeter 1911) ist seit langem untersucht und in Handlungszusammenhänge der kommunalen Wirtschaftsförderung und regionalen Wirtschaftpolitik übersetzt.

Vergleichsweise neu sind dagegen Ansätze, die sich mit der Schlüsselstellung des Produktionsfaktors Wissen in Relation zur Akkumulation von Kapital und Arbeitskraft für das langfristige regionale Wachstum auseinander setzen (Romer 1986). Spielten in den 1970er- und 1980er-Jahre im Mainstream der Wirtschaftswissenschaften regionale Fragen nur eine untergeordnete Rolle, so wurde im Zuge der Globalisierung und damit verbundener veränderter Wettbewerbsbedingungen seit Ende der 1980er-Jahre auch in die wirtschaftswissenschaftliche Forschung stärker räumlich differenziert (Krugman 1991; Porter 1990). Zunächst ging es dabei um empirisch vergleichende Untersuchungen auf der Ebene der Nationalstaaten. In jüngerer Zeit wendet man sich verstärkt der regionalen Ebene und besonders

metropolitanen Räumen zu. Es wird davon ausgegangen, dass unter den Bedingungen einer globalisierten Wirtschaft Standorte, die in bestimmten Wirtschaftsbereichen „Exzellenz“ entwickelt haben, bessere Entwicklungschancen haben. Empirische Belege stützen die These, dass angesichts der wachsenden Herausforderungen kein Land und keine Region mehr auf allen wirtschaftlichen Feldern herausragend kompetent sein kann. Demzufolge sei eine Profilbildung der einzelnen Regionen erforderlich, um im Wettbewerb in bestimmten Bereichen Exzellenz zu entwickeln und Nischen zu besetzen. Hinzu kommt die ökonomische Notwendigkeit, die knappen Ressourcen zu konzentrieren (Floeting 1997).

Im Rahmen der Profilbildung von Regionen wird dem ökonomisch-technologischen Strukturwandel sowie dem Zusammenhang von ökonomisch-technologischem Strukturwandel und der Entwicklung regionaler Innovationsmilieus eine wichtige Rolle zugemessen (Camagni 1991). Vernetzung und Embeddedness sind von besonderer Bedeutung für die Entwicklung innovativer Milieus und den Innovationsprozess (Grabher 1993) und spielen auch im Rahmen von Clusterkonzepten eine zentrale Rolle als Förderfaktoren, aber auch als Hemmnisse, die im Sinne einer Überinstitutionalisierung (Over-Embeddedness, Lock-in-Effekte) die Innovationsfähigkeit von Regionen beeinträchtigen können. Die Entwicklung innovativer Milieus und die Ausbildung von Clustern hängen eng zusammen. Bei den frühen Untersuchungen von GREMI (Groupe de Recherche Européen sur les Milieux Innovateurs) wurden vor allem Rückschlüsse auf die Regionalentwicklung gezogen („Drittes Italien“) (Camagni 1991). Auch das zweite, viel zitierte Beispiel für ein innovatives Milieu, Silicon Valley, liegt außerhalb der großen Städte (Saxenian 1994). Jüngere Untersuchungen suchen den GREMI-Ansatz auf die Entwicklung urbaner Regionen zu übertragen (Camagni 1999). In der Innovationsforschung wie in der Entwicklung und Umsetzung von Konzepten für den technologisch-ökonomischen Strukturwandel setzt sich Mitte der 1990er-Jahre immer stärker die Erkenntnis durch, dass räumliche Prozesse nicht allein eine Manifestation lokaler selbstorganisierter Prozesse sind. Vielmehr kommt es entscheidend auf Koordination, Führung und öffentlich-private Kooperation an. In diesem Zusammenhang wird auf die Rolle neuer Formen von Community Governance verwiesen (Camagni 2003).

5 KREATIVITÄT ALS ROHSTOFF UND STANDORTFAKTOR – DIE KREATIVE KLASSE ALS ORIENTIERUNGSPUNKT FÜR STADTPOLITIK?

Die Rolle von Kreativität für die Wirtschaftsentwicklung in kleinräumlich differenzierter Weise wird erst in jüngster Zeit thematisiert. Der Forschungsansatz von Florida (2002, 2005) hat diese Diskussion empirisch gestützt und popularisiert. Der Ansatz zählt zu den neuen Wachstumstheorien, nach denen wirtschaftliches Wachstum im Wesentlichen in den wissensorientierten Dienstleistungsbereichen und in den mit ihnen verbundenen Wirtschaftsbereichen zu erwarten ist. Der zentrale Punkt in Floridas drei T-These ist, dass nur die Regionen oder Städte, in denen alle drei Faktoren – „talent“, „technology“ und „tolerance“ – vorhanden sind und in denen sie überdies in einem günstigen Verhältnis zueinander stehen, mit wirtschaftlichem Wachstum rechnen können. Er leitet aus dem Zusammenwirken einen Kreislauf des gegenseitigen Bedingens und Beförderns ab: Ein tolerantes, vielfältiges Klima, in dem sich unterschiedlichste kulturelle Impulse gegenseitig bereichern, macht eine Region für die „creative class“ attraktiv. Die Vielzahl kreativer Talente schafft eine innovationsfreudige Stimmung und zieht Unternehmen aus den wissensintensiven Dienstleistungsbereichen und den Zukunftstechnologien an. Dies führt zu einer höheren Attraktivität der Region und zieht zusammen mit der weltoffenen und toleranten Stadt- bzw. Regionalkultur weitere hochqualifizierte Talente an. Für die USA weist er in empirischen Untersuchungen nach, dass für die Standortwahl insbesondere wachstumsorientierter innovativer Unternehmen und wissenschaftlicher Einrichtungen harte Standortfaktoren nicht mehr allein ausschlaggebend für Standortentscheidungen sind.

Die Bedeutung weicher Standortfaktoren wird auch von anderen Autoren in zahlreichen empirischen Untersuchungen seit längerem nachgewiesen (vgl. vor allem Grabow, Henckel, Hollbach-Grömig 1995). Der Ansatz von Florida unterscheidet sich von bisherigen Ansätzen vor allem in der Konzentration auf die Akteure der von ihm postulierten „Kreativen Klasse“ und der Fokussierung auf weiche Standortfaktoren – insbesondere eine spezifische Kultur und ein lokales Milieu, die der Ortsbindung dieser Akteure dienen.

Auch die zentrale Rolle von Wissen und Bildung für die Generierung wirtschaftlichen Wachstums wird seit längerem in vielen regionalökonomischen Arbeiten festgestellt. Gezielte Untersuchungen von Städten zu ihren Wissensressourcen und den Möglichkeiten deren strategischer Nutzung wurden bereits zu Beginn der 1990er-Jahre durchgeführt (vgl. Floeting/Henckel 1994). Kompetenzfeldorientierte Strategien der letzten

Jahre, neue Anreize zur Erschließung endogener Potenziale, die Entwicklung wissensbasierter Infrastrukturen und Konzepte sind Ausdruck der Ausdifferenzierung derartiger Ansätze (vgl. Floeting/Hollbach-Grömig 2005). Neu am Ansatz von Florida ist vor allem die Betonung der Bedeutung von „Kreativität" für den wirtschaftlichen Erfolg im globalisierten Wettbewerb. Florida stellt dabei fest, dass „Kreativität" über die Fähigkeit hinausgeht, Wissen zu akkumulieren.

Die Kritik am Forschungsansatz von Florida bezieht sich vor allem auf die sehr weite Definition der „Kreativen Klasse" und die Frage, ob man – vor dem Hintergrund der heterogenen Gruppenstruktur – überhaupt von einer „Klasse" sprechen kann. Darüber hinaus wird die geringe Handlungsorientierung der Arbeiten in Bezug auf Polarisierungs- und Exklusionsprobleme kritisiert. Ein weiterer Kritikpunkt bezieht sich darauf, dass der Forschungsansatz stark geprägt ist von der Lebens- und Arbeitsstildiskussion im Rahmen der Entwicklung einer vermeintlichen „new economy" zur Jahrtausendwende. Die mit der Krise der „new economy" verbundenen Veränderungen im Umgang mit neuen Lebensstilen und Arbeitsformen wurden bisher zu wenig einbezogen. Ebenso wird die wechselseitige Abhängigkeit der „Kreativen Klasse" und der restlichen produktiven Basis der Stadtwirtschaft nicht thematisiert. Gleichwohl stellt das Konzept ein sinnvolles Arbeitsinstrument zur Beschreibung des Kreativen Sektors dar, das allerdings an die spezifischen Verhältnisse in Europa und besonders der deutschen Städte angepasst werden muss.

6 KOMMUNALE HANDLUNGS- UND ANPASSUNGSSTRATEGIEN

Viele Kommunen in Deutschland haben auf die Veränderungen der Rahmenbedingungen und der technologischen und ökonomischen Entwicklung inzwischen mit Anpassungsstrategien reagiert (Spars und andere 2003). Die Dringlichkeit des Handlungsbedarfs auf kommunaler Ebene ist in dem Maße gestiegen, wie sich der ökonomische-technologische Strukturwandel in immer schärferer Form im Abbau von Arbeitsplätzen in bestimmten Branchen und Regionen zeigt, ohne dass dies durch Wachstum in anderen Bereichen kompensiert werden kann. Der technologisch-ökonomische Strukturwandel ist mit erheblichen Entwicklungsbrüchen verbunden, wie sich beispielsweise in den altindustrialisierten Regionen Westdeutschlands und – infolge der grundlegenden Strukturbrüche durch die deutsche Vereinigung – in weiten Teilen Ostdeutschlands zeigt. Dennoch muss er als normale Erscheinung im Rahmen von Veränderungs- und Entwicklungsprozessen angesehen werden.

Kommunale Wirtschaftsförderung und wirtschaftsorientierte Stadtentwicklungspolitik, die „Wissen" und „Kreativität" als wichtige Ressource ansehen, sind nichts völlig Neues. Städte waren immer Zentren des Wissens. Urbane Umgebungen waren immer Konzentrationspunkte für „kreative" Tätigkeiten und Personen. Daher waren kommunale Wirtschaftspolitik und wirtschaftsorientierte Stadtentwicklungspolitik implizit auch darauf ausgerichtet, die Wissensbasis in den jeweiligen Städten zu stärken. Wissen und Kreativität als strategische Ressourcen werden immer wichtiger – damit wächst auch die Notwendigkeit, sich explizit mit den Wissens- und Kreativitätsressourcen zu befassen, diese systematisch zu erfassen und die Chancen der Sicherung und Stärkung ebenso wie die Gefahren der Erosion zu prüfen.

6.1 Kompetenzfeldorientierte Konzepte

In einer Reihe von Städten und Regionen sind in jüngerer Zeit Konzepte entstanden, die explizit „kompetenzfeldorientierte Entwicklungsansätze" oder „Clusterkonzepte" genannt werden. Konzepte, die ähnliche Strategien verfolgen, werden in den deutschen Städten allerdings schon seit den 1980er-Jahren entwickelt und umgesetzt. Clusterkonzepte sind Teil der Neugestaltung des Verhältnisses zwischen Kommune und Unternehmen. Die kommunale Wirtschaftsförderung und die wirtschaftsorientierte Stadtentwicklung sehen ihre Aufgabe nicht nur darin, Ansiedlungen finanziell zu fördern und Gewerbeflächen bereit zu stellen. Wirtschaftsorientierte Stadtentwicklung beschäftigt sich in zunehmendem Maß mit der Profilbildung von Standorten, der Herstellung von kooperationsgeeigneten Raumgefügen, Imagebildung für bestimmte Räume und kleinräumigem Marketing.

Kommunale Wirtschaftsförderung analysiert die kleinräumige Entwicklung von Branchenclustern, initiiert und moderiert die Netzwerkbildung in der Wirtschaft. Von Unternehmen wird zugleich ein stärkeres Engagement für kommunale und regionale Belange einfordert. Die Organising Capacities von Städten und Regionen werden für die wirtschaftliche Entwicklung entscheidend. Der Erfolg kompetenzfeldorientierter Ansätze wird vor allem davon abhängen, ob es gelingt, ein funktionierendes Cluster- oder Netzwerkmanagement zu installieren. Die Benennung immer gleicher Technologiefelder wird allein nicht

mehr ausreichen. Auch die Einbeziehung eines – häufig diffusen – „Clusters“ Kreativwirtschaft wird dies nicht ändern. Erfolgreiches Cluster- oder Netzwerkmanagement muss die Entwicklungsdynamik von Kompetenzfeldern beachten. Neben der Gewährleistung von Kontinuität (Beteiligung von Akteuren, Generierung von Projekten usw.) gehört dazu auch, neue Trends rechtzeitig zu erkennen, neue Themen aufzugreifen und neue Akteure einzubinden.

6.2 Wissensorientierte Konzepte

Seit Beginn der 1990er Jahre werden Untersuchungen zu den lokalen und regionale Wissensressourcen durchgeführt und Strategien und Konzepte zu deren Förderung entwickelt (vgl. Floeting/Henckel 1994). Im Rahmen der Kulturwirtschaftsberichterstattung wurde in einer Reihe von Städten die Bedeutung der Kulturwirtschaft für die Stadtökonomie untersucht. Der Kulturwirtschaftsbegriff wird in jüngerer Zeit weiter gefasst: Man spricht von „creative industries“. Der Begriff der Kreativität wurde damit auch in Dokumente zur lokalen und regionalen Strategieentwicklung eingeführt.

In einer Reihe von Städten werden bereits Strategien angewandt, die als wissensorientierte Wirtschaftsförderung bezeichnet werden können. Gezielte Untersuchungen von Städten zu ihren Wissensressourcen und den Möglichkeiten deren strategischer Nutzung wurden bereits zu Beginn der 1990er-Jahre im Ausland (z.B. in Amsterdam, Delft, Genua, Mailand, Wien und einigen nordamerikanischen Städten) durchgeführt (Floeting/Henckel 1994). Kompetenzfeldorientierte Strategien der letzten Jahre, neue Anreize zur Erschließung endogener Potenziale, die Entwicklung wissensbasierter Infrastrukturen und Konzepte wie der „lernenden Region“ sind Ausdruck der Ausdifferenzierung derartiger Ansätze. Beklagt wird jedoch, dass in der Praxis „die sich daraus ergebenden konzeptionellen und organisatorischen Konsequenzen bis jetzt nur unzureichend zu integrierten Strategien umgesetzt“ (Gärtner 2004: 64) wurden. Zwar gibt es zahlreiche Einzelansätze für wissensbasierte Wirtschaftsförderung; die Maßnahmen werden jedoch selten aufeinander abgestimmt, miteinander verknüpft oder in eine umfassendere Strategie eingebunden.

In jüngerer Zeit werden in etlichen Großunternehmen und Unternehmensverbünden die Wissensbestände im Rahmen von „Wissensbilanzen“ „sichtbar“ zu machen versucht, wird gezieltes Wissensmanagement betrieben (BMWA 2004). Es wird auch versucht, diesen Ansatz auf die regionale Ebene zu übertragen und so beispielsweise Wissensbilanzen dazu zu nutzen, Forschungs- und Technologienetzwerke strategisch zu steuern (Bornemann/Sammer 2004).

Die Nachhaltigkeit wissensorientierter Wirtschaftsförderungskonzepte wird wesentlich durch Art und Ausmaß der Verknüpfung unterschiedlicher Wissensbereiche bestimmt. Wissensorientierte Konzepte umfassen damit weit mehr als nur Technologieförderung, Förderung von High-Tech-Branchen oder Elitehochschulen und Großforschungseinrichtungen. Sie sind sehr kommunikationsintensiv. Zugleich sind ihre wirtschaftlichen Erfolge nur schwer messbar. So ist beispielsweise Kommunikation sowohl ein wichtiger Prozess wissensorientierter Wirtschaftsförderung als auch ein wesentlicher Bestandteil von deren Ergebnis. Damit sind diese Ansätze eher schwer zu vermitteln, wo und wenn es um schnelle Verwertung und direkt messbare Erfolge geht. Dies macht sie auch leicht angreifbar. Sie im Rahmen von Wissensbilanzen stärker zu formalisieren, ist eine Reaktion auf solche Kritik. Gerade die indirekten und nur schwer zurechenbaren Effekte sind jedoch von großer – und wachsender – Bedeutung im Kontext von Vernetzung, Prozess- und Wissensorientierung.

7 STADTPOLITIK ZUR FÖRDERUNG VON “WISSEN” UND “KREATIVITÄT”

Neue Technologien ermöglichen veränderte Unternehmenskonzepte. Die Flexibilität bei der Standortwahl wächst, und Ansiedlungsentscheidungen erfolgen nicht mehr zwangsläufig langfristig, weil die mit der Verlagerung verbundenen Kosten sinken. Dies gilt besonders für die wissensorientierten Bereiche der Wirtschaft, die creative industries und ihre Akteure. Darauf müssen sich auch die kommunale Wirtschaftsförderung und die wirtschaftsorientierte Stadtentwicklungspolitik einstellen.

Zunächst müssen sie von dem Bestand städtischer Standorte ausgehend die Frage stellen, wie sich vorhandene Standorte an die Bedürfnisse eine stärker wissensorientierten lokalen und regionalen Wirtschaftsstruktur und der veränderten Erwerbstätigenstruktur anpassen lassen. Was kann kommunale Wirtschaftsförderung und wirtschaftsorientierte Stadtentwicklungspolitik dafür tun?

7.1 Urbanität und Funktionsmischung fördern

Räume, in denen sich „Kreativität“ und „Wissen“ konzentrieren, sind traditionell eher urbane Räume. Urbanität wird dabei häufig sehr kleinräumig verstanden, sodass schon Standorte des Innenstadtrands – erst recht Stadtrand- und Umlandlagen – von diesen „kreativen“ Unternehmen weniger nachgefragt werden. Für Bürostandorte – um die es sich im Kern bei den meisten Standorten kreativer Unternehmen handelt – sind dabei auch eher „ungewöhnliche“ städtische Räume wie alte Industriegebiete, Lagerhausstandorte oder „Amüsierviertel“ interessant. Selbst Hauptsitze kreativer Unternehmen „schrecken“ vor solchen Standorten nicht zurück, sondern suchen im Gegenteil die dort vermutete kreative Atmosphäre. Die ungewöhnliche Adresse gehört mit zur jungen kreativen Corporate Identity.

Mit den kleinräumigen urbanen Standorten werden Vorteile für face-to-face-Kontakte zu Kunden oder anderen Unternehmen verbunden. Die kleinräumige Mischung von Büroflächen, Restaurants, Einzelhandel, Dienstleistern, Unterhaltungsangeboten und Wohnungen unterstützt den Lebensstil junger urbaner Kreativer, die diese Dienstleistungsangebote in großem Umfang in Anspruch nehmen. Die Vermischung von Arbeitszeit und Freizeit in diesem Arbeits- und Lebensmilieu wird durch die schnelle – möglichst 24stündige – Verfügbarkeit der Angebote unterstützt. Die urbanen Standorte entwickeln deutlich andere Zeitstrukturen als übliche Büro-, Produktionsstandorte oder Wohngebiete (vgl. Eberling/Henckel 2002, 167). Diese Entwicklung stellt eine Renaissance typisch europäischer Stadtstrukturen mit spezifischen urbanen Qualitäten dar.

Die zurückgehende Zahl von Normalarbeitsverhältnissen, die zunehmende Vermischung von Arbeits- und Freizeit und die Flexibilisierung von Zeitstrukturen begünstigt auch die räumliche Integration von Freizeiteinrichtungen in Stadtquartiere. Zur Unternehmenskultur vieler kreativer Unternehmen und anderer Gründerunternehmen gehört die Vermischung von Arbeits- und Freizeit. Sie suchen Unternehmensstandorte, an denen auch ein interessantes Freizeitangebot besteht. Projektentwickler haben diese Nachfrage aufgegriffen und entsprechende Angebote entwickelt. Einige Standorte haben sich gerade dadurch erfolgreich etabliert, dass sie in der Nähe von Freizeiteinrichtungen zu finden waren. Viele gewachsene Standorte verfügen in besondere Weise über ein umfassendes Freizeitangebot.

Aussagen darüber, ob die gemischten Strukturen von Wohnen und Arbeiten von den Bewohnern und Beschäftigten im Quartier auch in der intendierten Form kleinräumig genutzt werden, sind zumeist nicht möglich. Es gibt aber zahlreiche empirische Belege, dass Unternehmen mit einem hohen Anteil kreativer Tätigkeiten und deren Beschäftigte funktionsgemischte Quartiere bevorzugen, selbst wenn die individuelle Nutzung nicht zwangsläufig mit einem Leben und Arbeiten in unmittelbarer Nachbarschaft verbunden sein muss und vermutlich auch in den seltensten Fällen verbunden sein wird.

7.2 Zwischennutzungen zulassen

„Wissen“ und „Kreativität“ benötigen Spielräume für die Entwicklung. Dies ist durchaus wörtlich gemeint. Flächen, die für Zwischennutzungen geeignet sind, eignen sich zur Nutzung durch „Kreative“ besonders. Die Kreativwirtschaft und die in ihr tätigen Personen akzeptieren „ungeordnete“ Räume eher als andere. Ungewöhnliche Orte tragen wesentlich zur Imagebildung von Unternehmen der Kreativwirtschaft bei. Zwischennutzbare Flächen eigenen sich für kulturelle Events, die die „Creative Class“ ansprechen. Damit bieten sich erhebliche Potenziale zum Umgang mit Flächen im voranschreitenden technologisch-ökonomischen Strukturwandel und den mit der demographischen Entwicklung in vielen deutschen Städten langfristig entstehenden Überhängen an baulich genutzten oder nutzbaren Flächen. Die flexibleren Arbeitsformen der Kreativwirtschaft spiegeln sich auch in deren Raumbedürfnissen wider. Flächen werden häufig kurzfristig, nur auf Zeit und den individuellen Raumbedürfnissen anpassbar benötigt. Dem muss Planung und Immobilienentwicklung Rechnung tragen.

Planung zielte bisher vor allem darauf ab, ungeordnete Raumsituationen zu ordnen und Flächen soweit möglich zu überplanen. In den letzten zwei Dekaden hat sich Planung hin zu einer integrierenden und moderativen Aufgabe gewandelt. Zukünftig könnte eine weitere wichtige Aufgabe der Planung sein, Flächen „liegen zu lassen“ und ihre spätere Nutzbarkeit hzu sichern. Ungenutzte, später nutzbare urbane Räume schaffen Flexibilität für die Anpassung an zukünftige Anforderungen einer veränderten Wirtschaftsstruktur und neuer Lebensstile.

7.3 Planungs- und Wirtschaftsförderungskultur verändern

Viele „kreative“ und „wissensorientierte“ Stadtquartiere haben sich eher zufällig entwickelt. In vielen Städten sind aber auch Stadtentwicklungsprojekte, gezielt von der kommunalen Wirtschaftsförderung und wirtschaftsorientierten Stadtentwicklungspolitik als räumliche Anker für „kreative“ und „wissensorientierte“ Unternehmen initiiert worden. Mit der Entwicklung der Projekte veränderten sich langsam auch planerische Auffassungen vom Umgang mit der Stadtentwicklungsplanung und die Kooperationsnotwendigkeiten zwischen Wirtschaftsförderungs- und Stadtentwicklungspolitik traten deutlicher hervor. Es vollzog sich ein Wandel von der allein liegenschaftsorientierten kommunalen Wirtschaftsförderung und allein planerischen Regelungen verhafteten Stadtplanung (bis in die erste Hälfte der 1980er Jahre), die vor allem auf Großunternehmen ausgerichtet war, hin zu einer Projektplanung (seit Mitte der 1980er Jahre bis in die zweite Hälfte der 1990er Jahre), die Wirtschaftsförderungs- und Stadtentwicklungsaspekte verknüpfte, aber immer noch eng an die Entwicklung einzelner Standorte gebunden war. Erst in den letzten Jahren haben sich kommunale Wirtschaftsförderung und wirtschaftsorientierte Stadtentwicklungspolitik zu einer immer stärker moderativen Aufgabe gewandelt, die die Bildung von Clustern anregt, Vernetzung fördert und sich darüber hinaus auf die Rahmensetzung bei der wirtschaftsräumlichen Entwicklung konzentriert. Diese Veränderungen im Planungsverständnis sind einerseits Ausdruck eines allgemeinen Beschleunigungs- und Individualisierungsprozesses, andererseits Kennzeichen des Bedeutungsverlustes der kommunalen Stadtentwicklungsplanung in vielen Städten, dem zunehmendem Rechtfertigungsdruck, unter dem Aktivitäten der kommunalen Wirtschaftsförderung stehen und der schwierigen finanziellen Situation der Kommunen. Die Stadtentwicklungsplanung wäre kaum noch in der Lage, in der umfassenden Weise wie dies bis in die 1980er Jahre der Fall war, Prozesse zu planen und zu steuern. Die Anforderungen von Unternehmen, Investoren, aber auch von Bürgern an individuelle Lösungen sind seit dieser Zeit erheblich gestiegen. Die Internationalisierungs- und Globalisierungsprozesse entziehen viele Entscheidungen dem unmittelbaren Einfluss der kommunalen Ebene. Dies beeinflusst auch das Handeln der kommunalen Wirtschaftsförderung und der Stadtentwicklungsplanung, die eher mit internationalen Akteuren Entscheidungen auszuhandeln hat, häufig nicht mehr in einem Konsens der lokalen Akteure entscheiden kann und Anordnungsbefugnisse verloren hat. Schließlich führen die immer größer werdenden Einschränkungen der kommunalen Handlungsmöglichkeiten aufgrund der verschlechterten finanziellen Rahmenbedingungen in den Kommunen zu einer Veränderung des Verwaltungshandelns. Weiche Instrumente – die vermeintlich weniger kosten – gewinnen an Bedeutung gegenüber großen Bauinvestitionen und Infrastrukturprojekten. Die Kommunen reagieren damit auch auf eine veränderte Nachfrage seitens der Unternehmen, Investoren und Bürger. In dem Maß, in dem bestimmte Einrichtungen in vielen Städten vorhanden sind, werden gerade die „weichen Instrumente“, die das Geschäftsklima und die Lebensqualität prägen, immer stärker standortentscheidend.

Strategien, Konzepte und Maßnahmen, die sich mit „Wissen“ und „Kreativität“ befassen, sind scheinbar ein preiswerter Ersatz für nicht mehr leistbare Investitionen. Erfolgreiche Strategien werden ohne langfristige Investitionen in die notwendige Infrastruktur aber kaum auskommen. Auch wissensorientierte Stadtentwicklungskonzepte und die „kreative“ Städte gibt es nicht kostenlos.

7.4 Integrierte Strategien zur Förderung von „Wissen“ und „Kreativität“ entwickeln

Obwohl in vielen Städten über neue Formen der kommunalen Wirtschaftsförderung und der wirtschaftsorientierte Stadtentwicklungspolitik diskutiert wird und die Vernetzung von Unternehmen und Einrichtungen an bestimmten Standorten von vielen Städten postuliert wird, sind nur wenige Stadtentwicklungsprojekte tatsächlich in eine umfassende, auf die Ressourcen „Wissen“ und Kreativität“ orientierte Stadtentwicklungsstrategien integriert. Hierin besteht ein wesentliches Manko der bisherigen Entwicklung. Standorte werden parallel entwickelt und konkurrieren z. T. miteinander. Die Potenziale der Ressourcen „Wissen“ und „Kreativität“ werden für den regionalen Strukturwandel nur unzureichend genutzt. Kommunale Wirtschaftsförderungsaufgaben und Stadtentwicklungsaufgaben zur Förderung der Ressourcen „Wissen“ und „Kreativität“ werden weitgehend unabhängig voneinander wahrgenommen, in einigen Fällen auch unkoordiniert.

7.5 Kontinuität von Strategien, Konzepten und Maßnahmen sichern

Strategien und Konzepte zur Förderung der Ressourcen „Wissen“ und „Kreativität“ müssen langfristig ausgelegt sein. Damit langfristige Strategien und Konzepte nicht zu einem Widerspruch zur notwendigen

und geforderten Flexibilität werden, müssen sie entfeinert sein. Die Kontinuität von ideeller und finanzieller Unterstützung ist von besonderer Bedeutung für deren Erfolg. Dies gilt ganz besonders auch für den politischen Rückhalt. Wichtig für die Kontinuität von Strategien, Konzepten und Maßnahmen zur Förderung der Ressourcen „Wissen“ und „Kreativität“ sind Akteure, die deren Umsetzung garantieren. Bisher gab es nur wenige Akteure, die als Promotoren einer integrierten Strategie auftraten.

Konzepte zur Förderung von „Wissen“ und „Kreativität“ als Ressource sollten modular strukturiert sein. Der Vorteil, dass solche Konzepte eine höhere Reversibilität aufweisen, auf veränderte Rahmenbedingungen, „windows of opportunity“, technologische Brüche, Innovationen und Ideen usw. besser reagieren können, ist mit dem Nachteil verbunden, dass sie auch schneller zurückzuziehen sind.

In den Städten konkurrieren immer mehr Konzepte und Projekte um Finanzierung und Aufmerksamkeit. Eine deutlichere Prioritätensetzung, die langfristig angelegt ist, könnte die Planungssicherheit erhöhen. Strategien zur Stärkung der Ressourcen „Wissen“ und „Kreativität“ könnten rahmensetzend wirken.

Die Entwicklung flexibler Akteursgruppen ist ein Nebeneffekt der kontinuierlichen Entwicklung einer wissensorientierten Stadtentwicklungsstrategie. Flexible Akteursgruppen können windows of opportunity besser nutzen.

8 SCHLUSSBEMERKUNG

Kommunale Wirtschaftsförderungs- und Stadtentwicklungspolitik sieht sich – nicht nur in Deutschland –verschiedenen Trends (Globalisierung, Europäisierung, technologisch-ökonomischer Strukturwandel usw.) gegenüber, die durch die Kommunen kaum zu beeinflussen sind – entweder, weil sie Gegenstand (supra)nationaler Politik sind oder weil es sich um Entwicklungen handelt, die sich insgesamt einer Steuerung durch Politik weitgehend entziehen. Während sich die direkten Einwirkungsmöglichkeiten verringern, erhöhen sich die Erwartungen an die Akteure, z.B. im Hinblick auf die Gestaltung von Rahmenbedingungen, die dazu beitragen, Arbeitsplätze zu schaffen. Es ist kein Zufall, dass kommunale Wirtschaftsförderung und wirtschaftsorientierte Stadtentwicklung gerade in dieser Situation mit den Themen „Wissen“ und „Kreativität“ Bereiche entdecken, in denen (vermeintlich) noch lokale und Handlungsmöglichkeiten bestehen. Die ersten konkreten Handlungsansätze machen gleichzeitig die Schwierigkeiten lokalen und regionalen Handelns auch in diesem Bereich deutlich. Sie ähneln den oben beschriebenen auffallend. Nicht alle Teile der Stadt werden in gleichem Ausmaß in wirtschafts- und stadtentwicklungspolitische Strategien der Kommune einbezogen werden können. Eine Folge der Globalisierung ist die Ungleichzeitigkeit der Entwicklung auf lokaler Ebene: Während einige Teile der Stadt in die globalen Ströme eingebunden sein werden, werden andere sich in stärkerem Maß an lokalen Rhythmen orientieren. Für einige Bereiche der Kommune werden global orientierte Wachstumsstrategien sinnvoll sein, für andere dagegen Präventionsstrategien notwendig werden; wieder andere bieten gute Ansätze für die Entwicklung lokaler Ökonomien oder sind Schauplatz einer Herausbildung spezialisierter Technologiestandorte. Auch Strategien, Konzepte und Maßnahmen zur Förderung der Ressourcen „Wissen“ und „Kreativität“ werden die einzelnen Räume der Städte und die Städte insgesamt in dieser unterschiedlichen Weise betreffen.
Bei zunehmend beschränkten Ressourcen Prioritäten zu setzen, die den personellen und finanziellen Aufwand von Aktivitäten der kommunalen Wirtschaftsförderung und der wirtschaftsorientierten Stadtentwicklung in Beziehung zum erwarteten Nutzen setzen, wird immer wichtiger. Dies kann heißen, bestehende Aufgaben zugunsten neuer Aktivitäten, denen mittel- bis langfristig höhere Bedeutung eingeräumt wird, in den Hintergrund zu stellen. Die Förderung der Ressourcen „Wissen“ und „Kreativität“ als explizite Aufgabe ist eine solche neue Aktivität. Die Diskussion über die Bedeutung dieses neuen Aufgabenfeldes hat in den deutschen Städten erst begonnen. Der schwierige Prozess der Priorisierung hat noch nicht stattgefunden.
Wirtschaftsförderungs- und Stadtentwicklungspolitik übernehmen in den diskursiven, kooperativen Prozessen, die im Umgang mit den Themen „Wissen“ und „Kreativität“ im urbanen Kontext notwendig sind, eine aktive Rolle. Themen, die die Einbindung unterschiedlichster Akteure erfordern. Konsens, Vertrauen, Transparenz, Kommunikationsfähigkeit und -bereitschaft sind dabei zentrale Merkmale für erfolgreiche Strategien, Konzepte und Maßnahmen.

Letztlich kann man sich des Eindrucks nicht erwehren, dass Strategien, Konzepte und Maßnahmen zur Förderung der Ressourcen „Wissen“ und „Kreativität“ in gewissem Umfang die, durch eine zunehmende Ökonomisierung von Stadtpolitik und -verwaltung und die damit verbundenen „Verschlankungsprozesse“ verschwundenen Spielräume und Redundanzen und die durch Hierarchien behinderten intrinsischen Motivationen der „kreativen“ Akteure, zurückholen sollen. Ob dies die „ökonomischere“ Lösung ist, muss sich erst noch beweisen.
Insgesamt werden kommunale Wirtschaftsförderung und wirtschaftsorientierte Stadtentwicklungsplanung zukünftig enger zusammenarbeiten müssen, als dies bisher in vielen Städten der Fall ist, um „Wissen“ und „Kreativität“ in den Städten Raum zu geben. Die Städte brauchen dabei vermutlich weniger „neue Räume“ als einen neuen Umgang mit bestehenden.

9 LITERATUR

Aktionsplan staatliche Beihilfen. Weniger und besser ausgerichtete staatliche Beihilfen – Roadmap zur Reform des Beihilferechts 2005–2009 (Konsultationspapier, dt.).

Bathelt, Harald, Johannes Glückler (2002), Wirtschaftsgeographie. Stuttgart.

Bender, Gerd (2004), mode 2 – Wissenserzeugung in globalen Netzwerken?. In: Ulf Matthiesen (Hrsg.) Stadtregion und Wissen. Analysen und Plädoyers für wissensbasierte Stadtpolitik, Wiesbaden, S. 149-157.

Bornemann, Manfred, Martin Sammer, Intellectual Capital Report as an Assessment Instrument for Strategic Governance of Research and Technology Networks. Graz 2004.

Bundesministerium für Wirtschaft und Arbeit (Hrsg.) (2004), Wissensbilanz – Made in Germany. Leitfaden, Berlin.

Camagni, Roberto (2003), Regional Clusters, Regional Development and Regional Competition. Beitrag zur Konferenz „Clustermanagement in der Strukturpolitik – Internationale Erfahrungen und Konsequenzen für NRW“, Duisburg.

Camagni, Roberto (1999), The City as a Milieu: Applying GREMI’s Approach to Urban Evolution, in: Revue d’Economie Régionale et Urbaine, H. 3 (1999), S. 591–606.

Camagni, Roberto (1991), From the „Local Milieu” to Innovation through Cooperation Networks, in: Ders. (Hrsg.), Innovation Networks: Spatial Perspectives. London.

Commission of the European Communities (2005), The Economic Costs Of Non-Lisbon. A Survey of the Literature on the Economic Impact of Lisbon-Type Reforms, Commission Staff Working Document, Brussels.

Floeting, Holger (2006), Forschungsfragen zum Themenkomplex „Wissensgesellschaft und Raumentwicklung“, Arbeitspapier für die Akademie für Raumforschung und Landesplanung, Berlin.

Floeting, Holger, Beate Hollbach-Grömig (2005), Neuorientierung der kommunalen Wirtschaftspolitik, in: Deutsche Zeitschrift für Kommunalwissenschaften/German Journal of Urban Studies, Vol. 44, Bd. I, S. 10-39.

Floeting, Holger (1997), Die Städte und die Informationsgesellschaft, in: Henckel, Dietrich/ Floeting, Holger/Grabow, Busso/Hollbach-Grömig, Beate/Neumann, Hans/Niemann, Heinz/ Reidenbach, Michael/Usbeck, Hartmut, Entscheidungsfelder städtischer Zukunft, Stuttgart/Berlin/Köln (Schriften des Deutschen Instituts für Urbanistik, Band 90), S. 209–256.

Floeting, Holger/Henckel, Dietrich (1994), Wissensorientierte Stadtentwicklung. Ein neues Leitbild für die Planung?, in: Stadtforum Journal, Nr. 15, (Mai 1994), Berlin (Senatsverwaltung für Stadtentwicklung und Umweltschutz), S. 22–23.

Floeting, Holger, Dietrich Henckel (1993), Lean production, Telematik, just-in-time. Stadträumliche Wirkungen neuer Produktions- und Logistikkonzepte. In: Stadtbauwelt 48, Dezember, S. 2620-2629.

Florida, Richard (2005), Cities and the Creative Class. New York.

Florida, Richard (2002), The Rise of the Creative Class, New York.

Fourastié, Jean (1963), Le Grand Espoir du XX. Siècle, Paris (Originalausgabe 1949).

Gärtner, Stefan, Integriert Wirtschaftsförderung: Regionalökonomische Ansätze und Konzepte. In: Brigitta Widmaier, Doris Beer, Stefan Gärtner, Ileana Hamburg, Judith Terstriep, Wege zu einer integrierten Wirtschaftsförderung. Baden-Baden, S. 13-73.

Grabher, Gernot (1993), The Weakness of Strong Ties: The Lock-In of Regional Development in the Ruhr Area, in: Grabher, Gernot (Hrsg.), The Embedded Firm. On the Socioeconomics of Industrial Networks. London, S. 255–277.

Grabow, Busso/Floeting, Holger (1998), Städte in der Dienstleistungs- und Informationsgesellschaft, in: Egeln, Jürgen/Seitz, Helmut (Hrsg.), Städte vor neuen Herausforderungen, Baden-Baden (ZEW Wirtschaftsanalysen, Bd. 28), S. 15–52.

Grabow Busso/Henckel Dietrich/Hollbach-Grömig, Beate (1995), Weiche Standortfaktoren, Stuttgart und andere (Schriften des Deutschen Instituts für Urbanistik, Bd. 89).

Krätke, Stefan (2004), Kreatives Wissen in stadtregionaler Perspektive. In: Ulf Matthiesen (Hrsg.) Stadtregion und Wissen. Analysen und Plädoyers für wissensbasierte Stadtpolitik, Wiesbaden 2004, S. 93-107.

Krugman, Paul (1991), Geography and Trade, Cambridge, MA.

Lange, Burkhardt (2006), Wissensgesellschaft, Innovation und Raumentwicklung, Vermerk zum ARL-Fachgespräch am 04.05.2006, Hannover.

Lundvall, Bengt-Åke, Björn Johnson (1994), The Learning Economy. In: Journal of Industrie Studies, H. 1(December), S. 23-41.

Marshall, Alfred (1920), Principles of Economies, London.

Matthiessen, Ulf (2004), Wissen in Stadtregionen. In: Ulf Matthiesen (Hrsg.) Stadtregion und Wissen. Analysen und Plädoyers für wissensbasierte Stadtpolitik, Wiesbaden, S. 11-28.

McKinsey & Company/Institut für Produktionsmanagement, Technologie und Werkzeugmaschinen der Technischen Universität Darmstadt (2005), „How to Go Global“ – Chancen globaler Produktion, Ergebnisse der McKinsey-PTW-Studie ProNet, Frankfurt 2005, http://www.mckinsey.de/_downloads/Presse/bb_praesentation_050216.pdf (18. Februar 2005).

Porter, Michael E. (1990), The Comparative Advantages of Nations, New York.

Ragnitz, Joachim (2002), Sektoraler Strukturwandel in Deutschland seit 1991, Stellungnahme, IWH – Institut für Wirtschaftsforschung Halle, http://www.iwh-halle.de/d/Abteil/
STWA/jrg/pub/stel18.htm (14. Februar 2005).
Romer, Paul M. (1986), Increasing Returns and Long-Run Growth, in: Journal of Political Economy, H. 94 (5) (1986), S. 1002–1037.
Saxenian, Annalee (1994), Regional Advantage. Culture and Competition in Silicon Valley and Route 128, Cambridge, MA.
Schumpeter, Joseph (1911), Theorie der wirtschaftlichen Entwicklung. Eine Untersuchung über Unternehmensgewinn, Kapital, Kredit, Zins und den Konjunkturzyklus, Berlin.
Spars, Guido/Antikainen, Janne/Floeting, Holger/Heinze, Michael/Henckel, Dietrich/Hokkeler, Michael/Jonuschat, Helga/Mariussen, Åge/Oertel, Britta/Uhlin, Åke (2003), Technologisch-ökonomischer Strukturwandel. Räumliche Auswirkungen und regionale Anpassungsstrategien, Bonn (Bundesamt für Bauwesen und Raumordnung, Werkstatt: Praxis Nr. 1)

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Das GDI-DE Modellprojekt XPlanung - Erste Erfahrungen mit der Umsetzung des XPlanGML-Standards

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1 ABSTRACT

Im Standardisierungs-Projekt XPlanung, das seit Ende 2003 im Rahmen verschiedener E-Government Initiativen läuft, werden ein semantisches Datenmodell und ein GML-3 basiertes, objektorientiertes Austauschformat XPlanGML für kommunale Bauleitpläne entwickelt. Der aktuelle Standard XPlanGML 1.2 ist in der Lage, Bebauungspläne und Flächennutzungspläne entweder als georeferenzierte Rasterkarten zu übertragen, oder die einzelnen Festsetzungen und Darstellungen als Geoobjekte mit punkt-, linien-, oder flächenförmigem Raumbezug darzustellen. Im Rahmen eines Modellprojektes der „Initiative Geodateninfrastruktur Deutschland“ (GDI-DE) findet seit Mitte 2006 eine erste Praxiserprobung des Standards XPlanGML statt. Dabei werden in insgesamt 8 Pilotprojekten, an denen Kommunen und Landkreise aus 8 Bundesländern beteiligt sind, existierende, raster- und vektorbasierte Pläne umgesetzt, sowie die Integration des Standards in kommunale Verwaltungsabläufe untersucht. Besondere Aufmerksamkeit gilt dabei der Frage, ob das Objektmodell XPlanGML prinzipiell in der Lage ist, den semantischen Inhalt existierender Planungen abzubilden, und mit welchem Aufwand existierende Pläne konvertiert werden können. Der Beitrag stellt die einzelnen, für XPlanung zuständigen E-Government Vorhaben vor und grenzt sie gegeneinander ab, diskutiert die Vorgehensweise und die wichtigsten Ergebnisse des GDI-DE Modellprojektes, und gibt einen Ausblick auf die Weiterentwicklung des Standardisierungsprojektes.

2 EINLEITUNG

Seit 2003 entwickelt im Projekt XPlanung eine deutschlandweite Arbeitsgruppe, der Vertreter verschiedener Kommunen und Landkreise, von Dienstleistern im Bereich kommunale Datenverarbeitung, Software-Firmen, sowie Mitarbeiter aus Wissenschaft und Forschung angehören, einen neuen Standard im Bereich der Bauleitplanung. Dabei werden ein semantisches Datenmodell und ein objektorientieres Austauschformat für Bauleitpläne, sowie formalisierte Vorschriften zur Visualisierung von Bauleitplänen entwickelt. Die Entwicklungen konzentrieren sich derzeit auf Bebauungspläne (BPläne) und Flächennutzungspläne (FPläne), basieren auf den gesetzlichen Vorschriften der Bauleitplanung in Deutschland wie dem Baugesetzbuch (BauGB), der Baunutzungsverordnung (BauNVO) und der Planzeichenverordnung (PlanzV), und orientieren sich an nationalen und internationalen Standards (XML, GML, ALKIS/NAS). Mit Hilfe des neu entwickelten Standards wird es zukünftig möglich sein, digitale Bauleitpläne zwischen beliebigen IT-Systemen ohne Informationsverlust oder Konvertierungsaufwand auszutauschen, Pläne in Datenbanken abzulegen, über standardisierte Web-Services Recherchen und Auswertungen dieser Pläne nach geometrischen und semantischen Kriterien vorzunehmen, und die Ergebnisse über einen beliebigen Web-Browser anzuzeigen.

Das Projekt XPlanung wurde auf der CORP 2005 (Benner et al. 2005) schon einmal vorgestellt. In den vergangenen 2 Jahren hat sich das Projekt allerdings stark weiterentwickelt. So wurden die damals noch getrennten Austauschformate BPlanGML (für BPläne) und FPlanGML (für FPläne) zu einem Format XPlanGML zusammengefasst, der mittlerweile in der Version 2.0 vorliegt. Gegenüber den Vorgängern wurde XPlanGML in vielen Details überarbeitet, erweitert und verbessert. (Krause, Benner 2006; Benner, Krause 2006A). So wurde der Standard u. A. um die Möglichkeit erweitert, nur den Geltungsbereich des Planes vektoriell zu erfassen, den sonstigen Inhalt aber durch eine georeferenzierte Rasterkarte abzubilden (Benner, Krause 2006A). Diese Variante bietet sich vor allem zur Erfassung von Altplänen an, deren vollständige Vektorisierung technisch und wirtschaftlich nicht möglich ist. Spezifikation und Dokumentation des Standards, sowie Testdatensätze im XPlanGML-Format sind über die Internet-Site des Projektes (www.xplanung.de) frei zugänglich.

Auch organisatorisch hat sich das Projekt seit dem Jahr 2005 stark verändert. Es ist in der Zwischenzeit in eine Vielzahl von E-Government Initiativen auf nationaler Ebene eingebettet, die in Kap. 3 dieses Beitrags

näher vorgestellt werden. Außerdem läuft seit Mitte 2006 eine erste Praxis-Erprobung des Standards im Rahmen eines Modellprojektes der Initiative Geodaten-Infrastruktur Deutschland (GDI-DE). Schwerpunkt des Beitrags ist es, die im Rahmen dieses Modellprojektes erfolgten Pilot-Implementierungen, sowie die dazu entwickelten Software-Pakete vorzustellen (Kap. 4), sowie die Ergebnisse der Pilotprojekte zu referieren (Kap. 5). Außerdem wird ein Ausblick auf notwendige Weiterentwicklungen des Standards gegeben (Kap. 6).

3 EINBETTUNG VON XPLANUNG IN DIE DEUTSCHE E-GOVERNMENT PROJEKTLANDSCHAFT

Das Projekt XPlanung ist in eine Vielzahl von E-Government Initiativen auf Bundes-, Landes und kommunaler Ebene eingebunden (s. Abb. 1). Im Folgenden wird versucht, einen aktuellen Überblick über die E-Government Initiativen in der Bundesrepublik Deutschland und die jeweilige Verankerung von XPlanung zu dokumentieren. Die aktuelle Situation Anfang 2007 zu beschreiben gestaltet sich jedoch schwierig, da das vorherige Jahr 2006 ein Jahr des Umbruchs der bisherigen bundesdeutschen E-Government Strategien war. Die E-Government Initiative Deutschland-Online (DO) ist organisatorisch und von der Setzung inhaltlicher Schwerpunkte starken Veränderungen unterworfen, die Initiative MEDIA@Komm-Transfer (MKT) wird in der bislang bestehenden Form nicht weitergeführt. Die Initiative MKT soll zukünftig durch eine Initiative MEDIA@Komm-Innovation weitergeführt werden. Alle diese nachfolgenden Initiativen befinden sich erst im Aufbau, die Verabschiedung der EU Initiative i2010 erfordert zudem ebenso neue Antworten.

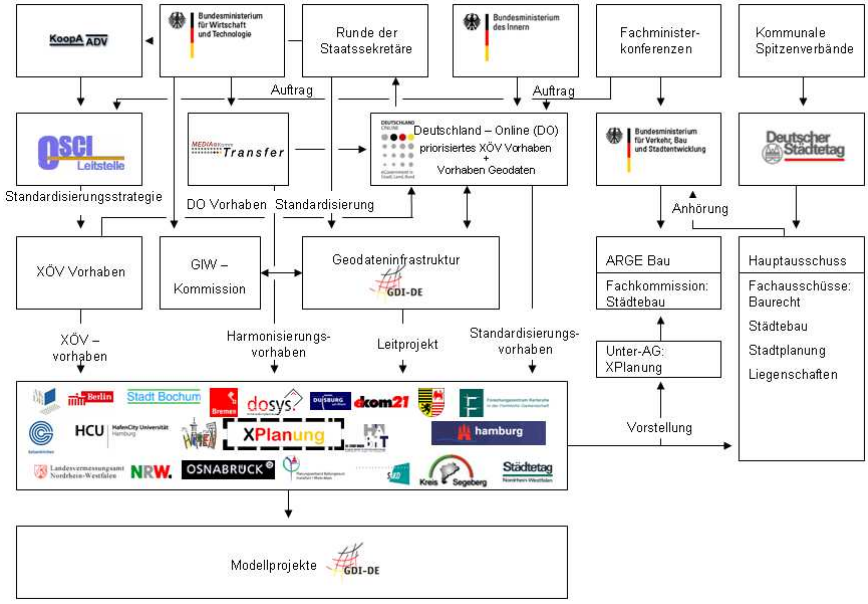


Abb.1: Einbindung von XPlanung in die E-Government Initiativen der Bundesrepublik Deutschland

Die E-Government Initiativen MKT und DO hatten das Ziel, medienbruchfreie elektronische Abläufe zwischen Bund, Ländern und Kommunen zu verbessern. Während es bei DO vor allem um die vertikale Integration zwischen Bund, Ländern und Kommunen ging (ebenenübergreifende E-Government-Spezifikationen), stand bei MKT die horizontale Verbreitung von E-Government-Spezifikationen auf kommunaler Ebene im Vordergrund. Träger der Initiative MKT war das Bundeswirtschaftsministerium. Die Initiative startete zur CeBIT 2004 und endete Anfang November 2006 mit einer Abschlussveranstaltung, auf der u. a. Spezifikationsberichte vorgestellt wurden. Die von Bund, Ländern und Kommunen getragene Initiative DO startete im Juni 2003 mit den Zielen, gemeinsame Verwaltungsdienstleistungen online bereitzustellen, Internet-Portale zu vernetzen, gemeinsame Infrastrukturen und Standards zu entwickeln sowie den Know-how-Transfer untereinander zu verbessern. Die Kernprinzipien waren dabei „Einige für alle“, die Verantwortung für ein Vorhaben trägt der Federführer, dabei müssen die entwickelten Standards transparent sein. Auf Basis dieser einheitlichen Standards sollen konkurrierende Produkte im Wettbewerb stehen können.

Im Jahre 2006 geriet die Initiative DO in starke Kritik, ausgelöst durch einen Beitrag des Staatssekretärs und Bevollmächtigten für E-Government und Informationstechnologie der Landesregierung Hessen Hr. Lemke auf dem „Forum Public Sector“ des Branchenverbands Bitkom. Im Juni 2006 wurde deshalb von der Bun-

deskanzlerin Dr. Angela Merkel und den Regierungschefs von Bund und Ländern in Form des „Aktionsplans Deutschland-Online“ eine Neuausrichtung der Initiative DO beschlossen. Einige wenige Vorhaben sollen demnach zukünftig priorisiert werden. Die Vorhaben, die bislang in Eigenverantwortung eines Vorhabensträger durchgeführt wurden, sollen durch ein Projektmanagement sowie durch Fach- und Prozeßberatungsdienstleistungen unterstützt werden. Weiterhin soll die nationale Kommunikationsinfrastruktur der Deutschen Verwaltungen ausgebaut werden, um elektronische Verwaltungswege ebenenübergreifend zur Verfügung stellen zu können. Die Fachministerkonferenzen sollen verstärkt durch den Arbeitskreis der Staatssekretäre für E-Government koordinierend eingebunden werden. Die Erarbeitung fachspezifischer Datenaustauschformate erfolgt dabei unter der Verantwortung der jeweils zuständigen Fachministerkonferenz. Fachübergreifende Standards (Datenkomponenten wie „Name“ oder „Adresse“) sollen im Rahmen der XÖV (XML-Standardisierung in der öffentlichen Verwaltung) Koordination (weiter-)entwickelt werden. Zunächst wurden drei priorisierte E-Government Fachvorhaben in den Themenfeldern „KFZ-Wesen“, „Personenstandswesen“ und „Meldewesen“ beschlossen, die durch die allgemeinen Vorhaben „Kommunikationsinfrastruktur der Deutschen Verwaltung“ und „Standardisierung“ (XÖV) auf insgesamt fünf DO Vorhaben ergänzt wurden.

Die bisherigen DO Vorhaben, die aktiv gearbeitet haben, sollen jedoch weitergeführt werden. Dies gilt auch für das Vorhaben Geodaten, dass unter der 1. Säule „Dienstleistungen“, Vorhaben 6 geführt wird. Ein Projekt des Vorhabens Geodaten ist dabei XPlanung.

Das Projekt XPlanung ist ebenfalls ein XÖV Projekt im Rahmen von OSCI (Online Services Computer Interface). Die OSCI-Leitstelle ist im Auftrag des KoopA ADV (Kooperationsausschuss Automatisierte Datenverarbeitung) verantwortlich für die Koordination der Entwicklung fachlicher Standards zum elektronischen Datenaustausch im Bereich der öffentlichen Verwaltung (XÖV), und für die Entwicklung eines Protokoll zur sicheren und vertraulichen Übertragung digital signierter Dokumente über das Internet (OSCI-Transport). Dabei werden u.a. Werkzeuge für die Entwicklung und Bereitstellung von fachlichen Standards zur Verfügung gestellt (z.B. XML–Repository, XGenerator 2.0) sowie ein Methodenwerk (XÖV Framework 1.0) für die fachliche Standardisierung und Koordination der laufenden XÖV-Projekte definiert. Das Projekt XPlanung nutzt allerdings an Stelle des XGenerators die Modellierungswerkzeuge der ADV auf Basis von Rational Rose. Bei der Standardisierung wird zwischen XÖV-Basis-Projekten (datenorientiert) und den XÖV-Erweiterten-Projekten (prozessorientiert), sowie zwischen fachspezifischer und fachübergreifender Standardisierung unterschieden. Das Vorhaben XPlanung gehört durch seine Mitgliedschaft in der XÖV Abstimminstanz zum priorisierten DO Vorhaben Standardisierung.

Parallel zu der Neuausrichtung von DO wurde im September 2006 vom Bundeskabinett das „E-Government 2.0“ Programm des Bundes beschlossen. Die Bundesregierung möchte mit dem Programm ebenso auch den Zielen der Europäischen Kommission aus der Initiative „i2010 - Eine europäische Informationsgesellschaft für Wachstum und Beschäftigung“ (Kommission der Europäischen Gemeinschaften, 2005) nachkommen. Ebenfalls Teil der Umsetzung der EU Strategie i2010 ist das im Auftrag des Bundeskabinetts vom Bundesministerium für Wirtschaft und Technologie formulierte Aktionsprogramm „iD2010 Informationsgesellschaft Deutschland 2010“ (BMWi 2006).

Als ein Strategisches Handlungsfeld der Politik der Bundesregierung wird unter dem Gliederungspunkt B.I.6 das Ziel benannt, die wirtschaftliche Nutzung öffentlicher Informationen zu verbessern. Der Schwerpunkt wird dabei auf die „Initiative Geodateninfrastruktur der Bundesrepublik Deutschland“ (GDI-DE) gelegt. Gemäß den Aussagen des Aktionsprogramm iD2010 werden im Rahmen von GDI-DE „bedeutsame Datenbestände wie beispielsweise solche der städtebaulichen Planung, der Grundstücksbewertung oder naturschutzrechtliche Gebietsfestlegungen zukünftig in einheitlichen Formaten oder über einheitliche Dienste zur Wertschöpfung oder Optimierung der Geschäftsprozesse zwischen Verwaltung und Unternehmen verfügbar gemacht“ (BMWi 2006, Seite 14). Der Terminus städtebauliche Planung ist dabei mit dem Projekt XPlanung gleichzusetzen.

4 XPLANUNG ALS GDI-DE MODELLPROJEKT

Neben den oben dokumentierten E-Government Initiativen, die ihren Schwerpunkt vor allem auf der Interoperabilität und Standardisierung alphanumerischer Daten haben, existiert explizit für die Interoperabilität und Standardisierung raumbezogener Daten die E-Government Initiative GDI-DE, die von der Geschäfts- & Koordinierungsstelle IMAGI / GDI-DE am Bundesamt für Kartographie und Geodäsie betreut und koordiniert

wird. Das Lenkungsgremium GDI-DE hat im Januar 2006 neben dem bereits beschlossenen Projekt „Schutzgebietsinformationen“ als weitere Modellprojekte für den Aufbau der Geodateninfrastruktur Deutschland die Projekte „VBORIS“ und „XPlanung“ beschlossen. Das Ziel des Modellprojektes XPlanung ist es, im Rahmen von Pilotanwendungen in verschiedenen Kommunen und Landkreisen eine Praxiserprobung des Standards XPlanGML vorzunehmen. Nach einem entsprechenden Aufruf der Geschäfts- und Koordinierungsstelle GDI-DE haben sich 9 Projekte etabliert, in denen die Umsetzung von Altplänen in XPlanGML untersucht werden, Web-Server zur Bereitstellung von Bauleitplänen auf XPlanGML-Basis aufgebaut werden, sowie die Integration des Standards in kommunale Verwaltungsabläufe untersucht wird. Mitglieder der XPlanung-Gruppe unterstützen und koordinieren diese Projekte und sorgen dafür, dass die Erkenntnisse in die Weiterentwicklung des Standards einfließen.

Ein typische Situation bei neuen Standards im IT-Bereich ist es, dass diese von existierenden Software-Systemen (noch) nicht unterstützt werden. Dies gilt auch für den Standard XPlanGML. Zwar können entsprechende Daten mit Standard GML-Viewern wie Aristoteles (Aristoteles 2006) betrachtet werden, aber eine mit der PlanzV konforme Darstellung der Daten ist damit natürlich nicht gewährleistet. Dasselbe gilt auch für den internetgestützten Zugriff auf XPlanGML-Daten über Web-Services. Web Feature Services (WFS) wie der degree WFS (deegree 2007) erfordern eine für das unterstützte GML-Anwendungsschema spezifische Konfiguration. Der Web Map Service (WMS), mit dessen Hilfe die GML Feature Daten in ein für Internet-Browser nutzbares Darstellungsformat umgewandelt werden, benötigt detaillierte Visualisierungsvorschriften in Form sog. „Styled Layer Descriptors“ (SLD). Zum Aufbau einer Datenbank mit Bauleitplänen mit Hilfe eines transaktionalen WFS (T-WFS) ist es insbesondere notwendig, dass die Daten im Austauschformat XPlanGML vorliegen. Zum Start des Modellprojektes existierte auf dem Markt aber keine Software, die dies Format erzeugen konnte. Deshalb wurden im Rahmen des Modellprojektes 2 Softwarepakete entwickelt, die im Weiteren kurz beschrieben.

4.1 XPlanGML-Toolbox

Zur Erprobung des Standards XPlanGML, als Werkzeug zur Konvertierung von Altplänen im Shapefile-Format, sowie zur Visualisierung von XPlanGML-Dateien wurde das Programm XPlanGML-Toolbox entwickelt. Das Werkzeug ist in der Lage, durch ESRI-Shapefiles repräsentierte Pläne einzulesen und mit Hilfe benutzerdefinierter Abbildungsvorschriften in XPlanGML zu konvertieren. Für diese Abbildung müssen die Shapefiles eine gewisse Struktur besitzen: Die Objekte einer Shape-Datei sind genau einer XPlanGML-Klasse zuzuordnen, und die Attribute dieser Klasse müssen in den Sachdaten des Shapefiles enthalten sein. Die so erzeugte GML-Datei kann dann in das Graphikformat SVG transformiert und mit einem beliebigen Internet-Browser betrachtet werden. Für diese Modelltransformation wurden alle Symbole und Signaturen der Planzeichenverordnung als SVG-Styles und SVG-Symbole definiert (FZK 2006). Für XPlanGML Objektklassen und Attribute, deren graphische Darstellung nicht durch die PlanzV definiert ist, mussten die Darstellungsvorschriften entsprechend erweitert werden. In der erzeugten SVG-Karte, deren Struktur Abb. 2 zeigt, stehen eine Anzahl von Funktionen zur interaktiven Einstellung und Auswertung des angezeigten Kartenausschnittes zur Verfügung:

- Anzeigen und Verbergen aller Objekte einer XPlanGML Klasse;
- Einstellung einer Vergrößerungs-Stufe über die „+“ und „-„ Knöpfe der Navigation;
- Festlegung des gezeigten Karten-Ausschnitts in der Übersichtskarte;
- Veränderung der Karten-Ausschnittes mit Hilfe der Pfeiltasten der Navigation;
- Anzeige des Klassen-Namens an der Cursor-Position;
- Anzeige aller Objekt-Attribute durch Anklicken eines Objektes (s. Abb. 3).

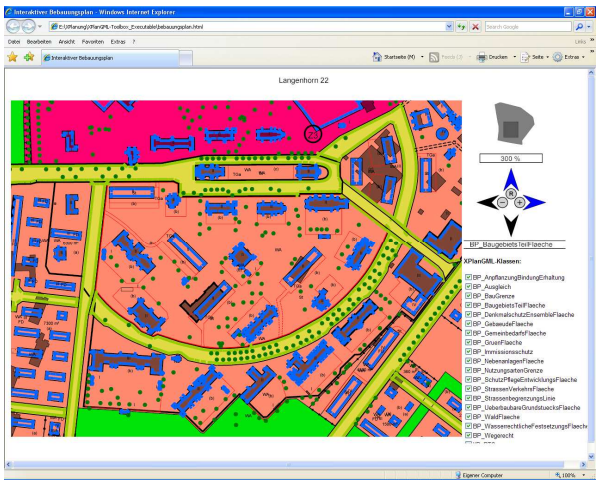
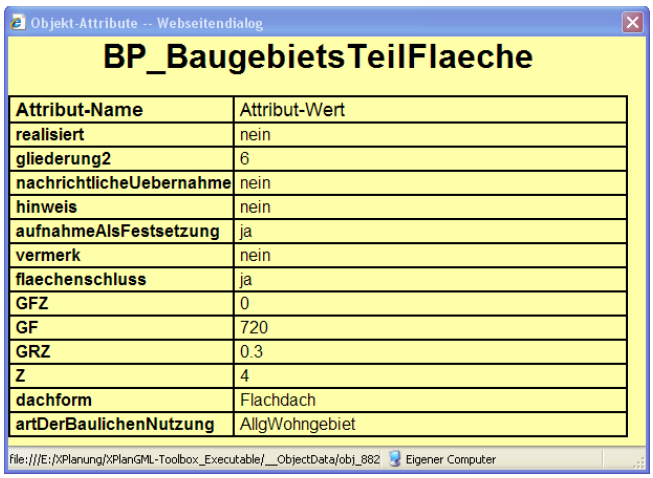


Abb. 2: XPlanGML-Toolbox



Objekt-Attribute -- Webseitendialog

BP_BaugebietsTeilFlaeche

Attribut-Name	Attribut-Wert
realisiert	nein
gliederung2	6
nachrichtlicheUebernahme	nein
hinweis	nein
aufnahmeAlsFestsetzung	ja
vermerk	nein
flaechenschluss	ja
GFZ	0
GF	720
GRZ	0.3
Z	4
dachform	Flachdach
artDerBaulichenNutzung	AllgWohngebiet

file:///E:/XPlanung/XPlanGML-Toolbox_Executable/__ObjectData/obj_882 Eigener Computer

Abb. 3: Objekt-Attribute

4.2 XPlanung Publishing Platform - X3P

Die XPlanung Publishing Platform (X3P) ist eine Demonstrations-Software für die Bereitstellung von Bau-leitplänen über standardisierte Web-Services (Müller 2006). Sie basiert auf der im Open Source Projekt deegree (deegree 2006) entwickelten Software, sowie weiterer Freier Software Komponenten. X3P besteht aus folgenden Komponenten:

- Einer Datenhaltungskomponente für XPlanGML, realisiert mit PostgesSQL/PostGIS;
- dem transaktionalen degree WFS;
- dem SLD-fähigen degree WMS; und
- einem interaktiven Auskunftsplatz („Portal“) auf Basis von degree iGeoPortal (s. Abb. 4).

Abb. 4: Portal der X3P Software

In Kombination dieser Komponenten kann XPlanGML in einfacher Art und Weise im Internet veröffentlicht werden. Der transaktionale WFS übernimmt dabei die Rolle des Imports von GML-Dateien, die in der PostGIS Datenbank gespeichert werden. Die XPlanGML-Versionen der im Modellprojekt behandelten Bauleitpläne wurden mit der in Kap. 4.1 beschriebenen XPlanGML-Toolbox erzeugt. Über WFS, WMS oder das Portal ist ein lesender Zugriff auf die Daten möglich. Um bei der Erzeugung von Karten für den WMS die Darstellungs-Vorschriften der Planzeichenverordnung einzuhalten, wurden für alle benutzten Objekttypen SLD-Darstellungsvorschriften entwickelt.

5 ERGEBNISSE DES MODELLPROJEKTES XPLANUNG

Im Rahmen des GDI-DE Projektes XPlanung wurden sowohl Bebauungspläne als auch Flächennutzungspläne in das Format XPlanGML konvertiert. Die beispielhaften Bebauungspläne aus den Städten Hamburg, Dortmund, Regensburg und Henstedt-Ulzburg lagen als AutoCAD Dateien vor, währenddessen die Flächen-

nutzungspläne der Städte Hamburg und Seevetal als ArcGIS Projekt bzw. als Shape Datei vorlagen. Die Bauleitpläne wurden in der Regel mit Hilfe von Fachapplikationen auf Basis von AutoCAD bzw. ESRI Produkten erstellt, wobei auffiel, dass von den Anwenderinnen und Anwendern die Möglichkeiten, die diese Fachapplikationen bieten, nur unzureichend genutzt wurden. Dies ist dem Umstand geschuldet, dass der Einsatz computergestützter Methoden in der Bebauungsplanung sich bislang darauf beschränkte, ausgedruckte Planwerke zu erstellen. Der Rationalisierungseffekt bezog sich bislang vor allem auf die Planerstellung und nicht auf die weitere Plannutzung. Dies geht so weit, dass nach Abschluss eines Bebauungsplanverfahrens die digitalen Daten gelöscht wurden. Die Nutzung digitaler Bauleitpläne in einem weitergehenden Verwertungszyklus scheint in der Praxis erst am Anfang zu stehen.

Es hat sich als ungünstig erwiesen, dass die Evaluation des Objektmodells XPlanGML 1.2 und die Implementierung dieses Objektmodells in der XPlanGML Toolbox und der X3P Plattform parallel liefen. Dies war dem großen Zeitdruck, unter dem die Initiative GDI-DE steht, geschuldet. Nach Abschluss des Modellprojektes XPlanung liegt mit dem Entwurf des Objektmodells XPlanGML 2.0 ein an die Anforderungen der Praxis angepasstes Objektmodell vor. Ein abermaliges Update der X3P Plattform an das aktualisierte Objektmodell XPlanGML 2.0 konnte jedoch im Rahmen von GDI-DE nicht mehr geleistet werden.

5.1 Konvertierung von Altplänen

Probleme bei der Konvertierung von Altplänen ergaben sich sowohl auf Ebene der Geometrie als auch auf der Ebene der semantischen Inhalte / Sachdaten des Plans. Die meisten Anwendungssysteme und Fachschalen zur Bauleitplanung bauen auf CAD-Systemen der AutoCAD Familie auf. Obwohl mit dieser Software eine Vielzahl geometrischer Konstrukte realisiert werden kann, fehlt für die Abbildung auf GML noch das geometrische Objekt „Polygon mit Inselfläche“. Durch eine Kombination von semantischen Heuristiken (gleicher Layername) und geometrischen Kriterien (ein geschlossenes Polygon liegt innerhalb eines anderen geschlossenen Polygons) kann der Konverter allerdings in den meisten Fällen eine richtige Zuordnung von Inselflächen und Außenkonturen vornehmen.

Schwieriger ist eine automatische Konvertierung, wenn in Altplänen Modellierungs-Konstrukte gewählt wurden, die keine Entsprechung im GML-3 Standard haben, oder wenn aus der geometrischen Modellierung keine Objektbildung abzuleiten ist. So ist es in der Praxis häufig vorgekommen, das optisch im Plan als Flächen erscheinende geometrische Objekte in Wahrheit aus mehreren Linienstücken zusammengesetzt waren, aus denen geschlossene Flächen nur mit geometrischen Heuristiken und im Regelfall nicht eindeutig ableitbar sind. Ein weiteres häufig aufgetretenes Problem betrifft Linienobjekte, deren Laufrichtung (d.h. die Reihenfolge der Linien-Stützpunkte) in XPlanGML in einigen Fällen eine semantische Bedeutung hat:

- Bei Baulinien und Baugrenzen muss die Laufrichtung so gewählt werden, dass beim Durchlaufen der Linie vom ersten zum letzten Punkt die Bebauung auf der rechten Seite liegt.
- Bei Strassen-Begrenzungslinien muss beim Durchlaufen der Linie die Straßenfläche auf der rechten Seite liegen.

In den betrachteten CAD-Systemen ist die Laufrichtung einer Linie dagegen im Regelfall ohne Bedeutung. Die Information über die Lage der Bebauung bzw. Straßenfläche wird durch einen Linienbegleiter vermittelt, die als graphisches Attribut der Linie aufgeprägt wird.

In den beispielhaften digitalen Bebauungsplänen wurden in den seltensten Fällen Geometrien, die Festsetzungen repräsentieren, attributiert. Es kommt bei der Erstellung der Pläne in erster Linie auf die graphische Wiedergabe der Festsetzungen gemäß der Planzeichenverordnung an. Festsetzungen wie Art und Maß der baulichen Nutzung oder die Zweckbestimmung einer Fläche werden allein durch separate Texte bzw. Symbole visualisiert und nicht zusätzlich als Attribut einer Festsetzung gehalten.

Bei der Konvertierung realer Bauleitpläne hat sich weiterhin gezeigt, dass die alleinige Wiedergabe der Inhalte der Planzeichenverordnung im Objektmodell nicht ausreichend ist. Die Darstellungen eines Flächennutzungsplans sind naturgemäß offen, die Aufzählung möglicher Darstellungen gemäß § 5 BauGB ist nicht abschließend. Hingegen ist der Katalog möglicher Festsetzungen gemäß § 9 Abs.1 BauGB zwar abschließend, jedoch legen die Städte und Gemeinden gerade bei der Definition möglicher Zweckbestimmungen z.B. von Grün- und Gemeinbedarfsflächen sehr viel Fantasie an den Tag. Weiterhin lässt sich die These aufstellen, dass zunehmend landschaftsplanerische Darstellungen und Festsetzungen unmittelbar Bestandteil eines Bebauungsplans werden (Hucke-Pack Festsetzungen) und nicht mehr in einem Landschaftsplan bzw. Grün-

ordnungsplan separat wiedergegeben werden. Dies bringt zum einen graphische Probleme durch die Wiedergabe zahlreicher Überlagerungen mit sich, zum anderen macht es eine Erweiterung des Objektartenkatalogs, der bislang auf die Wiedergabe der PlanzV beschränkt war, notwendig. Da naturschutzrechtliche Darstellungen und Festsetzungen auf Landesrecht basieren, ist es zukünftig notwendig, in die Modellierung von XPlanGML ein Konzept zur Wiedergabe landesrechtlicher Regelungen einzuführen. Dies kann bisher lediglich mit Hilfe „Generischer XPlanGML-Objekte“ wiedergegeben werden. Bei der Umsetzung von Bauleitplänen in XPlanGML fiel auch auf, dass es teilweise schwer fällt, Festsetzungen und Darstellungen eines Bauleitplans den entsprechenden Klassen aus dem Objektmodell von XPlanung zuzuordnen, da nicht immer ersichtlich war, auf welcher gesetzlichen Grundlage Darstellungen bzw. Festsetzungen getroffen worden sind.

Zusammenfassend kann man feststellen, dass eine Konvertierung von Altplänen in das neue objektorientierte Datenformat in vielen Fällen eine mehr oder minder aufwändige Überarbeitung der Altpläne erforderlich macht. Diese Situation wird sich vielleicht etwas entspannen, wenn der XPlanGML-Export direkt von den entsprechenden Fachanwendungen unterstützt wird, weil dann auch auf interne Datenstrukturen zugegriffen werden kann, die beim derzeit benutzten Shapefile-Export nicht zur Verfügung stehen. Wenn die vorhandenen funktionalen Fähigkeiten einer Fachschale aber falsch oder nicht benutzt werden, ist auch zukünftig eine manuelle Überarbeitung der Altpläne zwingend notwendig. Bei der großen Menge von Altplänen, die es insbesondere im BPlan-Bereich gibt, wird dies aus technischen und wirtschaftlichen Gründen flächendeckend kaum möglich sein. Denkbar ist allerdings, Altpläne flächendeckend durch georeferenzierte Rasterkarten zu erfassen, und dies für bestimmte Applikationen (z.B. Gewerbeflächen-Kataster) durch eine vektorielle Erfassung einzelner Objektarten zu ergänzen.

5.2 Notwendige Ergänzungen des Objektmodelles (XPlanGML 2.0)

Als generelles Problem bei der automatischen Generierung von Plan-Darstellungen hat es sich herausgestellt, wie und an welcher Position im Plan Attributwerte (z.B. Zweckbestimmungen oder Parameter des Maßes der baulichen Nutzung) durch Texte oder Symbole dargestellt werden. Einerseits dürfte dies gemäß des Paradigmas der „Trennung von Inhalt und Darstellung“ eigentlich nicht im XPlanGML-Modell abgelegt sein. Eine automatische Bestimmung der Positionen, an denen Symbole oder Texte im Plan platziert werden können, ohne andere relevante Information zu überdecken, ist aber andererseits sehr schwierig. Es hat sich deshalb als notwendig erwiesen, in Ergänzung der semantischen Objektklassen auch Klassen von „Präsentationsobjekten“ einzuführen, die ausschließlich zur graphischen Ausgestaltung des Planes dienen. Eine davon ist die Klasse XP_PPO mit punktförmigem Raumbezug, die zukünftig zur Verortung von Attributdarstellungen im Plan benutzt wird. Objekte der Klasse XP_PPO haben eine Referenz auf das Fachobjekt, dessen Att-ributwert sie an der spezifizierten Position darstellen sollen. Über Attribute der Klasse XP_PPO kann weiter-hin spezifiziert werden, welcher Attributwert des Fachobjektes darzustellen ist, und die Standard-Darstellung des Attributwertes kann durch Vorgabe eines Stylesheets, eines Skalierungsfaktors und eines Drehwinkels verändert werden.

Ein Ziel des GDI-DE Leitprojektes XPlanung war die Überprüfung, ob und wie sich beispielhafte Bauleitpläne der Modellkommunen auf das zum Zeitpunkt des Leitprojekts aktuelle Objektmodell XPlanGML 1.2 abbilden lassen. Prämisse bei der Entwicklung des Objektmodells XPlanGML war, für den Darstellungs- und Festsetzungskatalog des BauGB die entsprechenden Klassen möglichst vollständig vorzuhalten, und nur in Ausnahmefällen Festsetzungen und Darstellungen als Generische Objekte abbilden zu müssen. Im Rahmen der Entwicklung von XPlanGML 2.0 wurden deshalb einige fehlende Objektklassen und Attribute ergänzt. Auf die Möglichkeit, Darstellungen und Festsetzungen als Generische Objekte abbilden zu können, wird jedoch auch in Zukunft nicht gänzlich verzichtet werden können, da der Katalog der Darstellungen eines FNP gemäß § 5 BauGB naturgemäß offen ist. Auch für Bebauungspläne kann dies in Zukunft nicht ausgeschlossen werden, da hierin zunehmend Festsetzungen aus anderen Fachplanungen (z.B. aus der Landschaftsplanung) als eigenständige Festsetzungen übernommen werden.

Weiterhin wurden im Objektmodell von XPlanGML 2.0 Änderungen des novellierten Baugesetzbuchs 2007 übernommen, so weit diese die Bauleitplanung betreffen und für das Datenmodell relevant sind. Gemäß des neu formulierten § 9 Abs 1. Nr. 2a. BauGB ist es z.B. möglich, aus städtebaulichen Gründen vom Bauordnungsrecht der Länder abweichende Maße der Tiefe der Abstandsflächen festzusetzen. Dementsprechend wurde in XPlanGML 2.0 die Klasse "Abstandsflaeche" neu eingeführt. Ähnliches gilt für die Neuaufnahme

der Planart „Bebauungspläne der Innenentwicklung“ gemäß § 13a BauGB in die Enumerationsliste möglicher Planarten gemäß BauGB. Ausgleichsmaßnahmen und Flächen für Ausgleichsmaßnahmen können nunmehr Eingriffen im Geltungsbereich des (Eingriffs-) Bebauungsplans, in einem weiteren Geltungsbereich des (Eingriffs-) Bebauungsplans sowie im Geltungsbereich eines anderen (Ausgleichs-) Bebauungsplans direkt zugeordnet werden.

Eine Analyse der Flächennutzungspläne aus Hamburg und Berlin hat ergeben, dass in den jeweiligen Flächennutzungsplänen der Stadtstaaten neben Darstellungen auf Basis des BauGB ebenso regionalplanerische Festlegungen dargestellt werden. In den Flächennutzungsplänen in Hamburg und Berlin werden Aussagen zu Festlegungen zur Raumstruktur gemäß § 7 Abs. 2 Nr. 1c ROG, insbesondere zu Entwicklungsschwerpunkten dargestellt. Zur räumlichen Differenzierung von Entwicklungsschwerpunkten werden im Flächennutzungsplan der Freien und Hansestadt Hamburg Dienstleistungszentren, im Flächennutzungsplan von Berlin Einzelhandelskonzentrationen dargestellt. Zusätzlich werden im Flächennutzungsplan von Hamburg Eignungsflächen für die Windenergienutzung dargestellt. Der Terminus Eignungsflächen referenziert auf eine regionalplanerische Festlegung.

5.3 Möglichkeiten und Grenzen der Visualisierung mit SLD-Technologie

Es hat sich gezeigt, dass die Signaturen der PlanzV mit Hilfe der SLD-Technologie prinzipiell abgebildet werden können. Im Falle von komplexen linienbegleitenden Signaturen oder Randsignaturen von Flächen ist die Qualität der Darstellung allerdings mäßig. Der gerade freigegebene Nachfolgestandard „Symbology Encoding“ (OGC 2006), der derzeit allerdings softwaretechnisch noch nicht unterstützt wird, verspricht hier Verbesserungen.

Bedingt durch verschiedene Eigenschaften des Objektmodells sind die entwickelten SLD-Stylesheets sehr komplex. Dies liegt daran, dass bei vielen Klassen die Plandarstellung von mehreren Attributen beeinflusst wird, dass viele Objektklassen wahlweise mit punkt-, linien-, oder flächenförmigem Raumbezug gebildet werden können, und dass alle Signaturen mehrfach, für mehrere Maßstabsbereiche generiert werden müssen. Einige Konzepte des XPlanGML-Objektmodells wie die oben erwähnten Objekte mit variablem Raumbezug, die in Anlehnung an die ALKIS/NAS Standard gewählt wurden, machen zudem bei der standardkonformen Umsetzung mit der SLD-Technologie Schwierigkeiten. So waren spezielle Anpassungen der Software notwendig, um mit den oben erwähnten Objekten mit „variabler Geometrie“ fertig zu werden. Da diese Probleme genauso auch beim ALKIS/NAS Standard auftreten, soll hier eine gemeinsame Lösung gefunden werden.

5.4 Erfahrungen mit der XPlanGML Toolbox

Die XPlanGML-Toolbox kann prinzipiell sowohl als Konvertierung- als auch als Visualisierungs-Werkzeug für XPlanGML eingesetzt werden. Dabei hat sich besonders bewährt, dass man Karten im SVG-Vektorgraphikformat ohne Qualitätsverlust auf unterschiedliche Maßstäbe skalieren kann. Der Aufwand, Visualisierungs-Parameter für unterschiedliche Maßstabsstufen zu spezifizieren, ist damit deutlich geringer als bei Verwendung der SLD-Technologie. Allerdings hat auch SVG, Probleme, komplexe linienbegleitende Signaturen und Randsignaturen performant und qualitativ hochwertig darzustellen (Benner, 2007). Da eine Fortschreibung des SVG-Standards derzeit nicht in Sicht ist, sollte auch die Eignung anderer Vektorgraphik-Standards wie KML für die Darstellung der Planzeichen-Signaturen untersucht werden.

Auch die Funktionalität einer interaktiv einstellbaren Kartenpräsentation von Bauleitplänen hat sich bewährt. Die visuelle Auswertung von Bauleitplänen erfolgt sowohl in der Übersicht als auch im Detail. Da ein Computer-Bildschirm im Vergleich zu DIN A0 Ausdrucken relativ klein ist, erfordert dies einen permanenten Wechsel der Zoomstufe sowie des am Bildschirm gezeigten Kartenausschnitts. Beides kann auch bei komplexen Plänen von den verfügbaren SVG-Plugins und dem JavaScript Steuerprogramm der Toolbox mit ausreichender Geschwindigkeit durchgeführt werden. Da der Inhalt von Bauleitplänen meist sehr komplex ist, hat es sich auch als hilfreich erwiesen, den gezeigten Inhalt durch Ein- und Ausblenden von Ebenen / Objektklassen auf das Wesentliche zu reduzieren. Die Möglichkeit, sich alle Attributdaten eines Objektes, inklusive aller dem Objekt direkt zugeordneten textlichen Festsetzungen, „auf Knopfdruck“ anzeigen zu lassen, stellt eine signifikante Verbesserung gegenüber einer statischen Kartendarstellung dar.

Die Beschränkung der Schnittstelle zur Konvertierung von Altplänen auf ESRI-Shapefiles schränkt die Performance der Software stark ein. Zwar haben fast alle im Bereich der Bauleitplan eingesetzten Fachsysteme die Möglichkeit, ihre Daten in Shapefiles zu exportieren, dies muss aber in der Regel separat für jedes ein-

zelne Layer geschehen und ist entsprechend zeitaufwändig. Um die Shapefiles geometrisch und semantisch korrekt zu erzeugen, sind in vielen Fällen aufwändige Nachbearbeitungen der Ausgangsmodelle nötig. Die Konvertierung von Altplänen mit einem externen Konverterprogramm wie der XPlanGML-Toolbox ist deshalb nicht als Dauerlösung zu betrachten. Erst wenn die Erzeugung des objektorientierten Datenformats XPlanGML direkt in die Fachsysteme der Bauleitplanung integriert ist, und alle im internen Datenmodell verfügbaren Informationen genutzt werden können, kann mit einer signifikanten Beschleunigung des Konversionsprozesses von Altplänen gerechnet werden.

6 WEITERE ENTWICKLUNG DES PROJEKTES XPLANUNG

Bei der Weiterentwicklung des Projektes XPlanung kann man zwei Komplexe unterscheiden: Die technische Weiterentwicklung des Standards XPlanGML, sowie die Verbesserung der Akzeptanz des Standards auf der politischen und wirtschaftlichen Ebene.

Von der technischen Entwicklung her hat der Standard mit der Version 2.0 für die Behandlung von Bebauungsplänen und Flächennutzungsplänen eine gewisse Reife erreicht. Damit ist eine Grundlage geschaffen, den Standard in Fachverfahren auf kommunaler Ebene auch tatsächlich einzusetzen. Erst mit solchen Fachverfahren, die z.B. horizontale oder vertikale Abstimmungsprozesse im Aufstellungsverfahren von Bauleitplänen oder Bürgerbeteiligungs-Plattformen unterstützen, wird der durch die Standardisierung erreichbare Mehrwert auch wirklich realisiert.

Beim Datenmodell XPlanGML selber muss es in Zukunft vor allem darum gehen, noch weitere Planarten wie Landschaftspläne, Regionalpläne, oder regionale Flächennutzungspläne erfassen zu können. Schon die Erfahrungen des Modellprojektes haben gezeigt, dass der Übergang zwischen der kommunalen Flächennutzungsplanung, der Landschaftsplanung und der Regionalplanung fließend ist. Andererseits erfordert gerade die Aufstellung eines regionalen Flächennutzungsplanes, Pläne unterschiedlicher Gemeinden in ein gemeinsames Schema zu bringen, was durch einen vorgegebenen Standard extrem erleichtert wird.

Auch auf der politischen Seite ist noch viel Arbeit zu tun. Neben der formalen Einbindung in E-Government Initiativen müssen die Ergebnisse mit den Gremien der Fachministerien und der kommunalen Spitzenverbände abgestimmt werden. Die Fachkommission Städtebau, eine Arbeitsgruppe der Bundesbauministerkonferenz, der die für Städtebau, Bau- und Wohnungswesen zuständigen Minister und Senatoren der 16 Länder der Bundesrepublik Deutschland angehören, hat im September 2006 einen Beschluss hinsichtlich XPlanung gefasst. Dabei wird konstatiert, dass aufgrund der zunehmenden Bedeutung elektronischer Verfahren ein einheitlicher Standard für Datenformate auch im Bereich der Bauleitplanung sinnvoll sei. Die Fachkommission Städtebau ist weiterhin der Auffassung, das XPlanung ein grundsätzlich geeigneter Datenaustauschstandard für Pläne ist. Nach Abschluss der Praxisevaluierung im Rahmen von GDI-DE bittet die Fachkommission Städtebau die Arbeitsgruppe XPlanung erneut zu berichten. Aus diesem Beschluss sind jedoch bislang keine weiteren Aktivitäten zur Unterstützung der Standards XPlanung abzuleiten.

Neben den Gremien der Bauministerkonferenz wurden die Standardisierungsbemühungen ebenso unterschiedlichen Fachausschüssen des „Deutschen Städtetags“ zur Meinungsbildung vorgestellt. Eine formale Anerkennung des Standards XPlanGML steht noch aus. In diesem Zusammenhang stellt sich die Frage, in wie weit der Standard formal verankert sein muss. Es wäre eher von Bedeutung, wenn Applikationshersteller der Bauleitplanung die Schnittstelle XPlanGML in ihre jeweiligen Produkte als Austauschformat implementierten. Trotzdem muss geklärt werden, welche Institution formal den Standard pflegt und weiterentwickelt. Prinzipiell müssten Änderungen des BauGB, die die Bauleitplanung betreffen, und deren Abbildung auf das Objektmodell von XPlanung im Gleichklang verabschiedet bzw. modelliert werden. Dazu ist es notwendig, die Initiative XPlanung organisatorisch so einzubinden, dass Gesetzesänderungen sofort in die Modellierung einfließen können. Wenn man zudem bedenkt, dass die Modellierung von XPlanung in Zukunft um die Modellierung landesspezifischer Erweiterungen ergänzt werden muss, wird die Komplexität der Pflege des Standards erkenntlich.

7 ZUSAMMENFASSUNG

Es hat sich erwiesen, dass die Darstellungen und Festsetzungen der Bauleitplanung mit dem Objektmodell XPlanGML abgebildet werden können. Allerdings muss konstatiert werden, dass die graphische Abbildung der Planzeichenverordnung auf Basis von Standards noch nicht die gewohnten Ansprüche der Stadtplaner zufrieden stellen wird. Dies gilt insbesondere für die Umsetzung der Planzeichenverordnung mit der SLD

Technologie, die für die Abbildung von Flächennutzungsplänen ausreichend ist, sich jedoch für die Abbildung eines Bebauungsplan als mangelhaft erwiesen hat. Dies bedeutet jedoch nicht, dass es unmöglich ist, auf Basis von OGC Visualisierungsstandards Bebauungspläne in Zukunft zu visualisieren. Aus den Erfahrungen aus XPlanung heraus wurden Änderungen in die Standardisierungsarbeit des OGC eingebracht, die in der Verabschiedung des Standards Symbology Encoding 1.1.0 als Nachfolger des SLD Standards mündeten. Auf Basis dieser neuen Standardisierung gilt es in Zukunft eine OGC konforme Abbildung der Planzeichen der Planzeichenverordnung neu zu bewerten.

8 LITERATUR

ARISTOTELES (2006): http://131.220.71.208/index.php/Aristoteles.

Benner, J. (2007): „Visualisierung XPlanGML basierter Bauleitpläne mit SVG“; erscheint auf der AGIT 2007, Salzburg, 4. – 6. 7. 2007.

Benner, J., Krause, K.U., Müller, M. (2005): Elektronische Planzeichenverordnung –Modellierung, Datenaustausch und Visualisierung von Bauleitplänen mit OGC-Standards

Benner, J., Krause, K. U. (2006): XPlanung – Der Standard in der Bauleitplanung. GIS 11/2006, S. 32 – 37.

Benner, J, Krause, K. U. (2006A): XPlanung – Standardisierter Austausch digitaler Bauleitpläne im Raster- und Vektorformat. Mitteilungen DVW Bayern, Heft 2 (2006), S. 238 – 255.

BMWI (2006): ID2010 – Informationsgesellschaft Deutschland 2010. Aktionsprogramm der Bundesregierung, November 2006.

deegree (2007): http://www.deegree.org.

FZK (2006): XPlanGML Signaturen-Katalog. http://www.iai.fzk.de/projekte/geoinf/XPlanung/Planzeichen.htm.

Kommission der Europäischen Gemeinschaften (2005): i2010 – Eine europäische Informationsgesellschaft für Wachstum und Beschäftigung; SEC(2005) 717,

Krause, K. U. & Benner, J. (2006): Objektorientierte Datenmodelle für Bauleitpläne – das E-Government Projekt XPlanung. In: Strobl/Blaschke/Grieshaber (Ed.), AGIT 18, 5.-7. Juli 2006, S. 336-345.

Müller, M. U. (2006): Visuelle Unterstützung der Planzeichenverordnung mit SLD im Rahmen des XPlanung-Projektes. In: Strobl/Blaschke/Grieshaber (Ed.), AGIT 18, 5.-7. Juli 2006, S. 484-493.

OGC (2006): Symbology Encoding Implementation Specification, version 1.1.0; OGC 05-077r4.

🏆 *reviewed paper*

„MARS meets ANIMAP“
Die Koppelung der Modelsuite MARS mit dynamischer Internet-Kartographie

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1 KURZFASSUNG

Verkehr spielt in immer mehr Bereichen eine wichtige Rolle. Die Ausprägungen der Verkehrsorganisation beeinflussen die Wirtschaftsstrukturen, die Siedlungsstrukturen und in weiterer Folge die soziale und natürliche Umwelt.

Um Folgewirkungen verkehrspolitischer und raumplanerischer Maßnahmen auf die genannten Bereiche (Wirtschaft, Siedlungsstrukturen, Umwelt) zu quantifizieren wurde das Simulationsmodell MARS (Metropolitan Activity Relocation Simulator) am Institut für Verkehrsplanung und Verkehrstechnik (TU-IVV) entwickelt und implementiert. MARS ist ein integriertes dynamisches Raumnutzungs- und Verkehrsmodell, welches in der Lage ist, Auswirkungen verschiedenster verkehrs- und raumplanerischer Maßnahmen über einen Zeitraum von 30 Jahren zu simulieren.

In diesem Papier wird der Stand der Entwicklung von MARS dargestellt. Ein wichtiger Punkt bei der Kommunikation von Modellergebnissen ist deren Darstellung. Hier wurde von den Entwicklern von MARS in der jüngeren Vergangenheit zwei wichtige Erneuerungen realisiert.

Einerseits wurde durch die Portierung von MARS in die Programmierumgebung VENSIM die zugrunde liegende Komplexität immens gesteigert, gleichzeitig kann diese Komplexität relativ einfach an verschiedene Nutzergruppen (Verkehrsplaner, Modellierer, Entscheidungsträger, etc) kommuniziert werden.

Zur problemadäquaten Präsentation dieser Berechnungsergebnisse muss gleichzeitig mit den räumlichen Auswirkungen auch deren zeitliche Abfolge dargestellt werden. Diese gekoppelte Darstellung stellt die zweite wesentliche Verbesserung von MARS dar. Die Einbindung der „dynamischen“ Kartographie-Applikation ANIMAP in MARS ermöglicht die historisch-räumliche Entwicklung beliebiger Indikatoren zu visualisieren.

Ein Ziel dieses Papiers ist es, genauer auf die technische Umsetzung dieser Neuerungen einzugehen und die dadurch ermöglichte Informationskommunikation darzustellen.

2 GRUNDLEGUNG

In den letzten Jahrzehnten fand europa- bzw. weltweit eine stetige Zunahme der Verkehrsprobleme statt. Die angewendeten Lösungsstrategien (meistens Maßnahmen im Infrastrukturbereich) waren nicht in der Lage die Verkehrs- und die damit verbundenen Umweltprobleme zu lösen. Dies führte zu der Erkenntnis, dass nachhaltige Lösungen nur über integrierte Strategien, d.h. durch Kombination mehrerer verkehrlicher und raumplanerischer Maßnahmen, erreichbar sind. Die Europäische Union förderte deshalb ab den 90-er Jahren des vergangenen Jahrhundert einen Forschungsschwerpunkt zur Entwicklung geeigneter Methoden zur Beurteilung integrierter Raumnutzungs- und Verkehrsplanungsstrategien [Emberger and Bruntsch 2002]. Konkret wurde z.B. die Entwicklung von kombinierten Flächennutzungs- und Verkehrsmodellen (Land Use and Transport Interaction models – LUTI-Models) gefördert. Diese Modelle sollten in der Lage sein eine Vielzahl verkehrs- und raumplanerischen Maßnahmen, deren Rückkoppelungen und Interdependenzen zu berücksichtigen und gleichzeitig deren räumliche und zeitliche Effekte abbilden. Zusätzlich sollten die entwickelten Methoden dazu geeignet sein, Maßnahmebündel hinsichtlich synergetischer oder kompensatorischer Effekte zu evaluieren. Die Ergebnisse der Anwendung dieser Methoden wie auch die Methoden selbst sollten für die Entscheidungsfindung auf strategischer Ebene herangezogen werden können.

Das Institut für Verkehrsplanung und Verkehrstechnik der Technischen Universität Wien war Teilnehmer mehrerer in diesem Rahmen geförderter Forschungsprojekte[22] .

3 DAS INTEGRIERTE, DYNAMISCHE FLÄCHENNUTZUNGS- UND VERKEHRSMODELL MARS

MARS (Metropolitan Activity Relocation Simulation) ist ein aggregiertes, dynamisches Flächennutzungs- und Verkehrsmodell. Mit MARS können wahrscheinliche Entwicklungspfade urbaner Regionen für einen Zeitraum von 30 Jahren simuliert werden. Es wurde als Kernstück eines Bewertungs- und Optimierungssystems zur Beurteilung der Nachhaltigkeit von urbaner Regionen entwickelt. Das Modell basiert auf der Hypothese, dass Städte selbstorganisierende Systeme sind und daher die Prinzipien der Synergetik zur Beschreibung des kollektiven Verhaltens angewendet werden können. Aufbauend auf Wiener Forschungsergebnissen [Knoflacher and Pfaffenbichler 1999] wurde zuerst ein qualitatives Modell erstellt. Dabei kam die Methode der Causal-Loop-Diagramme zur Anwendung um Ursache-Wirkungsbeziehungen darzustellen. Auf dieser Basis wurde ein quantitatives Modell entworfen und in Computercode transformiert. Am Beginn der Entwicklung von MARS stand dem Institut für Verkehrstechnik und Verkehrsplanung keine System Dynamics Software zur Verfügung, welche in der Lage gewesen wäre, einfach und effizient mit Matrizen und Vektoren zu operieren. Als Softwareentwicklungsumgebung wurde deshalb 1996 Visual Basic® für Applikationen und Excel® gewählt.

Modelltechnisch gesehen basierten die MARS-Submodelle auf Gravitations- bzw. LOGIT-Modellen. Dieser Modellansatz wird im den Verkehrsteil wie auch dem Flächennutzungsteil angewandt. In beiden Fällen werden Ziel- und Quellpotentiale von Zonen berechnet und hinsichtlich so genannter Widerstandsfunktionen simultan verteilt. Die Grundform der Widerstandsfunktionen im Verkehrsmodell basieren auf deutschen Forschungsergebnissen [Walther 1991; Walther et al. 1997]. Sie können als generalisierte Kostenfunktionen mit subjektiver Gewichtung von Zugang-, Warte-, Umsteige- und Abgangszeiten verstanden werden. Für das Flächennutzungsmodell werden die Widerstandsfunktionen getrennt für Wohnzwecke und Arbeitsstättenentwicklung ermittelt. Hierbei werden Information bzgl. Arbeitsplätzen, Grundstückspreisen, Flächenverfügbarkeiten etc. mit den verkehrsmittelspezifischen Reisezeiten gewichtet und zur Berechung der Widerstände herangezogen. Mit MARS können strategische verkehrsplanerische und raumplanerische Maßnahmenbündel simuliert und ihre räumlichen und zeitlichen Auswirkungen auf die Stadtentwicklung abgeschätzt werden. Eine detaillierte Beschreibung von MARS bietet [Pfaffenbichler 2003]. Die Entwicklung und Anwendung des Modells MARS wurde auch in mehreren CORP Beiträgen präsentiert [Pfaffenbichler and Emberger 2001; Pfaffenbichler and Emberger 2003; Pfaffenbichler and Emberger 2004].

3.1 Vorteile der Portierung von MARS auf VENSIM

Die Entwicklung von MARS erfolgte über einen Zeitraum von mehreren Jahren. Softwaretechnische Beschränkungen von Visual Basic® machten seinerzeit eine Limitierung auf maximal 34 Verkehrszonen und drei Verkehrsmittel (Pkw, ÖV und Fußgeher) notwendig. Die ständige Weiterentwicklung des Modells innerhalb der letzten 8 Jahre erhöhte die Komplexität des Modells derart, dass, obwohl der Quellcode öffentlich verfügbar war, das Modell zu einem Black-Box Modell geworden war. Die nachträgliche Hinzufügung von Funktionalitäten, wie zum Beispiel, der Einbau eines ÖV-Kapazitätsmodelles (public transport overcrowding model) erwies sich als schwierig und fehleranfällig.

Zunehmende Rechnerleistung und die Erhöhung der elektronischen Verfügbarkeit von Inputdaten ermöglichen heute einen höheren Detaillierungsgrad. Eine Anhebung der möglichen Verkehrszonenanzahl und die Hinzunahme von weiteren Verkehrsmitteln wurde daher angestrebt. Aus diesen Gründen wurde die Entscheidung getroffen, MARS auf VENSIM® als neue Software Entwicklungsplattform zu portieren: Dadurch ist es gelungen die Limitation der Zonenanzahl zu eliminieren, zusätzliche Verkehrsmittel zu inkludieren und weitere Modellmodule zu integrieren.

[22] Z.B.: Optimisation of Policies for Transport Integration in Metropolitan Areas (OPTIMA), Financial Assistance for Transport Integration in Metropolitan Areas (FATIMA), Strategic Assessment Methodology for the Interaction of CTP-Instruments (SAMI), TRANSport Planning, Land Use and Sustainability (TRANSPLUS), Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems (PROSPECTS) und Planning Urban Mobility in Europe (PLUME).

Die wichtigsten Vorteile dieser Portierung von Visual Basic nach VENSIM sind:

a) einfache Darstellung im Modell implementierter Ursache-Wirkungsbeziehungen,
b) einfache Umsetzung dieser Ursache-Wirkungsbeziehungen in Programmcode,
c) die Möglichkeit das Modell mit relativ geringem Aufwand um neue Verkehrsmittel, Reisezwecke, verhaltenshomogene Personengruppen usw. zu ergänzen,
d) die verbesserte Modellierung der Zeitdimension,
e) die Nutzung der graphischen Ausgabemöglichkeiten der VENSIM® Programmierumgebung und
f) die Nutzung der VENSIM® internen Kalibrierung- und Optimierungsalgorithmen.

Die Verwendung von VENSIM® ermöglicht es zum Beispiel für Entscheidungsträger nur die wichtigsten Ursache-Wirkungsbeziehungen von MARS darzustellen.

Auf der anderen Seite ist es möglich mit versierten Verkehrs- und Landnutzungsmodellierern bis in die letzten Details der mathematischen Umsetzung der Ursache-Wirkungsbeziehungen hinabzusteigen. Ein wesentlicher Vorteil dieser Arbeitsweise ist, dass einerseits die Kommunikation gefördert und anderseits die Modellstruktur (oberster Level) mit dem Programmcode (unterster Level) fix verbunden ist.

Die Inputdaten für MARS sind in EXCEL Dokumenten abgelegt. Die Verwendung von EXCEL für die Verwaltung und Bearbeitung der Inputdaten hat den Vorteil, dass mittlerweile davon ausgegangen werden kann, dass jeder in der Verkehrsplanung Tätige diese Software beherrscht.

In den folgenden Sektionen werden einige der Vorteile der Verwendung vom VENSIM als Modellentwicklungsumgebung näher dargestellt. Zuerst wird auf die Darstellung, Programmierung und Lesbarkeit von Programmcode mittels eines einfachen Beispiels eingegangen. Danach wird gezeigt, wie Modellteile einfach kommuniziert und wie Modellergebnisse dargestellt und in/mit anderen Softwarepaketen weiterverabeitet werden können. Zum Schluss wird ein Beispiel gezeigt, wie man VENSIM einsetzen kann, Modelle auf empirsche Zeitreihen hin zu kalibrieren.

3.1.1 Programmierung, Darstellung und Kommunikation

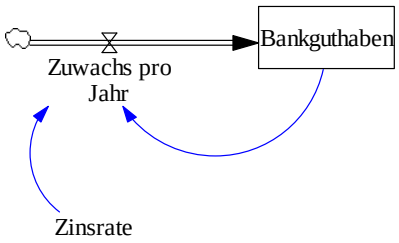
Ein einfaches Beispiel – Die Implementation eines Bankguthabens
Sie haben 100 Euro am Konto und wollen wissen wie viel Geld Sie nach 30 Jahren am Konto haben wenn sie 3,5% Zinsen per anno bekommen. In BASIC würde das folgendermaßen aussehen:

```
Dim i As Integer
Const Zinssatz = 0.035
Const timemax = 30
Dim Bankguthaben(0 To timemax), Zuwachs_pro_Jahr(0 To timemax) As Single

Sub main()
Open "TESTFILE" For Output As #1    ' Open file for output.

   Bankguthaben(0) = 100 'Anfangswert

For i = 1 To timemax
   Zuwachs_pro_Jahr (i) = Zinssatz * Bankguthaben (i - 1)
   Bankguthaben (i) = Bankguthaben (i - 1) + Zuwachs_pro_Jahr (i)
   Print #1, i, Zuwachs_pro_Jahr (i), Bankguthaben (i)
Next i

Close #1    ' Close file.
End Sub
```

Für nicht geübte Programmierer ist nicht ohne weiteres festzustellbar, was der oben gelistetete Code macht. Es ist daher notwendig den Code manuell in eine Graphik zu übersetzen, wenn man ihn einem Laien erklären will. In VENSIM wird hier ein altrnativer Weg eingeschlagen. Anstatt Quellcode zu schreiben wird hier zuerst eine Graphik der zu untersuchenden Aufgabenstellung erstellt. Die Syntax der Graphik ist relativ einfach, es gibt rechteckige Entitäten (Stocks – wird später noch genauer erklärt), Doppelpfeile (genannt Flows) die in bzw. aus diesen Stocks zeigen, und Variablen. Diese Entitäten (Stock, Flow, Variablen) werden mit einfachen Pfeilen verbunden. Entitäten am Anfang des Pfeils beeinflussen die Entität am Ende des Pfeils. Diese Darstellung der Abhängigkeiten zwischen den Entitäten und die Einteilung in drei

verschieden Typen (Stock, Flow, Variable) reicht aus um komplexe Sachverhalte dynamischer Systeme qualitativ zu beschreiben.

a) Die graphische Eingabe in Vensim



b) Der automatisch generierte Code

```
Bankguthaben= INTEG (
        Zuwachs pro Jahr,
                100)

Zinsrate=
        0.035

Zuwachs pro Jahr=
        Bankguthaben*Zinsrate
```

Abbildung 1: Graphische Eingabe in VENSIM und der dazugehörige automatisch generierte Code

Die graphische Darstellung erleichtert dem Programmierer und dem Leser des Modells intuitiv festzustellen was das „Programm“ macht

Für den interessierten Laien sind die Zusammenhänge in der Graphik dargestellt. Das Bankguthaben wird als rechteckige Box dargestellt und zeigt an, dass sich etwas über die Zeit ansammelt (in der Sprache von System Dynamics (SD) handelt es sich um einen Stock). Der Zuwachs_pro_Jahr ist in der SD-Sprachweise ein Flow, die Zinsrate eine Konstante. Die Pfeile zeigen an, dass der Zuwachs_pro_Jahr vom Bankguthaben und der Zinsrate abhängt. Für das prinzipielle Systemverständnis reicht diese Darstellung.

Der Code (dargestellt in der linken Seite der Tabelle in Abbildung 1) wird dabei automatisch generiert und ist auch ohne spezielle Programmierausbildung lesbar. Im Code sind die Konstanten und die Funktionen explizit dargestellt. Diese Darstellung ist für Modellierer wichtig.

Das MARS-Modell ist natürlich etwas komplexer, exemplarisch stelle ich in diesem Papier dar wie in MARS das Teilmodell der Flächennutzung implementiert wurde.

Die folgende Graphik ist direkt aus dem MARS-Modell entnommen:

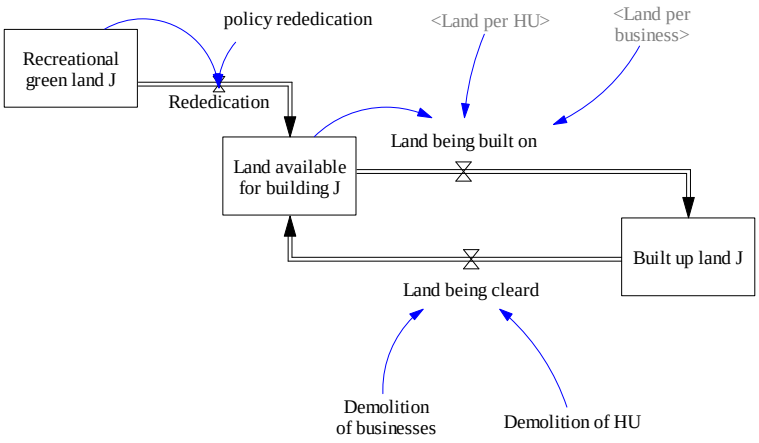


Abbildung 2: Flächennutzungsmodell implementiert in MARS

Man erkennt hier 3 Stocks. Der Stock Recreational green land J enthält die Fläche welche für Erholung im Bezirk J gewidmet ist. Über die Variable policy rededication kann gesteuert werden ob zusätzliche Fläche für Bauland (Stock Land available for building J) gewidmet wird oder nicht. Dieser Stock repräsentiert die verfügbare Fläche für Neubau.

In Abhängigkeit von einer exogenen Nachfrage (nicht dargestellt in der Graphik), der Flächenverfügbarkeit (ausgedrückt durch den Pfeil von Land available for building J nach Land being built on), des Flachenbedarf je Haus (Land per HU (housing unit)) und des Flächenbedarfs je Gewerbebetriebs (Land per businesses) werden diese Flächen verbaut (dargestellt mit dem Flow Land being built on).

Im Stock Built up land J wird festgehalten wie viel Fläche in Bezirk J bebaut ist. Wie man erkennen kann werden im Laufe der Zeit wieder Flächen frei (durch Abriss bzw. Änderungen in der Nutzung – dargestellt durch die Entitäten Demolition of businesses und Demolition of HU und sind so wieder frei für neue Nutzungen (Flow Land being cleard) und werden wieder den Stock Land available for building J zugeführt. Der Kreislauf ist geschlossen. Die Stocks Recreational green land J, Land available for building J und Built up land J ergeben zusammen die Gesamtfläche des Bezirks.

Wie unschwer zu erkennen ist, bietet die graphische Darstellung des oben beschriebenen Sachverhalts einen enormen Vorteil bei der Kommunikation der im Modell berücksichtigten Sachverhalte.

Die Graphik zeigt wie die einzelnen Stocks zusammenhängen, was die Bebauung beeinflusst und wie sich die einzelnen Stocks über die Zeit entwickeln. Gleichzeitig wird ein Großteil der Komplexität versteckt, da die dargestellten Zusammenhänge simultan für alle Bezirke im Modell gerechnet werden.

Durch einfaches Anklicken auf ein beliebiges Element kann die dahinter stehende Formel angezeigt werden – hier gezeigt am Beispiel Built up land J:

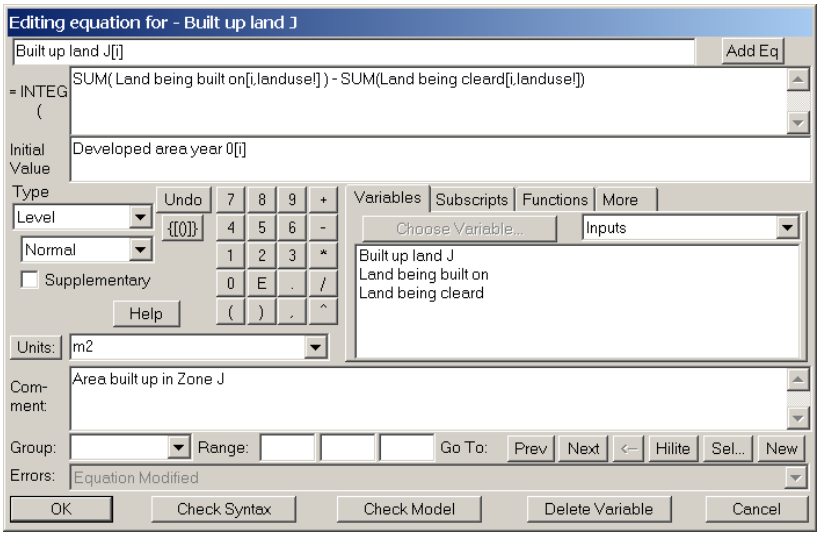


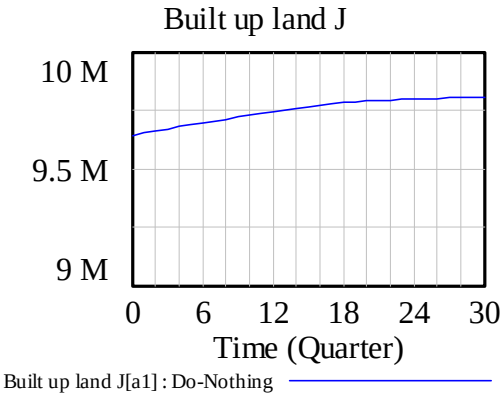
Abbildung 3: VENSIM Formeleditor

Die Formel zeigt, dass das bebaute Land zum Zeitpunkt t aus dem Bestand zum Zeitpunkt t-1 und der Differenz aus Zufluss (neu bebaute Fläche) zum Zeitpunkt t minus dem Abfluss (frei werdenden Flächen) zum Zeitpunkt t zusammensetzt. Betrachtet man die Formel genauer, so sieht man, dass zwei Subskripts verwenden worden sind, einerseits i (stellt die Bezirksnummer dar) und landuse (stellt die Flächennutzung getrennt für Wohnen und Gewerbe dar).

Zusätzlich zur einfachen Formeleingabe bietet der VENSIM-Formeleditor die Möglichkeit die Einheiten (Units) des Stocks zu definieren. Dieses Feature kann auch dazu genutzt werden zu kontrollieren, ob Einheiten-Konflikte zwischen den einzelnen Inputparametern aufgetreten sind oder nicht. Zusätzlich ermöglicht der Editor auch die Eingabe eines Kommentars der die Verständlichkeit der Formel unterstützt.

3.1.2 Datendarstellung und Analyse

Ein weiterer Vorteil der VENSIM Programmierumgebung ist, dass alle Werte aller im Modell existierenden Variablen entweder in Listenform oder als Graphik durch einfaches Anklicken sofort angesehen werden können. Natürlich können diese Informationen entweder direkt via copy&paste oder indirekt über eine File-Export-Funktion in andere Computeranwendungen (z.B. EXCEL, AniMap - siehe Kapitel 3) zur weiteren Verarbeitung exportiert werden.



Time (Quarter)	0	1	2	3
4	5	6	7	8
9	10	11	12	13
14	15	16	17	18
19	20	21	22	23
24	25	26	27	28
29	30			

"Built up land J[i]" Runs: Do-Nothing

Built up land J[a1]	9.643 M	9.652 M	9.660 M	9.669
M	9.678 M	9.686 M	9.695 M	9.703 M	9.712
M	9.720 M	9.728 M	9.735 M	9.743 M	9.750
M	9.757 M	9.764 M	9.770 M	9.776 M	9.781
M	9.785 M	9.788 M	9.791 M	9.794 M	9.796
M	9.797 M	9.799 M	9.800 M	9.801 M	9.803
M	9.804 M	9.805 M			

Abbildung 4: Darstellung der Ergebnisse, entweder als Graph oder Tabelle

3.1.3 Modellkalibrierung auf empirische Zeitreihen

Neben diesen oben genannten Vorteilen der Verwendung der VENSIM Programmierumgebung finden sich noch eine Reihe weiterer nützlicher Features, die den Modellierer von komplexen Systemen wirkungsvoll von Nebensächlichkeiten entlasten.

Dazu zählt zum Beispiel die Möglichkeit das Modell auf empirisch erhobenen Zeitreihen hin zu kalibrieren. Hierbei erstellt der Modellierer ein Modell, dass die erwartete zeitliche Entwicklung einer Variablen zuerst näherungsweise abbildet. Diese zeitliche Entwicklung kann entweder einen exponentiellen Wachstumsverlauf, einer Oszillation, oder ähnlichem entsprechen. Sobald das Modell dieses generelle Verhaltensmuster zeigt, kann eine Kalibrierungsroutine eingesetzt werden, die jene Parameterkombination ermittelt, welche im Vergleich mit einer empirischen Zeitreihe die geringste Abweichung liefert. Natürlich müssen die gefundenen Werte zusätzlich noch einer Plausibilitätsprüfung unterzogen werden.

Beispiel - Kalibrierung des Modells am Beispiel des Bevölkerungsmodells:

Die folgende Abbildung 5 stellt ein einfaches Kohortenmodell dar:

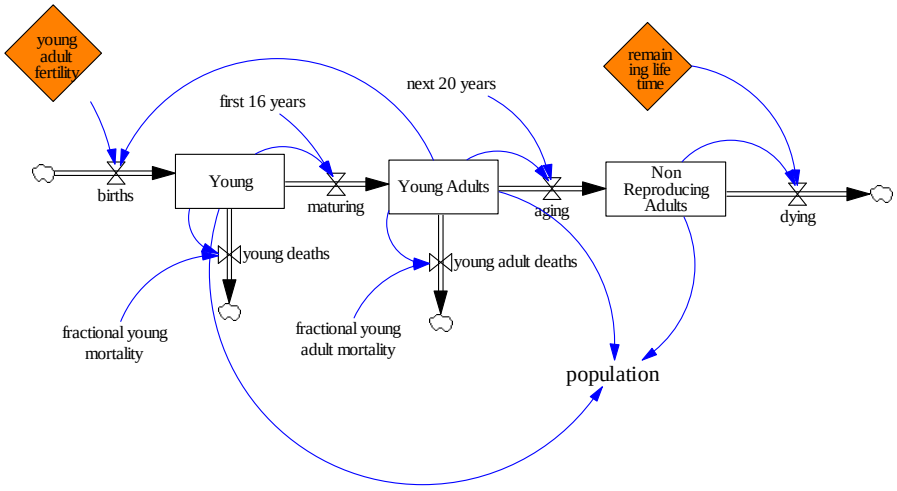


Abbildung 5: Kohortenmodell der Bevölkerungsentwicklung

Die Bevölkerung wird in 3 verschiedene Altersgruppen eingeteilt. Kinder (dargestellt durch den Stock mit dem Namen Young), Personen mittleren Alters (Stock Young_adults) und Personen die keine Kinder mehr bekommen können (Stock Non_Reproducing_Adults). Durch Geburten (births), welche von der Geburtenrate (young adult fertility) und der Anzahl der Personen in der Gruppe Young_Adults abhängen, werden Kinder geboren und im Stock Young „zwischengelagert“. Nachdem sie dort 16 Jahre lang waren, kommen diese Youngs in die Gruppe der Young_Adults wo sie 20 Jahre verbleiben und das Reservoir der potentiellen Eltern bilden. Nach 20 Jahren wechseln die Young_Adults in die Gruppe der

Non_Reproducing_Adults und verbleiben dort bis sie sterben. Das Modell wird noch ergänzt um Personen die früher sterben (Flow young_deaths und young_adult_deaths).

Das Modell stellt ein einfaches, allgemein anerkanntes Kohortenmodell dar und liefert ein zufrieden stellendes Verhalten über die Zeit, jedoch entsprechen die berechneten Werte noch nicht den empirischen Werten (Abbildung 6).

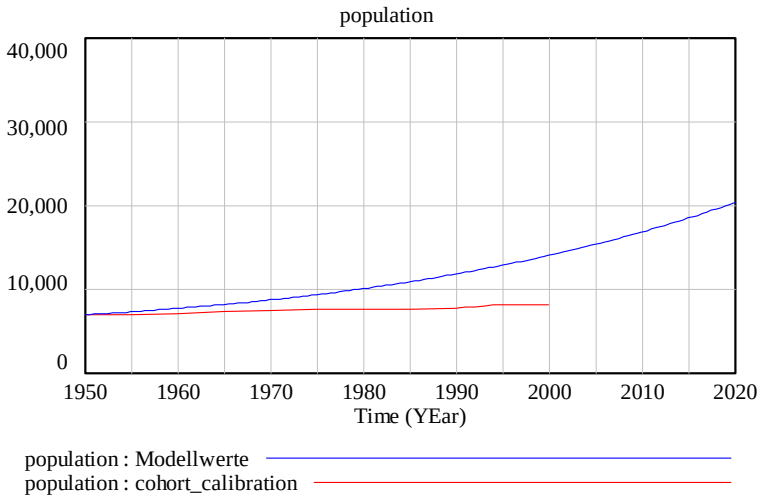


Abbildung 6: Vergleich der empirischen Werte mit den Modellwerten

Die untere (rote) Linie stellt die empirischen Werte für die Bevölkerungsentwicklung dar. Die obere (blaue) Linie stellt die vom Model berechneten Werte für die Bevölkerung dar. Wie man sieht, überschätzt das Modell die Bevölkerungsentwicklung. Um nun das Modell auf die empirischen Werte hin zu kalibrieren bietet VENSIM eine Prozedur an geeignete Inputparameter abzuleiten. In diesem Beispiel wurde festgelegt, dass die Parameter young_adult_fertility und remaining_life_time variert werden können[23] . Diese beiden Parameter sind in Abbildung 5 durch die orangen, um 90 Grad gedrehten Quadrate gekennzeichnet.

Für dieses Beispiel wurde festgelegt, dass sich diese Parameter in folgenden Wertebereichen beliebig bewegen dürfen:

0.01	<=	young_adult_fertility	<=	0.3
30	<=	remaining_lifetime	<=	80

Danach startet man die Kalibrierungsprozedur und erhält folgenden Output von VENSIM.
Initial point of search

```
  remaining lifetime = 50
  young adult fertility = 0.1
Simulations = 1
Pass = 0
Payoff = -2.86711e+008
---------------------------------
Maximum payoff found at:
  remaining lifetime = 55.5516
 *young adult fertility = 0.0625945
Simulations = 205
Pass = 3
Payoff = -100388
---------------------------------
The final payoff is -100388
```

Nach 205 Iterationen hat das Programm jene Lösung gefunden, welche am Besten geeignet ist, die empirischen Werte vorherzusagen. Graphisch erhält man folgendes Ergebnis:

[23] Welche Parameter in welchem Wertebereich variiert werden können, muss vom Modellierer festgelegt werden. Hierzu benötigt man natürlich das Fachwissen und die nötige Erfahrung im Modellbau.

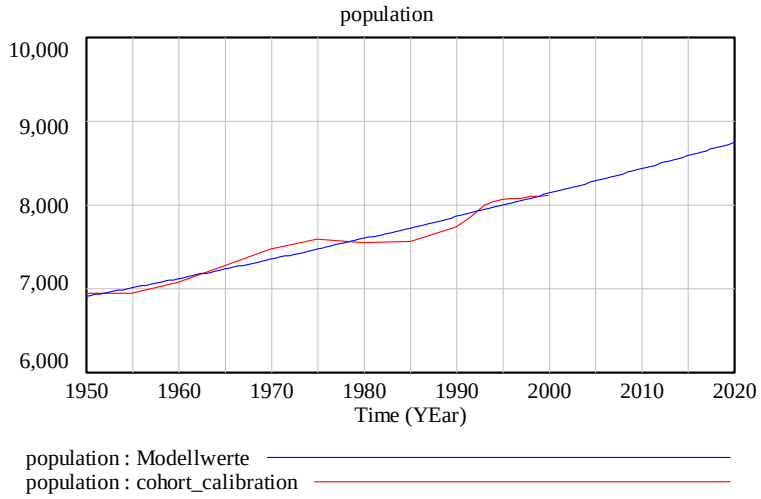


Abbildung 7: Vergleich Bevölkerungsentwicklung empirische Werte versus Modellwerte

Wie man sieht, liefert das Modell nun Werte, die sehr nahe an den Werten der Realität liegen. Vorausgesetzt, dass die oben in Abbildung 5 definierte Modellstruktur der Realität entspricht, kann man davon ausgehen, dass das Modell die Bevölkerungsentwicklung auch für Jahre nach 2000 (wo keine empirischen Daten mehr existieren) richtig vorhersagen kann.
Natürlich kann dieser Algorithmus auch für viel komplexere Kalibrierungsaufgaben verwendet werden. Ziel hier war es einfach einige der Features der Programmierumgebung VENSIM vorzustellen und zu zeigen wie diese beim Entwurf und Implementierung von MARS eingesetzt wurden.

4 ANIMAP

AniMap entstand ursprünglich als Spin-Off der Forschungs- und Lehrtätigkeit am Fachbereich für Stadt- und Regionalforschung der TU-Wien [Kalasek et al. 2002; Riedl 2005] in dem Möglichkeiten zur animierten Darstellung räumlich-zeitlicher Information mit Hilfe von Open-Source Software und offener Standards untersucht wurden [Hocevar et al. 2004].
In seiner ursprünglichen Architektur war AniMap als klassische Client-Server Web-Applikation konzipiert, bestehend aus einem DHTML-Frontend mit eingebetteten SVG-Vektorgraphiken [W3C 2003] und einem Backend zum Einpflegen von Daten und Visualisierungsoptionen in die Datenbank auf einem Server mit PHP und MySQL. Die Möglichkeiten zur kartographischen Präsentation und Animation umfassten Farbflächen, in die Karte gesetzte Balkendiagramme oder Größenpunkte.

4.1 Anforderungen von MARS-Seite

Zur Einpassung von AniMap in die Modelsuite MARS wurden folgende Punkte diskutiert und umgesetzt:

- Kein WebServer

Die raum-zeitliche Visualisierung von MARS-Modellergebnissen mit AniMap soll auch in Umgebungen ohne funktionierender Internetanbindung und/oder ohne verfügbaren (lokalen) Web-Server möglich sein (z.B. Präsentation mit einem Notebook-Computer).

Die gewählte Vorgangsweise vermeidet damit sogleich Aufwände zur Administration eines Web-Servers und einer dahinter stehenden Datenbank. Die Parametrisierung der Anwendung erfolgt hier über eine spezielle ArcView3-Extension und über Javascript-Dateien.

- Mehrere Karten gleichzeitig animieren

Das synchrone Ablaufen mehrerer animierter Karten ermöglicht den direkten Vergleich der Entwicklung mehrerer Modellvariablen parallel in einem Fenster.

- Szenarienvergleich

Zur Untersuchung der Auswirkungen verschiedener MARS-Modellparameterwerte und -bündel auf die Simulationsergebnisse wurde ein Modus zum automatischen Vergleich von Modellvariablen zwischen verschiedenen Modellszenarien geschaffen.

4.1.1 Einbettung in MARS

Die Anbindung an MARS erfolgt in einem ersten Schritt mittels loser Koppelung. Ein in VBScript geschriebenes Konvertierungsprogramm übersetzt von VENSIM erzeugte Ausgabedateien in Javascript-Befehle, welche von AniMap interpretiert werden.

4.2 Funktionalität von AniMap/MARS

4.2.1 Zeitschaltung und Zoom

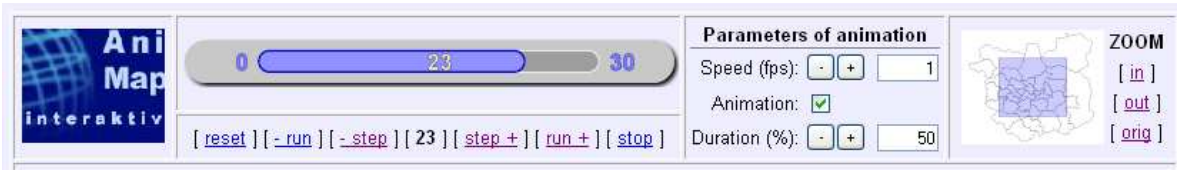


Abbildung 8: Animationsfortgang, Animationsparameter und Zoomwerkzeug

Die Benutzerinteraktion zur Zeitschaltung wurde gegenüber der Ursprungsversion ausgebaut. Nunmehr ist es möglich neben einem Mausklick auf die HTML-Steuerelemente im linken oberen Bereich des AniMap-Fensters (s. Abbildung 8 oben) die Animation auch über die Pfeiltasten der Tastatur zu steuern. Die Steuerung der Animationsgeschwindigkeit erfolgt ebenfalls wahlweise über HTML-Steuerlemente (s.o.) oder die Tastatur (+/- Tasten). Ob eine Karte überhaupt gleichförmig animiert wird – oder alternativ dazu sprunghafte Zeitübergänge stattfinden – legt der Benutzer über eine Checkbox fest.

Weiters bewirkt ein Mausklick in eine Zeile des Attributinfo-Bereiches (s. Abbildung 9 rechts) die Anzeige des entsprechenden Jahres für alle dargestellten Karten gleichzeitig.

Die Wahl des dargestellten Kartenausschnitts wird über ein einfaches Zoom-Fenster bewerkstelligt. Ein Mausklick legt den neuen Kartenmittelpunkt fest.

4.2.2 Animierte Einzelkarten (Modus VIEW)

Im VIEW-Modus werden bis zu 3 Variablen (Karten) gleichzeitig dargestellt. Die Animation erfolgt genauso wie ein etwaiges Zoomen in allen Karten synchron. Die Festlegung der Kartenanordnung auf dem Bildschirm erfolgt im Layout-Modus und ist wahlweise nebeneinander, untereinander und übers Eck (für die erste Option siehe die Abbildung 9., für die letzte Abbildung 10 Szenarienvergleich weiter hinten im Text).

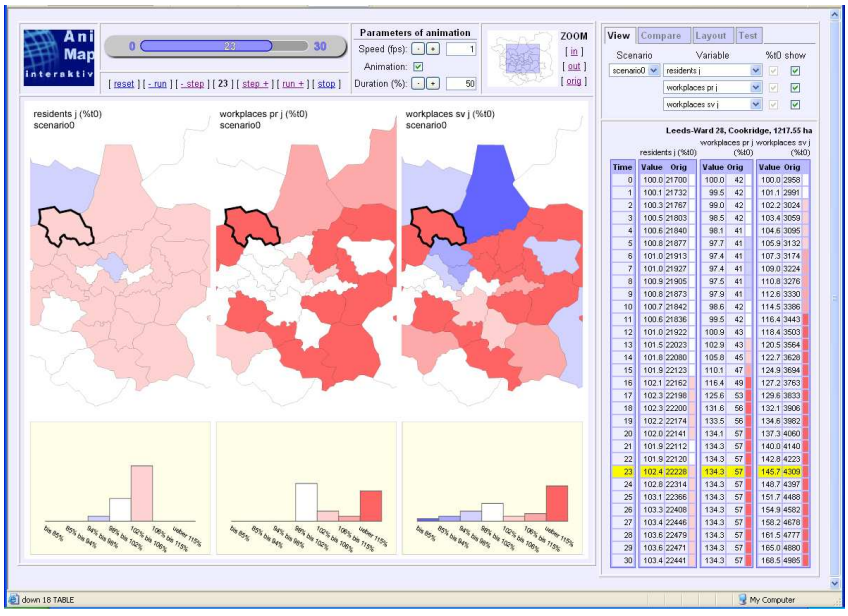


Abbildung 9:Animap im VIEW-Modus mit 3 Karten

Die Stabdiagramme zur Visualisierung der Häufigkeitverteilung in der Legende werden synchron zu den Karten animiert. Die Attributinfo-Anzeige im rechten Bereich des Fensters erfolgt über Mausklick auf ein Polygon in eine Karte. Die Zeile des aktuellen Jahres im Animationsverlauf wird dabei mit gelber Hintergrundfarbe hervorgehoben. In einer zusätzlichen Spalte ist der über die Legende (farb)klassifizierte Verlauf der dargestellten Variable über die Jahre erkennbar.

Eine Bemerkung zur kartographischen Visualisierung: Da im Rahmen von AniMap/MARS nur animierte Choropletenkarten eingesetzt werden, dürfen Variablen mit absoluten Wertausprägungen (wie z.B. Bevölkerungszahlen, Anzahl an Arbeitsplätzen, etc.) nicht direkt in die Flächefarbe umgelegt werden (siehe dazu einschlägige Lehrbücher wie z.B. [Dickinson 1973], p. 51ff). Solche Variablen müssen zuerst anhand eines zweiten absoluten Merkmals normalisiert werden. Oft wird dazu das Merkmal Fläche herangezogen und so z.B die Bevölkerungszahl auf einen Dichtewert (pro ha) umgerechnet.

Experimente zeigten jedoch, dass durch diese Transformation (und auch ähnliche, wie z.B. pro Kopf) sich die numerischen Werte über die Zeit hinweg nur relativ marginal verändern und dadurch Veränderungen nur relativ schlecht bis gar nicht perzeptiv erfassbar sind. In AniMap wurde daher hier der Weg einer Indexberechnung eingeschlagen. Dabei wird ein (absolutes) Merkmal anhand seines Ursprungszustand (zum Zeitpunkt t=0) relativiert und in Prozent angezeigt (i.e. die Option „%t0“). Die farbliche Klasseneinteilung weist Werte über 100% in dunkler werdenden Rottönen (i.e. Zunahmen) und unter 100% in entsprechenden Blautönen aus (i.e. Abnahmen). Im Attributinfo-Bereich wird sowohl dieser Indexwert in % (Spalte „Value“) als auch der Ursprungswert (Spalte „Orig“) angezeigt.

4.2.3 Szenarienvergleich (Modus COMPARE)

Dieser Modus wird über die Auswahl des entsprechenden Registerblattes rechts oben im AniMap-Fenster angesprochen und bietet einen Vergleich verschiedener Simulationsläufe eines VENSIM-Modells.

Die Ergebnisse eines Simulationslaufes werden in einer sog. Szenariendatei abgelegt und einzelne Variablen daraus können über Szenarien hinweg mit einander verglichen werden. Die Berchnung der Differenz erfolgt automatisch und wird gemeinsam mit den Originaldaten der beteiligten Szenarien kartographisch angezeigt.

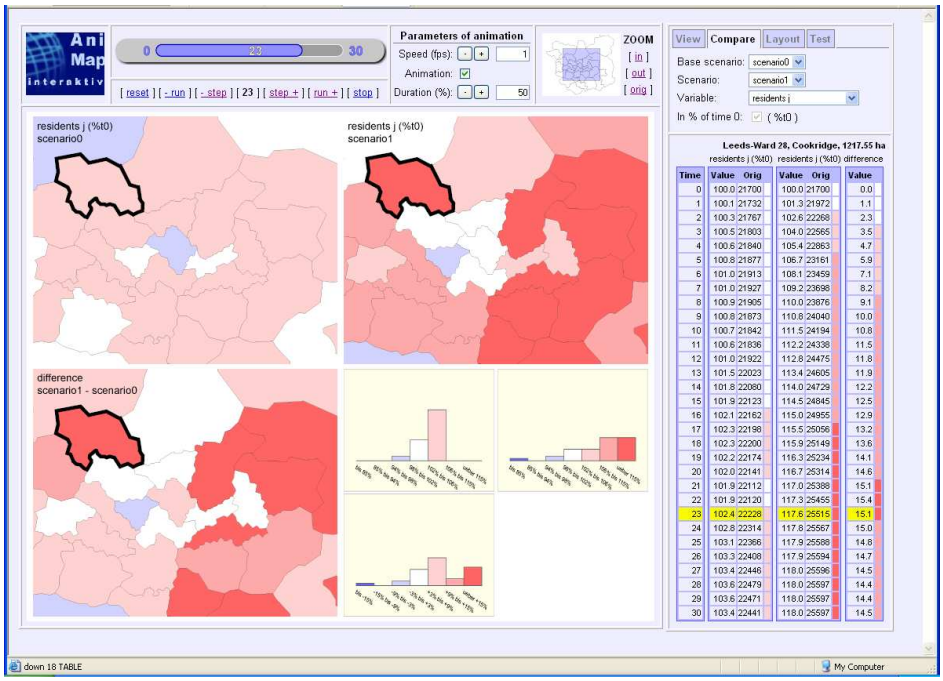


Abbildung 10:AniMap im COMPARE-Modus (Szenarienvergleich)
(links oben: Residents Szenario0, rechts oben: Residents Szenario1, links unten: Differenz Szenario1-Szenario0)

4.3 Ausblick

Aktuell sind in AniMap/MARS Animationen von Datenzeitreihen mit flächenhaften Bezug implementiert. Nach einer angemessenen Test- und Bewährungsphase ist in einem nächsten Ausbauschritt daran gedacht, auch linien- und punktförmige Information animiert darzustellen. Dies eröffnet beispielsweise Möglichkeiten zur Darstellung von Netzausbaumaßnahmen öffentlicher Verkehrsmittel, Radwegen oder Bahnhöfen in ihrer

zeitlichen Abfolge. Als größte Herausforderung wird sich dabei vermutlich herausstellen, diese dann vielschichtig und synchron ablaufenden Animationsvorgänge mit dem kognitiven Erfassungsvermögen des menschlichen Betrachters in Einklang zu bringen.

Eine engere Koppelung zwischen AniMap und MARS wird – die technische Machbarkeit mit angemessenem Aufwand vorausgesetzt – angestrebt.

5 ZUSAMMENFASSUNG

In diesem Papier wurden einige Konzepte und Features der Programmierumgebung VENSIM dargestellt. Obwohl VENSIM sehr gut geeignet ist zeitliche Abfolgen zu modellieren und darzustellen sind die räumlichen Darstellung über die Zeit nicht ausreichend. Aus diesem Grund wurde das Modell MARS um das Softwaremodul AniMap erweitert.

Ziel des Papieres ist es die zugrunde liegenden Ideen einer dynamischen Modellierung dem Leser anhand des integrierten Flächennutzungsmodells MARS näher zubringen. Das komplexe Zusammenspiel von Raumnutzung und Verkehr, von Raumplanung und Verkehrsplanung und deren Darstellung in Zeit und Raum benötigt adäquate Methoden. Eine dieser Methoden ist System Dynamics und die darauf aufbauenden Programmierumgebung VENSIM. Viele Problemstellungen, wie räumliche und zeitliche Entwicklungen, Rückkoppelungen zwischen Verkehrssystem und Raumnutzungssystem sind nur mit dieser Methode zielführend zu modellieren. Dem gegenüber sind Gleichgewichtsmodelle nur bedingt geeignet, da die raum-zeitliche Entwicklung komplett ausgeklammert wird.

Im System Dynamics Ansatz ist gerade das der interessante Punkt; wie geht ein System von einem Status in einem anderen über? Kann ein (dynamischer) Gleichgewichtszustand erreicht werden? Findet Konzentration oder Zersiedelung statt? Was sind die treibenden Größen? Wo sind Hebelpunkte um zielorientiert in das System eingreifen zu können? Was ist die Eigengeschwindigkeit bzw. die Trägheit des Systems?

All diese Fragen können zumindest ansatzweise mit SD und MARS in Kombination mit AniMap simuliert, visualisiert und wissenschaftlich analysiert werden.

6 LITERATUR

Dickinson, G. C. (1973). " Statistical mapping and the presentation of statistics." Edward Arnold Ltd., London 1973

Emberger, G., and Bruntsch, S. "Urban Planning in European Research - The Land Use and Transport Research Cluster." CORP 2002 - Computergestützte Raumplanung, Vienna

Hocevar, A., Lunak, D., and Riedl, L. "Darstellung von Zeitreihen räumlicher Daten mittels WebMapping." Schrenk M. (Hrsg.): Beiträge zum Symposium CORP2004, Wien

Kalasek, R., Riedl, L., and KRAMER, K. (2002). "FIS – the Special Information System of the Vienna Municipal Department for Environmental Protection. A Flexible Internet-based System for Environmental Data." Pillmann W., Tochtermann K.

Knoflacher, H., and Pfaffenbichler, P. C. (1999). "BENEFICIAL - Economic Benefits of an Efficient Institutional Co-ordination between Transport and Landuse policy, Illustrated on Austrian Level, Forschungsprojekt im Rahmen der EU-COST-Aktion 332."

Pfaffenbichler, P. C. (2003). "The strategic, dynamic and integrated urban land use and transport model MARS (Metropolitan Activity Relocation Simulator)," Technische Universitaet Wien, Vienna. http://www.ivv.tuwien.ac.at/publications/online/MARS_smallest_size.pdf

Pfaffenbichler, P. C., and Emberger, G. "Ein strategisches Flächennutzungs-/Verkehrsmodell als Werkzeug raumrelevanter Planungen." CORP 2001: Computergestützte Raumplanung, Vienna, 195-200

Pfaffenbichler, P. C., and Emberger, G. "Are European cities becoming similar?" CORP2003, 8. internationales Symposion zur Rolle der IT in der und für die Planung sowie zu den Wechselwirkungen zwischen realem und virtuellem Raum, Vienna, 243-250.www.corp.at/archiv.htm

Pfaffenbichler, P. C., and Emberger, G. "Die Bewertung der Nachhaltigkeit innovativer städtebaulicher Maßnahmen mit dem Simulationsmodell MARS." CORP 2004 - Computergestützte Raumplanung,in: "Beiträge zum 9. Symposion zur Rolle der Informationstechnologie in der Stadt- und Raumplanung sowie zu den Wechselwirkungen zwischen realem und virtuellem Raum", Vienna, 689 - 694

Riedl, L. (2005). "Räumliches Informationsmanagement und Applikationsentwicklung, Online-Unterlagen zur Lehrveranstaltung, http://www.srf.tuwien.ac.at/lva/imak/ [2007-03-11]."

W3C. (2003). " Scalable Vector Graphics (SVG) inkl. Link zur Spezifikation (Recommendation) von SVG 1.1 , http://www.w3c.org/Graphics/SVG/ [2007-03-13]."

Walther, K. (1991). Maßnahmenreagibler Modal-Split für den städtischen Personenverkehr - Theoretische Grundlagen und praktische Anwendung, Aachen

Walther, K., Oetting, A., and Vallée, D. (1997). Simultane Modellstruktur für die Personenverkehrsplanung auf der Basis eines neuen Verkehrswiderstands, Aachen

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Die urbane Landschaft als Handlungsfeld in der postsozialistischen Stadtentwicklung in Sofia

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1 ABSTRACT

Der vorliegende Artikel leistet einen Beitrag zur aktuellen Debatte des adäquaten Umgangs mit Stadtrandsituationen, der international im Diskursfeld des „landscape urbanism“ geführt wird. Indem unbebaute Flächen – aus landschaftsarchitektonischer Sicht als Freiräume bezeichnet – als umfassende Potenziale begriffen werden, die über die reduktionistische Sicht dieser Flächen als Baulandreserve hinausgeht, stellt sich die Frage, in welcher Weise diese Potenziale sichtbar und aktivierbar gemacht werden können.

Am Beispiel der südlichen Territorien von Sofia / Bulgarien werden die historischen und aktuellen Entwicklungsdynamiken aus landschaftsarchitektonischer Sicht diskutiert. Der südliche Stadtraum von Sofia – zwischen Stadtzentrum und den Ausläufern des Berges Vitosha – wurde in den Expansionsphasen der Stadt schrittweise in unterschiedlichen Mustern urbanisiert. In diesen Prozessen etablierten sich formationsspezifische Raummuster, die die widersprüchliche Stadtentwicklungspolitik seit den 1920er Jahren bis heute widerspiegeln. Gegenwärtig wird der südliche Stadtraum als eine der wichtigsten Flächenreserven in der Stadtentwicklung von Sofia definiert.

In drei Fallstudien werden die spezifischen Problemstellungen dargestellt und analysiert.

Die Verdichtungsprozesse rund um und im Südpark (Jushen Park) stellen die Transformation der niedrigen Bebauung aus der Zwischenkriegszeit durch eine dichte Geschosswohnungsbebauung dar und beschreibt das schrittweise Ausgreifen dieses Prozesses auf den öffentlichen Südpark.

Die Fallstudie von Mladost setzt sich mit den direkten Auswirkungen des Restitutionsprozesses auseinander, der eine Rückgabe unbebauter Flächen an die ehemaligen Eigentümerinnen und Eigentümer bzw. deren Rechtsnachfolgerinnen und Rechtsnachfolger erlaubt. Die Resultate sind die Fragmentierung des siedlungsbezogenen Freiraumsystems und die rentable Umnutzung der restituierten Flächen zu Autoparkplätzen, Tankstellen und Einkaufsmärkten. Daraus hat sich ein relevantes soziales Konfliktpotenzial entwickelt, das sich in der Bildung von lokalen Bewohnerinnen- und Bewohnerinitiativen manifestiert. Dies verdeutlicht nicht nur das Entstehen zivilgesellschaftlicher Strukturen und mit deren Vernetzung eine Veränderung des städtischen Governancesystems, sondern ebenso den sozialen Gehalt, der dem Freiraum innewohnt.

Die Fallstudie des südlichen Stadtrands analysiert die vorhandene Situation entlang der anästhetischen Begriffe von Störung, Heterogenität und Fremdheit und erweitert den herkömmlichen Landschaftsbegriff um die Attribute der räumlichen Offenheit, des räumlichen Kontinuums, der Vorläufigkeit und der Unfertigkeit des Raums. Die Betrachtung der Stadtlandschaft erfolgt angesichts der dynamischen Entwicklungen prozessual, was ein Verharren auf statischen Planungsgrundsätzen obsolet erscheinen läßt.

Die aktuellen Entwicklungen sind als massiver Verdichtungsprozess zu charakterisieren, die den öffentlichen, den siedlungsbezogenen und den peripheren Freiraum quantitativ massiv verringern und sowohl das übergeordnete als auch das lokale Freiraumsystem verändern. Diese Prozesse verlaufen auf Grundlage der Restitution planerisch weitgehend unreguliert. Eine Neupositionierung der im Postsozialismus weitgehend bedeutungslosen Stadtplanung hat die Chance, durch die Integration der entstandenen zivilgesellschaftlichen Strukturen und der privatwirtschaftlichen Akteurinnen und Akteure ein Planungsparadigma zu etablieren, das die urbane Landschaft als zentrales Handlungsfeld in sozialen wie in baulichen Prozessen begreift. Dafür ist nicht nur die Entwicklung eines Verständnisses von Freiraum als Produkt und als Prozess notwendig, sondern gleichwohl eine Erweiterung des Landschaftsbegriffs mit der Integration anthropogen überformter Stadtlandschaften.

2 EINLEITUNG

Funktionelle Fragmentierung und planerische Unbestimmtheit charakterisieren einen wesentlichen Teil europäischer Stadt-Landschaften. Die Ränder der Städte, ihre Peripherien rücken ins Zentrum der fachlichen

Aufmerksamkeit (vgl. Sieverts 1997, Cupers / Miessen 2002, Bölling / Sieverts 2004, Ferguson 2006). Das Unbestimmte, Undefinierte, Vergängliche bilden dabei Referenzpunkte, die den Peripherien als Attribute zugeschrieben werden. Mit dem Konzept der ephemeren Landschaften (Qviström, Saltzman 2006) werden die Aspekte der Vergänglichkeit (griech. ephemeros: für einen Tag) und der Alltäglichkeit beleuchtet und auf die vernakulären Landschaften von J.B. Jackson[24] verwiesen. Die Kurzlebigkeit der materiellen Struktur dieser Landschaften ist verknüpft mit den sozialen und kulturellen Dimensionen des Vergänglichen und setzt einen Kontrapunkt zur Dauerhaftigkeit gebauter Strukturen. Die Transformation bildet daher einen wesentlichen Fokus bei der Betrachtung der Ränder. Im Prozess ihrer Neuverhandlung und Neuinterpretation spiegelt sich ihr Verhältnis zur Dauerhaftigkeit wider.

Die spezifischen Eigenschaften einer Stadtlandschaft bleiben in einer reduktionistischen, verwertungsgeleiteten Sicht ausgeblendet, indem unbebaute Flächen mit ihrer Funktion als Bauerwartungsland gleichgesetzt werden. Der Frage der Integration von Landschaft und Stadtentwicklung wird im aktuellen Diskursfeld des Landschaftsurbanismus (engl. Landscape Urbanism) nachgegangen. Dabei wird der Fokus auf das Wesen, die Eigenheiten und die Potenziale urbaner Landschaften gelegt. Dazu zählen neben den bekannten Attributen des ökologischen Werts, des topographischen Reliefs und des möglichen Ausblicks, vor allem die spezifischen Muster der Organisation, performative – handlungsbezogene Programme, formale Gestaltsprache, materielle Qualitäten und signifizierender Bedeutungsinhalt (vgl. Czerniak 2006: 107).

Um die Fragen nach der Rolle und den spezifischen Qualitäten urbaner Landschaften beantworten zu können, werden am Beispiel der südlichen Territorien von Sofia / Bulgarien die historischen und aktuellen Entwicklungsdynamiken dargestellt und die Merkmale der daraus resultierenden Freiräume aus landschaftsarchitektonischer Sicht diskutiert. Der südliche Stadtraum von Sofia – zwischen Stadtzentrum und den Ausläufern des Berges Vitosha – wurde in den Expansionsphasen der Stadt schrittweise in unterschiedlichen Mustern urbanisiert. In diesen Prozessen etablierten sich formationsspezifische Raummuster, die die widersprüchliche Stadtentwicklungspolitik seit den 1920er Jahren bis heute widerspiegeln.

3 METHODIK

In drei Fallstudien werden anhand verschiedener Stadtlandschaften die aktuellen Entwicklungen dargestellt. Die Auswahl der Untersuchungs-gebiete umfaßt zum einen den Typ des städtischen Parks am Beispiel Südpark, der siedlungsbezogenen Freiräume am Beispiel der Großwohnanlage Mladost und die heterogene Raumstruktur des südlichen Stadtrandes. Zum anderen bilden sich in den ausgewählten Beispielen je spezifische Akteurskonstellationen, Konflikte und Qualitäten ab. Die Fallstudien sind in den Kontext der Rolle der Freiräume in der städtebaulichen Entwicklung eingebettet.

Die Fallstudien wurden in unterschiedlichen Forschungsarbeiten erstellt und verwenden verschiedene Methoden der Datengewinnung. Die Fallstudie Mladost wurde im Rahmen des Projektes „Activating the Potentials of Public Urban Green Spaces“ ausgearbeitet und verwendet einen stadtsoziologischen Zugang (vgl. Grimm-Pretner et. al. 2006). Die beiden Fallstudien zum Südpark und zum südlichen Stadtrand wurden im Rahmen eines Forschungsaufenthaltes zu „Potenziale und Qualitäten der räumlichen Abseite im postsozialistischen Sofia“ erstellt. Dabei wird eine experimentelle Methodik angewandt, mit der landschaftsarchitektonische Aufnahmen den Stadtraum selbst als Quelle der Erkenntnis verstehen und der Blick auf ihn zum maßgeblichen Aufnahmemedium wird. Diese Form der Datengewinnung wurde mittels

[24] Den Begriff der vernakulären Landschaft leitet Jackson von der Verwendung des Wortes „vernakulär“ für die Beschreibung unterschiedlicher Aspekte lokaler Kultur ab. Als vernakuläre Landschaften versteht Jackson u.a. Räume, in denen dauerhafte Hinweise auf deren politische Organisation fehlen. Vernakuläre Landschaften zeichnen sich durch kleine, unregelmäßige, heterogene Strukturen aus und verändern sich hinsichtlich Nutzung, Eigentumsverhältnisse und Ausdehnung schnell. Mobilität und Wandel sind zentrale Begriffe in der Beschreibung vernakulärer Landschaften (vgl. Jackson 1984: 33ff). In der Anwendung dieses Begriffs auf zeitgenössische Landschaften verwendet Jackson den Begriff der „auto-vernakulären Landschaft“, die in den Aspekten der Mobilität und des kurzfristig besetzten Raumes ähnlich konfiguriert ist wie historische vernakuläre Landschaften. Das zentrale Definitionskriterium für diesen neuen Landschaftstypus bildet die Organisation und Anpassung der Landschaft an das Automobil (vgl. Jackson 1990: 54).

sogenannter Dérives[25] umgesetzt. Bei diesem absichtslosen Umherschweifen im städtischen Raum wurde im Vorhinein nur der ungefähre Stadtbereich festgelegt, durch den das Dérive führen sollte. Die Routenwahl wurde gänzlich von der subjektiven Befindlichkeit und dem topologischen Kontext bestimmt. Die Begehungen wurden mit Hilfe eines Stadtatlas durchgeführt und mit einer digitalen Kamera dokumentiert. Die Auswahl der Motive orientierte sich an der subjektiven Klassifizierung des Ortsspezifischen und des topologischen Charakters bzw. hatte die Aufgabe der Unterstützung der Rekonstruktion der Begehung.

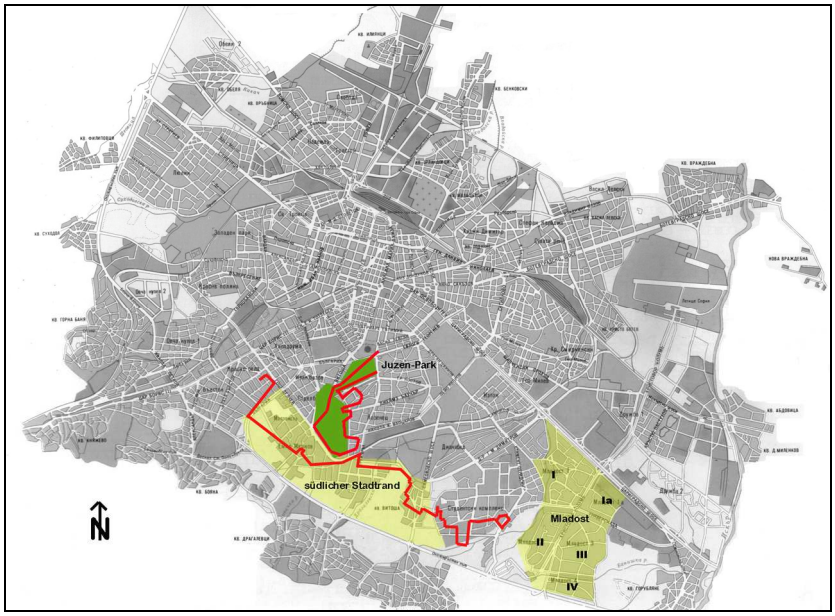

Abb. 1: Lage der Fallstudien, in rot: Dérives

4 ERGEBNISSE

4.1 Die Hügel von Losenetz und der Grünkeil des Südparks

Die Hügel von Losenetz bilden knapp außerhalb des historischen Stadtzentrums von Sofia die erste landschaftliche Erhebung in Richtung Süden. Aufgrund dieser topographischen Lage ist Losenetz nicht nur ein attraktiver Wohnstandort, sondern auch Gegenstand einer Stadtplanung, die eine malerische, harmonische Stadtlandschaft als Entwicklungsziel definiert. Der Masterplan aus dem Jahr 1938 entwickelt unter Einbeziehung der „hohen“ und der „niedrigen“ Horizonte von Sofia ein System zur Organisation der öffentlichen Freiräume im Zentrum von Sofia. Die südwärts ausgerichtete städtebauliche Achse des Bul. Vitosha inszeniert darin die höchsten Erhebungen von Losenetz als landschaftlichen Zielpunkt und artikuliert über Aussichtspunkte die Idee einer homogenen, panoramatischen Stadtstruktur (vgl. Sofia Municipality 2004: 8).

[25] Dérives (frz. Dérive oder engl. drift: abdriften) wurden von den Situationisten im Rahmen ihrer psychogeographischen Stadterkundungen als Methode eingeführt. Das absichtslose Umherschweifen im städtischen Raum orientiert sich an sogenannten Stationen und ermöglicht einen Blick auf die Stadt, abseits von Touristenströmen, Produktions- und Konsumorten. Diese Dérives dauerten von einem Tag bis zu vier Monaten. Die Stadt wurde in diesem Zugang als ein Terrain der Leidenschaft interpretiert (vgl. Sadler 1998: 91ff).

Abb. 2: Aktueller Transformationsprozess mit massiver Verdichtung

Ebenfalls im Masterplan von 1938 wird das übergeordnete Freiraumsystem von Sofia definiert, das mit Grünkeilen den dichtbebauten Stadtraum durchdringt und die Verbindung zu den umgebenden Landschaftsräumen herstellt. Der Südpark übernimmt darin die Funktion der Anbindung an das Vitosha Gebirge südlich von Sofia. Die Realisierung des Südparks erfolgte in insgesamt drei Teilbereichen seit den 1970er Jahren im landschaftlichen Stil (vgl. Radoslavova 2001: 513). Die ideelle Konzeption des Parks als homogene, statische und definierte Landschaft widerspricht der tatsächlich realisierten Gestalt, die eine Erfassung des Gesamtparks als einheitlichen Raum aufgrund der Fragmentierung durch Verkehrsstränge und Wohngebiete verunmöglicht. Das gegebene landschaftliche Relief wird als statisches Bild inszeniert, das aus bestimmten, definierten Blickrichtungen wahrnehmbar ist. Die naturhafte Landschaft bildet darin die Entsprechung zum homogenen Bild der Stadt.

Die Erstbesiedlung der Hügel von Losenetz erfolgte in der Zwischenkriegszeit im Zuge der Flüchtlingsmigration nach dem ersten Weltkrieg in einer unregulierten, chaotischen Art und Weise. Außerhalb der inneren Ringstraße wurden die bis dahin unbebauten Gebiete in einer kleinteiligen Parzellenstruktur besiedelt, die bis heute charakteristisch für diese Gebiete ist.

Heute sind diese Quartiere attraktive und nachgefragte Wohngebiete. Nach 1989 sah sich Losenetz einem extrem starken Entwicklungsdruck ausgesetzt, der flächenhaft in eine Neubebauung mündete, die die Bebauungsregeln massiv überschritt. Die Entwicklung umfasst die Transformation bestehender Ein- und Mehrfamilienhäuser aus den 1920er und 1930er Jahren mit niedriger Dichte und in schlechtem baulichen Zustand. Die Grundstücke werden aufgekauft, die Gebäude abgerissen und durch die verdichtete Neubebauung ersetzt. Der Charakter der betroffenen Stadtteile verändert sich dadurch vollständig. Als typisches Beispiel für diese Entwicklung wird im Stadtentwicklungsplan das Stadtgebiet Losenetz angegeben, „das seinen Charme, sein Erscheinungsbild und sogar das spezifische Mikroklima als Auswirkung des exzessiven Verdichtungsprozesses verloren hat“ (Sofia Municipality 2004: 17). Die Verdichtung bestehender Wohngebiete ist in Losenetz weitgehend abgeschlossen.

Die Errichtung von Neubauten greift augenscheinlich auf die bisher unbebauten Randbereiche des angrenzenden Süd-Parks über – eine Abgrenzung zwischen Park und Wohn- (bzw. Bau-) -gebiet ist im Bereich der neuen US-amerikanischen Botschaft (die selbst direkt im Park situiert ist) nicht mehr erkennbar. Damit scheinen Grenzen dieses klassischen Parks nicht länger statisch zu sein, sondern verschieben sich analog der Durchsetzungsfähigkeit unterschiedlicher Interessen. Auch im Kernbereich des Parks ist die Homogenität des Parkraums durch Besitzansprüche im Zuge von Restitutionsverfahren in Frage gestellt (vgl. Abb. 3). Zwar untersagt das Gesetz zur „territorialen, städtischen und ländlichen Entwicklung“ die Bebauung öffentlicher Freiräume, erlaubt aber die Errichtung von Gebäuden, die einer Erholungsnutzung dienen (vgl Dimitrova 2006: 10).

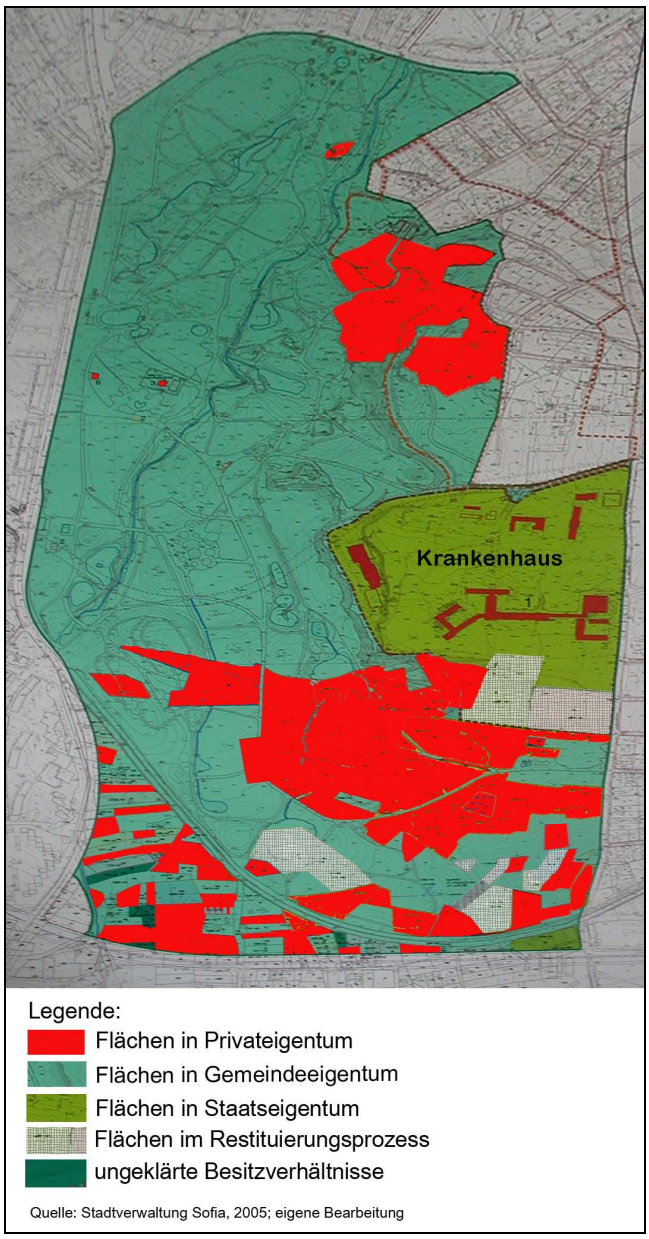

Abb. 3: Eigentumsverhältnisse im Südpark 2005

Das statische Konzept urbaner Landschaft, das die Sofioter Stadtplanung im 20. Jahrhundert verfolgte, ist mit diesen Entwicklungen obsolet geworden. Sowohl die Wohngebiete auf den Hügeln von Losenetz wie auch der Grünkeil des Südparks sehen sich mit einem umfassenden Transformationsprozess konfrontiert, der die homogene Stadtlandschaft fragmentiert und einer Neuverhandlung aussetzt.

4.2 Mladost – Großsiedlung

Anhand der Fallstudie Mladost werden die direkten räumlichen und sozialen Auswirkungen des Restitutionsprozesses von unbebauten Flächen diskutiert. Diese haben nicht nur quantitativ und qualitativ einen Einfluss auf das siedlungsbezogene Freiraumsystem, sondern zeigen auch das soziale Potential von Freiräumen auf.

Der Bezirk Mladost liegt im Südosten von Sofia und ist aufgrund seiner Nähe zum Stadtzentrum, der relativ guten Verkehrsanbindung und der Nähe zum Naherholungsgebiet am Berg Vitosha ein nachgefragter Wohnstandort. Erbaut wurde die Großsiedlung Mladost, genauso wie weitere große sozialistische Stadtentwicklungsprojekte an der Peripherie von Sofia auf „nationalisierten“ landwirtschaftlichen Flächen in den späten 1960er und 1970er Jahren. In dieser Zeit wurde der akuten Wohnungsnot, bedingt durch die rasch voranschreitende Industrialisierung der Hauptstadt und der starken Migration in die Stadt, durch die Errichtung von seriell gefertigten Plattenbauten begegnet. Heute befinden sich 46 % der Wohnungen von Sofia in diesen Großsiedlungen. Die Großsiedlung Mladost besteht aus fünf Einheiten (I, Ia, II, III, IV)

(siehe Abb. 1) mit insgesamt 424 Wohnblocks und wird von zirka 110.000 Menschen bewohnt (Stand 2003). Zirka 95% der Wohnungen befinden sich in Privatbesitz (vgl. Dandolova 2006: 39ff).

Abb. 4: Privatisierung und Umnutzung eines vormals öffentlichen Freiraums in Mladost

Abb. 5: Vormals öffentliche Grünfläche in Mladost; jetzt umzäunt und bewacht

Mit dem Erlass des „Gesetzes zur Restitution nationalisierter Grundstücke“ 1992 wurde die Basis zur Rückgabe unbebauter Grundstücke an die vormaligen Besitzerinnen und Besitzer bzw. deren Nachkommen geschaffen. Auf den städtischen Raum hatte diese radikale Vorgehensweise große Auswirkungen. Da das Restitutionsgesetz Verfassungsrang besitzt, werden alle anderen (kommunalen) Regulationen nachrangig behandelt.

Von der Restitution sind insbesondere die unbebauten Freiräume der großen Wohnhausanlagen und die Flächen der Parkanlagen, wie bereits im Fallbeispiel Südpark beschrieben, betroffen. Zunächst bewirkte das neue private Grundeigentum mit umfassendem Verfügungsrecht eine Privatisierung öffentlichen Raums. In weiterer Folge wurde versucht, aus dem neuen Besitz durch Umnutzungen bzw. Weiterverkauf Kapital zu schlagen.

Vor allem in den Wohnhausanlagen wurden die Grundstücke von den Behörden oftmals als urbanisiertes Land klassifiziert, für das relativ einfach eine Baubewilligung zu erlangen war. Der Prozess mündete in eine baulich-strukturelle Änderung der Anlagen, die nach keinem ersichtlichen räumlichen Organisationsmuster verlief. Durch die Errichtung von Wohngebäuden, Parkplätzen (vgl. Abb. 4) oder kleinen Unternehmen trat eine Verdichtung und Nutzungsänderung, aber auch eine Fragmentierung der Flächen ein. Gemeinschaftseinrichtungen wie Spiel- oder Sportplätze wurden umgenutzt, vorhandene Fußwegerelationen unterbrochen oder öffentliche Einrichtungen durch Einkaufs- oder Freizeitzentren, Tankstellen, Autowaschanlagen oder Restaurants ersetzt.

Eine klare Strategie zur städtebaulichen Entwicklung der Großsiedlungen ist nicht erkennbar. Das Wohnumfeld wird nicht als integraler Bestandteil der Wohnsiedlung gesehen, das einen wesentlichen Beitrag

zur Wohnqualität leistet. Die Freiräume innerhalb der Siedlungen sind eher Abstandsflächen als ein differenziertes System aus unterschiedlichen Freiraumtypen. Der schlechte Pflege- und Erhaltungszustand der öffentlichen Freiräume leistet ebenfalls einen Beitrag zu deren Marginalisierung und potentiellen Bebaubarkeit. Die unzureichende Erhaltung der öffentlichen Räume ist nicht nur auf fehlende finanzielle Ressourcen zurückzuführen, sondern auch auf fehlende Konzepte und Instrumente für deren nachhaltige Entwicklung.

Die unterschiedlichen Interessenslagen der Bewohnerinnen, Bewohner und der Profiteure der Restitutions- und Privatisierungsprozesse führten zur Entstehung von sozialen Konflikten. Die Unzufriedenheit der Bewohnerinnen und Bewohner mit ihrer Wohnsituation, mit der Entwicklung ihres Wohngebietes, mit der teilweise korrupten Verwaltung und intransparenten Entscheidungsprozessen führte dazu, dass 2001 in Mladost eine Interessensgemeinschaft von Bewohnerinnen und Bewohnern gegründet wurde, deren Ziel der Schutz der gemeinsamen Interessen und die Etablierung einer lokalen Selbstverwaltung war. 2002 erfolgte die Registrierung als NGO. In kurzer Zeit entstanden in ganz Sofia ähnliche Organisationen, deren Anzahl zu Beginn von 2006 zirka 40 betrug. In weiterer Folge vereinigten sie sich zu „Green Sofia“, eine zivile Bewegung zum Schutz der Frei- und Grünräume in Sofia. 2005 erfolgte die Registrierung des „Network of Associations of Citizens of Sofia” – NACS.

Die Bürgervereinigungen streben auf unterschiedlichen Ebenen Veränderungen und Maßnahmen an, um das übergeordnete Ziel der Verbesserung ihrer Lebensbedingungen zu erreichen: Es besteht die Notwendigkeit, alle Anstrengungen der lokalen Bevölkerung, der lokalen Verwaltung, der Medien und der staatlichen Institutionen zu koordinieren und voranzutreiben. Dazu ist es notwendig, transparente Entscheidungsprozesse zu etablieren und die Aktivitäten der Verwaltung und politischen Entscheidungsträger zu kommunizieren. Grundlage für eine Verbesserung der Lebensbedingungen ist generell ein verändertes Verständnis der Wohnsiedlungen als integrale räumliche Einheit für Wohnen, Arbeiten, Erholung und Kommunikation. Aus Sicht der Bürgervereinigungen ist es unumgänglich, ein Verbot von Restitution innerhalb der Siedlungsgrenzen zu erlassen (vgl. Dandolova 2006: 48). In weiterer Folge sind Konzepte zu entwickeln, die eine tatsächliche Einbindung der Zivilgesellschaft in Entscheidungsprozesse ermöglicht.

4.3 Südlicher Stadtrand

Zwischen den peripheren, dörflich geprägten Siedlungsgebieten und dem dichtbebauten Stadtgebiet erstreckt sich entlang der äußeren Umfahrungsstraße ein landschaftlich geprägter Korridor am Übergang zwischen dem Gebirgsfuß des Vitosha Massivs und dem Talboden der Ebene von Sofia. Kleine Flüsse und Bäche, die am Vitosha entspringen, strukturieren den Korridor und bilden durch ihre Ablagerungskegel typische Landschaftselemente (vgl. Nikolov, Mihaylov 2001).

Dieser Korridor stellt in der übergeordneten Planung des Freiraumsystems seit 1938 einerseits einen Grüngürtel zur Verbindung der großen Parkanlagen des Südparks und des Borisova Gradina dar, andererseits fungiert er als Verbindung des Südparks mit dem Landschaftsraum des Vitosha Gebirges. Obwohl sich der Standort in der generellen Südorientierung der Stadtentwicklung als Wohngebiet geeignet hätte, wurde der Korridor unter der sozialistischen Stadtplanung von Bebauung freigehalten. In den Erläuterungstexten zu den Flächenwidmungsplanungen von 1979 und 1985 findet sich folgende Argumentation dazu: „Diese Territorien (müssen) von Plattensiedlungen bewahrt und als Reserve für die Zukunft erhalten werden“ (Doytchinov 2002: 135). Dennoch entwickelten sich noch vor 1989 drei Wohngebiete im Korridor, die zu zwei Drittel illegal errichtet wurden und dementsprechend kleinteilig und teilweise provisorisch angelegt sind.

Abb. 6: Fettwiese am Fuß des Vitosha als landschaftliche Trägerstruktur

Abb. 7: Neu errichtete Wohnhausanlagen und Abholmarkt bilden mit dem undefinierten Straßenraum ein heterogenes Ensemble

Abb. 8: Stahlskelett auf der grünen Wiese als Relikt sozialistischer Industrialisierungsbestrebungen

Seit 1989 hat sich der Investitionsdruck auf das Gebiet massiv erhöht. Mit der Entwicklung eines Konzepts für die strukturelle und räumliche Entwicklung der südlichen Territorien sollte ein regulatorischer Rahmen für diese Entwicklungsdynamik entwickelt werden. „Die im Plan dargestellte gesamte Struktur (ist) nicht das Resultat einer erwarteten Entwicklung, die es zu lenken gilt, sondern das Abbild einer zukünftigen Entwicklung, die zu gestalten sein wird. (...) Wenig ist die diffuse Ausgangssituation zu spüren und

ungeklärt, mit welchen Mechanismen sie zu einer Struktur ‚konstruiert' werden soll" (Doytchinov 2002: 136). In dieser Charakterisierung wird das dahinterstehende Planungsverständnis deutlich, das mit statischen Bildern einer strukturellen Vorstellung operiert und den prozessualen Charakter des sozialen wie des räumlichen Gefüges weitgehend außer Acht lässt.

Als diffus könnte auch die räumlich-strukturelle Konfiguration des Gebietes beschrieben werden, die sich in einer weitgehend ungeordneten Gemengelage aus Funktionen, Räumen und Bedeutungsinhalten manifestiert. Tatsächlich erscheint die Gestalt des Korridors diffus, weil sie sich aus Attributen zusammensetzt, die einem homogenen, geordnetem Landschafts- und Stadtbegriff widersprechen.

Der Korridor präsentiert sich als heterogene Struktur: In unmittelbarer räumlicher Nähe treffen die kleinteiligen, illegalen Wohngebiete mit neu errichteten, acht bis neungeschossigen Eigentumswohnanlagen aufeinander. Die Fettwiesen auf den Ausläufern des Vitosha (siehe Abb. 6) wechseln ab mit aufgelassenen Gärtnereibetrieben und flächengreifenden Kiesgewinnungs- und Industriearealen. Der räumlich undefinierte öffentliche Strassenraum kontrastiert mit den Abgrenzungen der hochpreisigen Eigentumswohnungsanlagen. (siehe Abb. 7).

Die verschiedenen Strukturen verweisen auf unterschiedliche Zeiten, Interpretationen und Bedeutungsinhalte. Ein Stahlskelett steht auf der grünen Wiese und verweist auf die Industrialisierungsbestrebungen im Sozialismus. Baufällige Einfamilienhäuser ohne infrastrukturelle Erschließung bilden die materiellen Zeugnisse der provisorischen Aneignung von verstaatlichtem Grund und Boden. Die kleinteiligen Spuren landwirtschaftlicher Produktion verweisen auf die Versuche zur Selbstversorgung und die wirtschaftliche Prekarität im Postsozialismus. Diese in den Raum eingeschriebenen Bedeutungen stellen Fremdkörper in den aktuellen Entwicklungsdynamiken der Verdichtung und bestmöglichen Verwertung dieser attraktiven urbanen Landschaft dar. Das verwirrende, heterogene Gefüge wird strukturiert durch großflächige, offene Räume, durch landschaftliche Trägerstrukturen, die den übergeordneten Zusammenhang herstellen. Die Blickbeziehung zum Vitosha, der Bezug zur ortsprägenden Topographie und Vegetation produzieren ein Kontinuum, das die landschaftlichen Qualitäten in den Vordergrund stellt.

Die angesprochene Diffusität des Korridors kann mittels einer Sichtweise aufgelöst werden, die die bestehenden Strukturen, ihre Relationen und Qualitäten einbezieht. Der Bedeutungsgehalt des Areals wird dadurch komplexer und reichhaltiger, woraus ein Planungsansatz entwickelt werden kann, der über ein tabula rasa Verständnis für Stadtrandsituationen hinausgeht. Die landschaftlichen Trägerstrukturen stellen ein übergeordnetes, lesbares Raumkontinuum zur Verfügung. Der prozessuale Charakter dieser Strukturen, der sich in der materiellen Widerspiegelung von Jahreszeiten, Klima, Wetter etc. ausdrückt, liefert eine Basis, mit der die Vorläufigkeit der vorhandenen Stadtlandschaft als Qualität begriffen werden kann. Dadurch wird Stadtentwicklung zu einem offenen System, das nicht auf die Erreichung eines vordefinierten Bildes abzielt, sondern die ortsprägenden Qualitäten für die Aktivierung der vorhandenen Potenziale nutzt.

5 DISKUSSION

Die aktuellen Entwicklungen sind als massiver Verdichtungsprozess zu charakterisieren, die den öffentlichen, den siedlungsbezogenen und den peripheren Freiraum quantitativ verringern und sowohl das übergeordnete als auch das lokale Freiraumsystem verändern. Diese Prozesse verlaufen auf Grundlage der Restitution planerisch weitgehend unreguliert. Die aktuelle Stadtentwicklung in Sofia produziert gegenwärtig Stadtrandsituationen unabhängig von der Lage und der Funkion des angrenzenden Freiraums. Indem der Freiraum als Verhandlungsmasse für den dynamischen Urbanisierungsprozess verwendet wird, unterliegt der physische wie der soziale Raum einem massiven Transformationsprozess.

Die Ergebnisse der Kommunalwahlen Ende 2005 führten zu einem Wechsel in der Stadtverwaltung von Sofia und es scheint ein verändertes Verständnis bezüglich der Problematik der Freiraumentwicklung damit einherzugehen. Vertreterinnen und Vertreter der Verwaltung begannen Kontakte und Kooperationen mit der Bürgerbewegung aufzunehmen. Es wurden Diskussionen über den Stadtentwicklungsplan geführt, der von den Bürgerinnenn und Bürgernn stark kritisiert wird.

Die Ausarbeitung des aktuellen Master Plans (vgl. SOFIA MUNICIPALITY 2004) für die Region Sofia stand unter dem Vorzeichen der Aufnahme der Beitrittsverhandlungen Bulgariens zur EU im Jahr 1999. Die Auswirkungen des freien Kapital-, Personen- und Güterverkehrs und eine verstärkte Investitionstätigkeit

stellen die Triebkräfte für das Entwicklungsszenario bis 2020 dar. Dementsprechend werden den Routen und Knoten der Transeuropäischen Korridore für die zukünftige Zentrenentwicklung eine überragende Bedeutung zugemessen: die vorgeschlagene Entwicklungsrichtung folgt der topografischen Vorgabe der Ebene von Sofia nach Nordwesten (Richtung Beograd) und Südosten (Richtung Istanbul / Schwarzmeerküste). Das Leitbild der kompakten Stadt wird abgelöst von einem dispersen Entwicklungsleitbild, das eine polyzentrale Stadtstruktur anbietet. Die fünf neuen strukturellen Zentren befinden sich alle am äußeren Ring des Stadtgebietes und beziehen sich auf bereits bestehende Strukturen. Dieser geplanten flächenmäßigen Ausdehnung der Stadt wird auf landschaftlicher Ebene mit einem Landschaftsbegriff begegnet, der sowohl Natur- und Kulturlandschaften wie auch die anthropogen überformten Landschaften mit einschließt. Mit der Einführung von „Themenparks“ wird ein Konzept vorgeschlagen, das unterschiedliche Typen von Freiräumen und Landschaftsteilen zu einer Entwicklungsstrategie mit einem bestimmten Thema unter Berücksichtigung von ökologischen, ästhetischen und nutzungsspezifischen Aspekten vereinigt. Der Begriff des „Themenparks“ bleibt dabei vage und meint keine definierte Parkanlage, der eine thematische Ausrichtung zugrunde liegt. Vielmehr handelt es sich um eine thematische Strategie, die beispielsweise im dichtbebauten Stadtraum alle vegetationsgeprägten Freiräume, wie Gärten, Parkanlagen, Straßenvegetation etc. zum „Green Memory of Sofia“ Themenpark zusammenfasst. Demgemäss ist der „Themenpark“ weniger als räumliche, denn als ideelle Entität zu verstehen. In der Integration anthropogen überformter Landschaften – wie aufgegebenes landwirtschaftliches Land, Abbaugebiete etc. – wird der Landschaftsbegriff erweitert und damit die Potentiale dieser Flächen und deren kultureller Wert thematisiert. Allerdings werden zur räumlichen Definition und zur Umsetzung der Strategie wenige Aussagen gemacht. Zusätzlich konterkariert die aktuelle investitionsgeleitete bauliche Entwicklung die Aussagen und Vorgaben des Master Plans. Die grünen Korridore als Verbindungsräume zwischen Naturlandschaften und den großen städtischen Parkanlagen werden beispielsweise kontinuierlich verkleinert, fragmentiert und bebaut.

Dieses Überholen des Planes durch die Realität ist einerseits einer relativ langen Zeit der rechtlichen Unwirksamkeit geschuldet: der Master Plan wurde im April 2003 vollendet, die Umweltverträglichkeitsprüfung durchgeführt und auch vom Gemeinderat genehmigt, die endgültige Genehmigung durch das nationale Parlament erfolgte erst Ende 2006. Andererseits wird dadurch nicht das Fehlen von Strategien und Instrumenten erklärt, die Stadtlandschaften als Handlungsfeld zum Inhalt haben. Vielmehr spiegelt sich in vorhandenen Planungsdokumenten ein statisches Planungsverständnis wider.

Die Gründe für diese Situation liegen zum einen im planungsstrukturellen Relikt der sozialistischen zentralistischen Planung, die den Kommunen keine Planungsautonomie gewährte. Zum anderen spiegeln die Diskussionen um die Beschlussfassung des Master Plans die widerstreitenden Interessen zwischen einer marktregulierten Stadtentwicklung, die dem sagenhaften Boom der Immobilienbranche auf Kosten des landschaftlichen Gefüges den Boden bereitet und einer geplanten Stadtentwicklung, in der der lokale Staat über bestimmte Regulationsinstrumente verfügen kann. Die generelle Skepsis gegenüber staatlicher Regulation und administrativer Verfügung scheint der marktregulierten Variante gegenwärtig den Vorzug zu geben.

6 SCHLUSSFOLGERUNGEN

Dieser Artikel analysiert aus landschaftsarchitektonischer Sicht die historischen und aktuellen Entwicklungsdynamiken und diskutiert die Potenziale, die sich daraus ergeben. Indem aus unterschiedlichen Blickwinkeln die aktuellen Dynamiken betrachtet werden, ergibt sich ein umfassendes Bild, das die Basis für einen komplexen Planungszugang zu Standtlandschaften bildet. Dafür ist nicht nur die Entwicklung eines Verständnisses von Freiraum als Produkt und als Prozess notwendig, sondern gleichwohl eine Erweiterung des Landschaftsbegriffs mit der Integration anthropogen überformter Stadtlandschaften.

6.1 Freiraum als Produkt und Prozess

Freiraum als Produkt: Dieser Aspekt fokussiert auf die vielschichtigen Eigenschaften und unterschiedlichen Typen, aus denen sich das Netz des urbanen Freiraums zusammensetzt. Er beschreibt den tatsächlichen Zustand des Ortes, genauso wie daraus Anforderungen für eine zukünftige Entwicklung in quantitativer und qualitativer Sicht abgeleitet werden können. In Bezug auf die landschaftsurbanistische Diskussion können

diesem Aspekt die Attribute des ökologischen Werts, des topographischen Reliefs, des möglichen Ausblicks, der formalen Gestaltsprache und der materiellen Qualitäten zugeordnet werden.

Freiraum als Prozess: Die Produktion und die Entwicklung von Freiraum und der Stadt als Ganzes wird als Prozess gesehen. Seine Charakteristika und verschiedenen Kräfte müssen analysiert werden, um den Prozess in Richtung einer nachhaltigen Stadtentwicklung zu steuern, und um adäquate Strategien formulieren zu können. Im Sinne des Landschaftsurbanismus stellen die spezifischen Muster der Organisation, die performativen – handlungsbezogenen Programme und die signifizierenden Bedeutungsinhalte jene Attribute dar, die prozessual zu betrachten sind. Die Berücksichtigung beider Aspekte bildet eine fundierte Basis, die unterschiedlichen Potentiale des Freiraums umfassend zu erkennen und zu nutzen.

6.2 Erweiterung des Landschaftsbegriffs

Das komplexe Verständnis von Freiräumen beinhaltet die Erweiterung eines Landschaftsbegriffes, der über das statische, herkömmliche Bildverständnis hinausgeht und landschaftliche Qualitäten einbezieht, die einerseits aufgrund ihrer Flüchtigkeit und Vorläufigkeit bildhaft nicht oder nur schwer darstellbar sind und andererseits ästhetische Kategorien anspricht, die der Erscheinung zeitgenössischer Stadtlandschaften entspricht. Indem die Leitbilder des homogenen, statischen Raums durchbrochen und Heterogenität, Divergenz und Fremdheit als Attribute begriffen werden, die auf bestimmte ortsprägende Qualitäten verweisen (vgl. Welsch 1990), erschließt sich die planerische Bearbeitung alltäglicher Stadtlandschaften, ohne auf ein tabula rasa Konzept zurückgreifen zu müssen.

Dazu ist es notwendig, Stadtlandschaften als Ausdruck aktueller und historischer sozialer Prozesse zu verstehen. Indem die materiellen Spuren dieser Prozesse entschlüsselt und lesbar gemacht werden, können auch die Bedeutungsinhalte der Stadtlandschaften sichtbar gemacht werden[26]. Die Relationalität des Raumes erscheint dabei als zentrales Charakteristikum. Damit wird die Bipolarität von bebautem und unbebautem Raum obsolet. Der konstruierte Gegensatz zwischen Stadt und Land, zwischen Gebäude und Freiraum, zwischen Bauerwartungsland und Park kann mit einer relationalen Sichtweise aufgelöst werden. Der Diskurs verlagert sich von einer rückwärtsgewandten Verteidigungshaltung zur Bewahrung möglichst vieler unbebauter Flächen zur Frage nach ortsadäquaten Strategien, die die vorhandenen Potentiale nachhaltig entwickeln.

6.3 Planungsparadigma

Durch das komplexe Verständnis von Stadtlandschaften wird ein Planungsverständnis entwickelt, das von den örtlichen Bedingungen und seinem sozialen Kontext ausgeht. Indem Planung als offenes System verstanden wird, stellt weniger die Produktion eines bildhaften Endzustandes den planerischen Fokus dar. Stattdessen bildet Planung einen integrativen Prozess, der durch die Integration der entstandenen zivilgesellschaftlichen Strukturen und der privatwirtschaftlichen Akteurinnen und Akteure die urbane Landschaft als zentrales Handlungsfeld begreift.

Das bedeutet eine Konkretisierung der vorhandenen diskursiven Ansätze des Master Plans im Sinne einer Operationalisierung der Begriffe der anthropogen überformten Landschaften und der Themenparks. Daraus leiten sich die Fragen nach der Entwicklung adäquater Aufnahme- und Darstellungsmodi, sowie eines methodischen Instrumentariums ab, die die Entwicklung innovativer Planungs- und Steuerungsstrategien ermöglichen. Damit könnte die im Postsozialismus bisher weitgehend bedeutungslose Stadtplanung die Chance zur Neupositionierung erlangen.

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[26] Auf die Berücksichtigung sowohl der physischen Raummuster wie auch der Bedeutungsinhalte von Landschaft weist Körner im aktuellen Diskurs zur Entwicklung eines adäquaten, „neuen“ Landschaftsbegriffes hin: „(...) entscheidend ist aber der innere produktive, letztendlich künstlerische Vorgang im Subjekt, das diese Räume in einem ästhetischen (...) Prozess zu schönen und sinnhaften Landschaften macht“ (vgl. Körner 2006: 22; Prominski 2004).

8 QUELLENVERZEICHNIS

BÖLLING, L. / SIEVERTS, T. (Hg.): Mitten am Rand. Auf dem Weg von der Vorstadt über die Zwischenstadt zur regionalen Stadtlandschaft. Müller+Bussmann, Wuppertal, 2004.

CUPERS, K. / MIESSEN, M.: Spaces of Uncertainty. Müller+Bussmann, Wuppertal, 2002.

CZERNIAK, J.: Looking Back at Landscape Urbanism - Speculations on Site. In: WALDHEIM, C. (ed.): The Landscape Urbanism Reader, Princeton Architectural Press, New York, 2006.

DIMITROVA, E.: Re-thinking Public Green Space: The Case of Vrabnitza Administrative Unit, Sofia; in: GRIMM-PRETNER, D., RODE, P., WÜCK, R., DIMITROVA, E., MARKOVA, A., KOVACHEVA, I., DANDOLOVA, I., HADJ PECOVA, S.: Activating the Potentials of Public Urban Green Spaces. Forschungsbericht; Auftraggeber: ASO - Austrian Science and Research Liaison Office Sofia Bulgaria / Centre for Social Innovation, 2006.

DANDOLOVA, I.: Public Green Spaces at Risk: Mladost, Sofia; in: GRIMM-PRETNER, D., RODE, P., WÜCK, R., DIMITROVA, E., MARKOVA, A., KOVACHEVA, I., DANDOLOVA, I., HADJ PECOVA, S.: Activating the Potentials of Public Urban Green Spaces. Forschungsbericht; Auftraggeber: ASO - Austrian Science and Research Liaison Office Sofia Bulgaria / Centre for Social Innovation, 2006.

DOYTCHINOV, G. / GANTCHEV, C.: Österreichische Architekten in Bulgarien 1878 – 1918. Böhlau, Wien, 2001.

DOYTCHINOV, G.: Das pluralistische Experiment – Widersprüche und Potential der mitteleuropäischen Stadt. Verlag der Technischen Universität Graz, Graz, 2002.

FERGUSON, F. (Hg.): Talking Cities – Die Mikropolitik des urbanen Raumes. Birkhäuser, Basel, 2006.

GRIMM-PRETNER, D., RODE, P., WÜCK, R., DIMITROVA, E., MARKOVA, A., KOVACHEVA, I., DANDOLOVA, I., HADJ PECOVA, S.: Activating the Potentials of Public Urban Green Spaces. Forschungsbericht; Auftraggeber: ASO - Austrian Science and Research Liaison Office Sofia Bulgaria / Centre for Social Innovation, 2006.

JACKSON, J.B.: Landschaften. Ein Resümee, 1984, in: FRANZEN, B. / KREBS, S. (Hg.): Landschaftstheorie, Walter König, Köln, 2005.

JACKSON J.B.: Die Zukunft des Vernakulären, 1990, in: FRANZEN, B. / KREBS, S. (Hg.): Landschaftstheorie, Walter König, Köln, 2005.

KÖRNER, S.: Eine neue Landschaftstheorie? – Eine Kritik am Begriff „Landschaft Drei“. In: Stadt+Grün 10/2006, Patzer, Berlin-Hannover, 2006.

NIKOLOV, B. / MIHAYLOV, M.: Soils, Flora and Fauna. In: BULGARIAN ACADEMY OF SCIENCES: Sofia – 120 years as Capital of Bulgaria, Prof. Marin Drinov Publishing House, Sofia, 2001.

QVISTRÖM, M. / SALTZMAN, K.: Exploring Landscape Dynamics at the Edge of the City. In: Landscape Research, Vol. 31, No.1; Routledge, London, 2006.

PROMINSKI, M.: Landschaft entwerfen. Zur Theorie aktueller Landschaftsarchitektur. Reimer, Berlin, 2004.

RADOSLAVOVA, J.: The Gardens of Sofia. In: BULGARIAN ACADEMY OF SCIENCES: Sofia – 120 years as Capital of Bulgaria, Prof. Marin Drinov Publishing House, Sofia, 2001.

SADLER, S.: The Situationist City. MIT Press, Cambridge – London, 1998.

SIEVERTS, T.: Zwischenstadt – zwischen Ort und Welt, Raum und Zeit, Stadt und Land. Vieweg, Braunschweig, 1997.

SOFIA MUNICIPALITY: Sofia City Strategy, Tip Top Press, Bulgaria, 2003.

SOFIA MUNICIPALITY: Master Plan of the city of Sofia and Sofia Municipality – Synthesis, 2004

WELSCH, W.: Ästhetisches Denken. Reclam, Stuttgart, 1990.

🏆 *reviewed paper*

Grünflächensicherung für Wien - BIOTOPMONITORING als Instrument der Stadtentwicklung

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1 ZUSAMMENFASSUNG

Im Grünraum-Beobachtungsprogramm BIOTOPMONITORING WIEN wird die Verteilung und der Zustand der Stadtvegetation über Bezirks-, Eigentums- und Zuständigkeitsgrenzen hinweg aus Luftbildaufnahmen dokumentiert. Neben einer detaillierten Klassifizierung der Struktur und Funktion von 21.500 begrünten Teilflächen des Stadtgebietes werden quantitative Änderungen der Baumkronen-, Strauch- und Wiesenflächen, sowie qualitative Änderungen des Kronenzustandes der Stadtbäume kartiert. Zusätzlich quantifiziert das BIOTOPMONITORING den Grad der Bodenversiegelung und die Versiegelungsdynamik der Böden in Wien.

Im vorliegenden Beitrag wird die Grünraumentwicklung Wiens aus dem Blickwinkel der Grünflächensicherung analysiert. Ausgehend von der Zielsetzung und der Methodik der Grünraumerfassung werden Bei-spiele für den Einsatz der Grünrauminformation dargestellt. Das flächendeckende Langzeitmonitoring der Stadt bietet grünraumverwaltenden Abteilungen Informationen, die als Entscheidungsgrundlage für die Pla-nung, das Grünraummanagement und den Naturschutz einsetzbar sind. Herausgearbeitet wird dabei, welch bedeutende Koordinationsleistung der Stadtverwaltung für die Grünflächensicherung abverlangt wird.

1.1 GRÜNFLÄCHENINFORMATION IN DER STADT

Wien mit einer Fläche von 414 km2 und 1,7 Mio. Einwohnern verfügt über ansehnliche städtische Grünanlagen, einen bedeutenden Waldanteil, einen Teil des Nationalparks Donauauen und ausgedehnte Erholungsflächen. Informationen zum Grünraum finden sich in mehreren Fachdienststellen der Stadtverwaltung. Dazu gehören das Stadtgartenamt, das Forstamt, die Umweltschutzabteilung, die Stadtplanung, die Bezirksverwaltungen und die Stadtvermessung. Im Bereich der privaten Grundstücke verfügen einzelne Eigentümer (Verwaltungsgesellschaften, Industriebetriebe u.a.) über Grüninformation. Eine stadtgebietsübergreifende Zusammenschau über privates und öffentliches Grün bestand bis zum Beginn des Einsatzes von Fernerkundungsmethoden nicht.

Zur Bereitstellung einer hochwertigen städtischen Infrastruktur gehört auch die Sicherung von Grün- und Freiflächen, die auf Nutzungsänderungen besonders empfindlich reagieren. Das für die Stadtstruktur und das Stadtklima bedeutsame Netz von Freiräumen und die, das Stadtbild bestimmende Grünausstattung mit einer über Jahrzehnte laufenden Entwicklungsdynamik, sind aufgrund der meist vorrangig wirtschaftlich geprägten Zielsetzungen der Bodennutzung in ihrem Bestand immanent gefährdet.

Ihren Aufgaben entsprechend beauftragt die Wiener Umweltschutzabteilung seit Beginn ihres Bestehens 1973 Studien zu Umweltthemen, Stadtökologie und Grünraumerhebung. Eines der langfristig angelegten Arbeitsprogramme ist das BIOTOPMONITORING, das periodisch Informationen zum Zustand und zur Entwick-lung des Wiener Grünraumes auf der Grundlage von Luftbildern liefert.

Im BIOTOPMONITORING werden vom Flugzeug aus Farbinfrarot-Luftbilder aufgenommen, auf denen die Grünflächen besonders kontrastreich erkennbar sind. Nach Jahren kooperativer Methodenentwicklung steht für Wien nunmehr eine Gesamterfassung zahlreicher Grünparameter für die Jahre 1997 und 2000 zur Verfügung. An der Auswertung des Bildfluges 2005 wird derzeit gearbeitet. Neben einer detaillierten Klassifizierung der Stadtvegetation werden quantitative Änderungen der Grünflächen, sowie qualitative Änderungen wie Erweiterung oder Verringerung des Grünanteils und Änderungen des Kronenzustandes der Stadtbäume erfasst.

2 BEDEUTUNG DER STÄDTISCHEN GRÜNBEREICHE

Die pflanzliche Umwelt erfüllt zahlreiche Funktionen im menschlichen Leben (Bollnow 1988 und 2000, Mikocki, Ricica 2003) und bietet aus ökologischer, sozialer und wirtschaftlicher Sicht vieles. Sie bereichert das Stadtbild, begünstigt das Mikroklima, das Wohlbefinden sowie die Gesundheit der Menschen und ist Lebensraum für Tiere. Grünflächen werten die Wohnqualität auf, haben generell erheblichen Einfluss auf die

Lebensqualität der Stadtbevölkerung und heben die Attraktivität im Tourismus. Sie bieten Raum für Freizeitsport, schaffen Orte der Begegnung und begünstigen Entspannung, Ruhe und Erholung. Sport- und Erholungsflächen, Parks und Waldgebiete, deren Nutzung gut organisiert ist, können zu beliebten und herausragenden Attraktionen des Stadtgebietes werden. Aus ökonomischer Sicht bestimmen Freiräume deutlich den Wert von Immobilien. So verändern Frei- und Grünräume je nach Funktion und Ausstattungsmerkmalen den Bodenrichtwert um bis zu 20 %; in Ausnahmefällen auch darüber (Gruehn 2006). Andererseits besteht auch ein „Wert dessen, was von selbst ist". In „Wildwuchs" (2003) der „Anthologie des Ungeplanten" geht ein Autorenkollektiv der Frage nach „Wie viel Wildnis braucht der Mensch?"; wobei diese Frage Spuren in der Grünraumpolitik der Stadt hinterlässt (M. Häupl). Auch bei der Begründung des Wertes der Naherholung werden Sehnsüchte artikuliert, die eine Nähe zum Urlaubserleben zeigen (Keul 1995), wobei die Informiertheit über Naherholungspotentiale mit steigender Distanz zu Parks sinkt (Martens, Keul 2004). Und selbst bei hohem Grünbedeckungsgrad zeigen in der Großstudie Leben und Lebensqualität in Wien (2003) noch 26 % der 8.300 Befragten einen Bedarf nach mehr Grünanlagen im direkten Wohnumfeld, obwohl es das Alltägliche widerspiegelt (Keul 1995).

Um dieses Naturvermögen zu erhalten und qualitativ zu sichern entschied sich die Wiener Umweltschutzabteilung im Jahr 1991 aufgrund der Ergebnisse aus mehreren Forschungsprojekten, das Arbeitsprogramm BIOTOPMONITORING zu beauftragen, um umfassend Grüninformation über Zuständigkeitsgrenzen hinweg zu erschließen.

Etwa ab diesem Zeitpunkt setzte auch die Europäische Union Initiativen zur Entwicklung politischer Strategien für die städtische Umwelt. Dazu gehören das Gesamtkonzept „Grünbuch über die städtische Umwelt" (1990), das Projekt „nachhaltige Städte" (1993), der Bericht „Zukunftsfähige Städte" (1996), der Aktionsrahmen „Nachhaltige Stadtentwicklung in der EU" (1998) und die Berichte „Towards more sustainable urban land use" (2001) und „Towards a thematic strategy on the urban environment" (COM(2004)60 final). Eine ´Thematic Strategy on the urban environment´ war Schwerpunkt im 6. EU Forschungs-Rahmenprogramm und die Europäische Umweltagentur publizierte einen Atlas der Entwicklung von 25 Europäischen Städten (Towards an urban atlas, 2002). Auf der Grundlage des 6. Umweltaktionsprogramms legte Anfang 2006 die EU-Kommission die „Strategie für die städtische Umwelt" (COM(2005)718 final) vor, in der umfassende Vorstellungen für die Gestaltung des städtischen Lebensraumes enthalten sind.

3 INFORMATION FÜR DAS GRÜNRAUMMANAGEMENT

Die Gestaltung des gesamten städtischen Grünraumes bedarf einer Zielsetzung, eines Grünmanagements mit Dokumentation der pflegerischer Maßnahmen und eines Controllings. Dabei bestimmen Finanzmittel, Eigentumsverhältnisse sowie historische und aktuelle Gegebenheiten der Vegetationsausstattung den Umfang von Erhaltungs- und Pflegemaßnahmen zur Sicherung der Natur- und Grünausstattung der Stadt. Unverzichtbare Grundlage des städtischen Grünraummanagements ist die Information über Ausmaß, Verteilung, Entwicklung und Qualität der Vegetation sowie im Bedarfsfall der Zugriff auf lokale Daten.

Die Politik legt Budget- und Personalressourcen zur Pflege und Verwaltung städtischer Grünflächen fest und gestaltet jene, die Stadtvegetation betreffenden rechtlichen Rahmenbedingungen. Dazu gehören das Wiener Stadtentwicklungs-, Stadtplanungs- und Baugesetzbuch (Bauordnung für Wien) mit den Flächen-widmungs- und Bebauungsplänen, das Naturschutzgesetz mit dem Programm „Netzwerk Natur" (Wiener Ar-ten- und Lebensraumschutzprogramm 2000) und die Umweltschutzgesetzgebung mit dem Baumschutzgesetz (Schmied, Pillmann 2003).

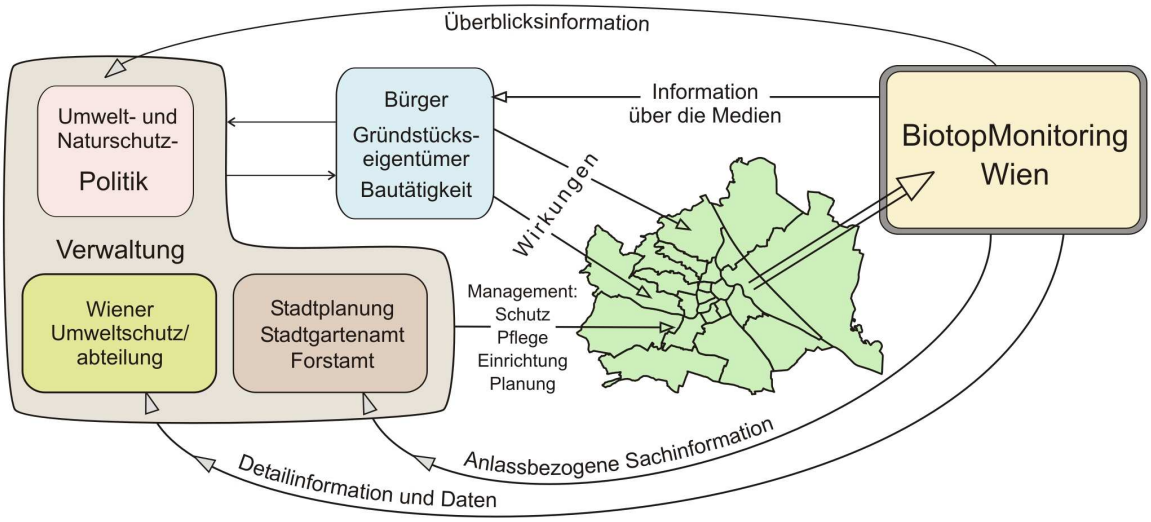
Der Informationsbedarf von Behörden und Grundstückseigentümern/-besitzern zu Größe, Ausstattung und Zustand der Vegetation ist abhängig von Zuständigkeiten für Grünplanung und Pflege, Sachkompetenz, Umweltbewusstsein, Gestaltungswillen, dem Ökosystemverständnis und den Langzeit-Zielsetzungen. Dabei bestimmen die, der Informationsgewinnung zugeordneten Finanzmittel die erreichbare Informationstiefe.

Fragen zu Grüninformation und städtischer Grünraumentwicklung wurden umfassend in den Forschungsprogrammen COST C11 „Greenstructures and Urban Planning" (http://www.map21ltd.com/COSTC11-book/index.htm) und COST E12 „Urban Forests and Trees" diskutiert (Schipperijn, Pillmann, Tyrväinen et al. 2005). Zu den Aufgaben die durch verbesserte Information qualitativ höherwertig durchführbar sind, gehören Baumpflege und Rodung, Grünanlagenpflege, Spielplatzunterhaltung, Parkbewirtschaftung, Biotop-

überwachung bis hin zur Administration von z. B. landwirtschaftlichen Förderprogrammen. Wesentliche Bedeutung für die Grüngestaltung Wiens kommt den Magistratsdienststellen und der Privatwirtschaft zu.

Das folgende Systembild zeigt Informationsflüsse in einem Modell der städtischen Grünraumentwicklung.

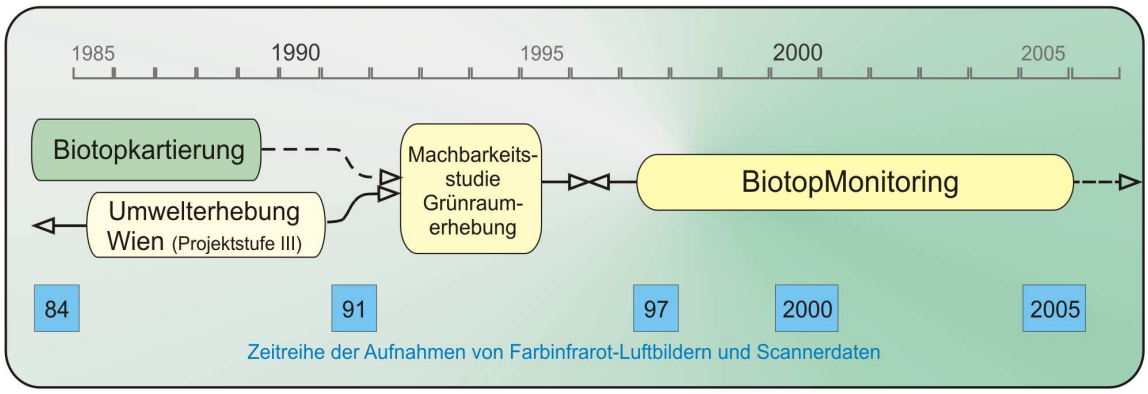
Bürger, Grundstückseigentümer, die Bautätigkeit und der Verkehr bewirken vielfältige Veränderungen der Begrünung. Umfassende Grüninformation aus dem BIOTOPMONITORING für Umwelt- und Naturschutzpoli-tik und die zuständigen Magistratsabteilungen bewirken einen Steuerungseffekt auf die Flächennutzungspla-nung und das Grünraummanagement mit den Aufgaben Schutz, Pflege, Einrichtung und Planung.



Informationsflüsse im Modell der städtischen Grünraumentwicklung

4 PIONIERARBEIT IM STADTMONITORING

Die Wiener Stadtverwaltung beauftragte mit einer nahtlosen Folge von Arbeitsprogrammen die Analyse städtischer Vegetation, um die Standortqualität für alle Arten zukünftiger Nutzungen zu erhalten.



Arbeitsprogramme zur Dokumentation, Quantifizierung, Analyse und Bewertung des Grünraums im Stadtgebiet Wiens

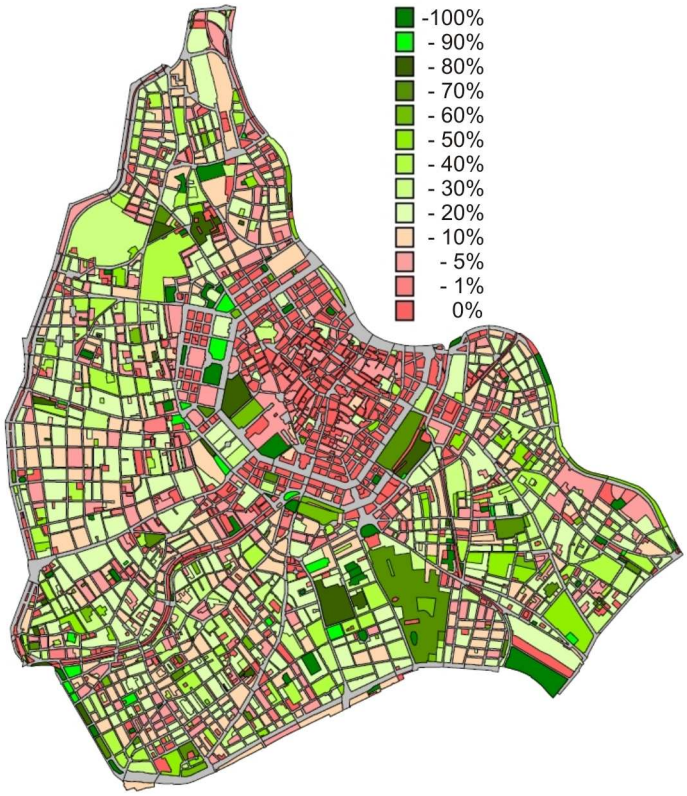
Auf der Suche nach Möglichkeiten zur regelmäßigen Erfassung der Vegetation wurden erstmals 1979 Infrarot-Luftbilder und digitale Scanneraufnahmen(!) der Stadt aufgenommen. Zur Untersuchung der Waldzustandsentwicklung und der Stadtbäume erfolgte 1986 eine Gesamtaufnahme Wiens, die 1991 durch die neuerliche Analyse der Stadt und des gesamten Wienerwaldes (890 km2) mit einer visuellen Interpretation des Kronenzustandes von 70.000 Bäumen fortgeführt wurde.

Aufgrund einer Machbarkeitsstudie und der gesammelten Erfahrungen begann 1996 die Intensivarbeit im Arbeitsprogramm BIOTOPMONITORING. Es werden die Größe, die Verteilung und der Zustand von Grünflä-chen in Parks, auf Straßen, in Höfen und Erholungsflächen aber auch der Zustand des Waldes erhoben. Mitt-lerweile liegt im BIOTOPMONITORING einer Serie von Auswertungen der Befliegungen

1991 und schwer-punktmäßig 1997 und 2000 vor. Die Auswertung der Farbinfrarot-Luftbilder des Bildfluges 2005 ist derzeit in Arbeit. Die Fülle der im Geographischen Informationssystem (GIS) gespeicherten verorteten Daten er-möglichen die selektive Darstellung der Entwicklungstendenzen. Eine detailliertere Darstellung der Metho-den der Fernerkundung und der Umweltinformatik zur Erfassung der Quelldaten und deren Aufbereitung finden sich in Pillmann, Kellner, Klar (2001 und 2002) und Ries, Pillmann, Kellner (2002).

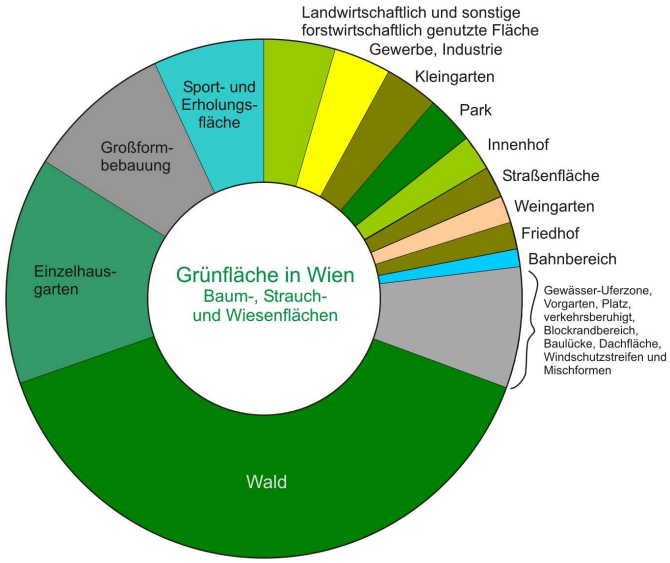
Mittlerweile ist das BIOTOPMONITORING im Stadtentwicklungsplan STEP 2005 als Instrument zur Bilanzierung der Grünentwicklung aufgenommen. Damit steht für die Grünraumpolitik zuverlässiges Datenmaterial und ein Kontroll-Instrument zur Verfügung, das für Politik, Verwaltung und Bürger verfügbar ist und das wirksam für Stadtplanung und Grünflächenpolitik eingesetzt werden kann (BIOTOPMONITORING Berichte 1996-2002).

5 VEGETATION IM ZENTRUM UND IN DER PERIPHERIE



Prozentuelle Begrünung der Blockflächen in den Wiener In-nenbezirken. (Anmerkung: Wien ist untergliedert in 23 Bezirke, 250 Zählbezirke, 1364 Zählgebiete und über 10.000 Baublöcke; Nutzungseinheiten sind eine weitere Unterteilung der Blöcke).

Der städtische Grünraum ist ein Mosaik von Naturelementen. Im dicht bebauten Stadtgebiet dominieren Grünanlagen in Innenhöfen und Wohnbereichen, Parks und die Straßenvegetation. Vom Zentrum in Richtung der Peripherie der Stadt, steigt die Vielfalt der mit Vegetation ausgestatteten Flächen. Einzelhausgärten, durchgrünte Wohnhausanlagen, Gewerbe- und Industrieflächen, Verkehrsflächen, Spiel- und Sportanlagen, Büro-, Einkaufs- und Vergnügungszentren bilden zum Teil Kristallisationspunkte für eine ansehnliche Begrünung. Andererseits verdrängen oder minimieren einzelne Großprojekte die Natur in der Stadt. Im Außenraum der Stadt sind Wald, Landwirtschaft, Einzelhausgärten, und Erholungsflächen, teilweise auch Kleingärten, Friedhöfe, und Weingärten flächenbestimmend.



Zur Beschreibung der Grünausstattung wird zu jeder der in der Stadtkarte 21.500 abgegrenzten Teilflächen (Nutzungseinheiten) der prozentuelle Flächenanteil der Baumkronen-, Strauch- und Wiesenfläche, der bebauten, versiegelten und nicht versiegelten Fläche angegeben. Klassifiziert werden die Nutzungseinheiten in 25 Stadtstrukturtypen sowie in 55 Toptypen wie Höfe, Plätze, Parks, Friedhöfe, Kleingärten, Dachgärten, Ufervegetation und Wald. Das nebenstehende Bild vermittelt einen Eindruck der Grünbedeckung in den Innenbezirken Wiens.

Eine bezirksübergreifende Planung, Einrichtung und Pflege der Stadtvegetation ist durch die Eigentumsverhältnisse und unterschiedlichen Zuständigkeiten erschwert. Die im BIOTOPMONITORING gewonnene Information dient der Kontrolle, Bewertung und Sicherung des Grünraumes.

Rund 200 km2 oder knapp 50% des Stadtgebietes sind mit Büschen und Wiesen bewachsen und mit Baumkronen überschirmt. Die Summe dieser von oben in Luftbildern sichtbaren Grünelemente der Stadt wird als Nettogrünfläche bezeichnet. Die bedeutendsten Flächenanteile stammen vom Wald- und Wiesengürtel, der Land- und Forstwirtschaft, von Einzelhausgärten, durchgrünten Wohnhausanlagen, Erholungs-, Sport- und Betriebsflächen, Kleingärten und Parks. Die in der digitalen Stadtkarte eingetragene Grüninformation kann nach Bezirken und Bezirksteilen statistisch ausgewertet werden. Vegetation auf Verkehrsflächen wird der Grundkarte des Wiener Staßen-Informationssystems zugeordnet.

Eine Verteilung der Nettogrünfläche auf die „Grünflächen-Toptypen“ im BIOTOPMONITORING zeigt das ne-benstehende Ringdiagramm. Darüber hinaus ermöglicht die visuelle Luftbildinterpretation auch den Zustand der Baumkronen zu beurteilen. Auf den Farbinfrarot-Luftbildern sind mittlere und starke Schäden aus der Baumkronenstruktur, der Textur und der Farbe deutlich erkennbar.

Für Grünbereiche im Zentrum und in der Peripherie gelten unterschiedliche Wertmaßstäbe. Die Größe ei-ner Grünfläche im Stadtkern tritt gegenüber der Sichtbarkeit und Erlebbarkeit, der leichten Erreichbarkeit, der gestalterischen Ausstattung und der ökologischen Wirkung in den Hintergrund. Höfe, Fassadengrün, Einzelhaus- und Kleingärten, begrünte Fußgängerzonen, Erholungsflächen und Sportplätze sind flächenbezogen oft klein, aus sozialer und oft auch aus ökologischer Sicht besonders wertvoll.

Die Naturausstattung und die Freiflächen Wiens tragen zur Erhöhung der Lebensqualität bei. Umrahmt und durchzogen wird der innerstädtische Bereich von einem „Grüngürtel“, der 1995 vom Gemeinderat als bleibendes Leitbild der Stadtentwicklung (STEP 2005) beschlossen wurde. Auch das 1994 beschlossene „1.000 ha Programm“ ermöglicht die Sicherung des Landschaftsraumes (Pirhofer, Stimmer 2006).

6 ANWENDUNGEN DER GRÜNRAUMINFORMATION

Städtische Grünbereiche haben für Natur, Umwelt, Lebensqualität und Wirtschaft besondere Bedeutung. Ergebnisse des BIOTOPMONITORINGS kommen in Verwaltung und Politik zum Einsatz. Dazu gehören Beurtei-lungen von Flächenwidmungsplänen und Empfehlungen zur strukturellen Gestaltung von Grünzonen und Bebauungsformen unter besonderer Beachtung von Natur- und Bodenschutz. Da der Wert von Biotopen

un-ter anderem auch von dessen Seltenheit abhängt, bedarf es einer Methode, den Überblick über den Grad der Schutzwürdigkeit einer Vegetationsausprägung zu schaffen.

6.1 Strukturelle Gestaltung

Die Erhebung der unterschiedlichen Parameter mit der Methode des BiotopMoniotorings liefert Daten, Werte und Vergleichszahlen, deren Verwendung je nach Aussageziel sehr genau hinterfragt werden muss. Nicht jeder Zuwachs an Vegetation ist immer für alle Beurteilungskriterien positiv zu bewerten. Die Entwicklung von einer einschichtigen Vegetation über Verbuschungsphasen zu einem mehrschichtigen Phytotop muss nicht immer eine ökologische Verbesserung darstellen. Im Beispielfall einer Trockenrasengesellschaft, wie sie im pannonischen Klimaeinfluss des Nordostens von Wien noch öfter anzutreffen sind, sind diese Tendenzen nicht günstig. Dazu kann aus den IR-Aufnahmen der Befliegungen im Vergleich der Jahre die Entwicklung beobachtet werden. Am Beispiel eines Trockenrasens im 22. Wiener Gemeindebezirk (Donaustadt) kann man die Verbuschungstendenzen zwischen den Jahren 1991 und 2000 erkennen. Bei der Erarbeitung von Maßnahmenplänen zur Erhaltung des Lebensraumes werden diese Erkenntnisse miteinbezogen.

6.2 Verwaltungsaufgaben

Die Aufgaben, jene Flächen, deren Ausdehnung mit der Methode des BIOTOPMONITORINGS erhoben wer-den, zu schaffen, zu schützen, zu beobachten – kurz: zu verwalten liegt in der Verantwortung vieler Teilbe-reiche der Wiener Stadtverwaltung. Die gezeigte Aufstellung der Verwaltungszuständigkeiten zeigt Beispiele von Teilaufgaben, denen sich die Abteilungen widmen, darüber hinaus gibt es jedoch eine lebendige Zu-sammenarbeit zu unterschiedlichsten Themenkreisen der Grünraumgestaltung.

MA	*Verwaltungsdienststelle*	*Grünbereich*	*Teilaufgabe*
	Geschäftsgruppe Umwelt		Grünflächensicherung
	Bezirksverwaltungen	Stadtteilbezogene Grünflächen "Grätzelgrün"	
	Gebietsbetreuungen	Stadtteilbezogene Grünflächen "Grätzelgrün"	
18	Stadtplanung	Gesamtgrünfläche	Flächenwidmungsbilanzen; Planung und Evaluierung von Entwicklungsgebieten
22	Umweltschutz	Stadtvegetation mit ökologischer Funktion	Naturschutz inkl. Vertragsnaturschutz Bodenschutz Vegetationszustand Versiegelung Ausstattung der Stadt-ökologischen Funktionstypen
42	Stadtgartenamt	Grün auf öffentlichen Flächen; Straßengrün; Dachbegrünung	Vegetationszustand
43	Städtische Friedhöfe	Friedhofsvegetation	
45	Wasserbau	Gewässerbegleitvegetation	Versiegelung
49	Landwirtschaftsbetriebe	Weingärten, Ackerbau	Vertragsnaturschutz
49	Forstamt	Wald Wienerwaldwiesen	Aufforstungen Baumkronenzustand Wienerwald

Zuständige Verwaltungsdienststellen für Grünflächen und deren Lebensgrundlagen

6.3 Beurteilungspraxis von Plänen hinsichtlich Boden- und Vegetationsschutz

Gemäß der Bauordnung für Wien ist bei der Festsetzung und Abänderung der Flächenwidmungs- und Bebauungspläne auf die Erhaltung beziehungsweise Herbeiführung von Umweltbedingungen zu achten, die gesunde Lebensgrundlagen sichern, und möglichst sparsam und ökologisch verträglich mit den natürlichen Lebensgrundlagen sowie dem Grund und Boden umgehen. Daher wird jeder Planentwurf unter Mitwirkung der Wiener Umweltschutzabteilung erstellt und dabei geprüft, ob Lebensgrundlagen gesichert werden und umweltspezifische Aspekte der Lebensqualität Beachtung finden. Bei der Planung eines Bauprojektes, wie das Beispiel „An den Eisteichen“ zeigt, wird bei der Aufteilung der bebaubaren Fläche auf den Wert der Natur geachtet. Unter Berücksichtigung der im Planungsgebiet befindlichen Tier- und Pflanzenarten und deren Lebensräume, des Landschaftshaushaltes und der Aspekte des sozialen Raumes, wie der Nutzbarkeit von Freiräumen, der Förderung des unmittelbaren Naturerlebnisses oder der Durchlässigkeit für alle Altersgruppen wird jener Bereich des Landschaftsraumes ermittelt, welcher idealerweise unbeeinträchtigt freigehalten werden sollte. Für die Bewertung einer Fläche nach dem System „Wert der Natur“ (Rienesl 2000) ist es ebenso wichtig, die relative Situation im Landschaftsraum zu beurteilen und die Verbindung zu anderen Freiräumen zu erfassen. Da nie alle Bereiche zugänglich sind, werden ergänzend zu Bewertungen im Gelände IR-Bildern eingesetzt.

Auch im Bereich des dichter bebauten Stadtgebietes besteht Potential, durch geringfügige Maßnahmen in der Praxis der Festsetzung der Bebauungspläne eine ökologisch wirksame Vegetation zu schützen. Darüber hinaus wird durch Hintanhalten von Entwicklungen, welche eine erhöhte Versiegelungsrate in dem betroffenen Gebiet entstehen lassen würden, auch der Anteil natürlicher Böden erhalten. Ein Beispiel aus Wien zeigt die Sinnhaftigkeit der Ausrichtung einer Einzelhausbebauung zu den Erschließungsstraßen hin, die durch eine restriktive Führung der Baufluchtlinienführung erreicht werden kann.

Gemäß der Richtlinie 2001/42/EG des Europäischen Parlamentes und des Rates über die Prüfung der Umweltauswirkungen bestimmter Pläne und Programme (sog. SUP-Richtlinie) werden auch die Flächenwidmung- und Bebauungspläne zumindest einem SUP-Screening unterzogen, bei welchem die Erheblichkeit der Umweltauswirkungen u.a. auf die Schutzgüter Flora und Fauna bzw. Boden und Wasser jeder einzelnen Planänderung beurteilt wird. Ist die Auswirkung erheblich, wird eine Alternativenprüfung angeschlossen.

6.4 Bodenversiegelung als Indikator einer ressourcenschonenden Stadtentwicklung

Zusätzlich zur Analyse der Grünentwicklung liefert das BIOTOPMONITORING auch Informationen zur Bo-denversiegelung. Da der Schutz natürlicher Böden in der Stadt die Grundlage der Stadtvegetation ist, wird die Dynamik der Versiegelung beobachtet, um mögliche Entsiegelungsmaßnahmen zur Kompensation der baulichen Stadtentwicklung identifizieren zu können. Diese Methode ist eine der derzeit genauesten und von jenen die historisch am längsten bestehende Methode zur Erfassung der Versiegelungsrate in Wien. Neben den Indikatoren für das gesamte Stadtgebiet können auch lokal bezogene Daten errechnet werden, wie der Versiegelungsgrad der einzelnen 23 Wiener Gemeindebezirke. Weiters ist die Erhebung des Versiegelungs-grades der stadtökologischen Funktionstypen oder anderer nutzungsbezogenen Flächen möglich. Die Vertei-lung der begrünten, nicht begrünten und nicht versiegelten und versiegelten Flächen im Wiener Stadtgebiet ist sehr inhomogen. Aus dem Blickwinkel der Luftreinhaltung sind beispielsweise brach liegende, unversie-gelten Flächen ohne Vegetationsbedeckung zu minimieren.

Auch in der Europäischen Dimension wird auf das Problem der Zersiedelung und des steigenden Bodenverbrauchs durch das Wachstum der Stadtregionen besonders hingewiesen (Urban Sprawl in Europe, 2006).

7 GRÜNFLÄCHENVERÄNDERUNGEN

Derzeit ist Grüninformation aus den Befliegungen 1991, 1997 und 2000 verfügbar. Veränderungen der Grünbedeckung auf den über 27.000 betrachteten Teilflächen wurden vereinfacht in die drei Gruppen vorteilhaft, neutral und ungünstig eingeteilt. Beispiele für vorteilhafte Begrünungs-Effekte sind: Neubegrünung, Flächenvergrößerung, Vegetationszuwachs sowie die Verbesserung des Kronenzustandes. Ungünstig zu bewerten sind der Verlust oder die Verkleinerung einer begrünten Fläche, die Verminderung der Grünflächenqualität durch Verlust von Bäumen und die Zustandsverschlechterung von Baumkronen. Neutral bewertet werden tatsächlich unveränderte Flächen, der meist bei jungen Bäumen bedeutende Zuwachs, sowie ein ausgeglichener Grüngewinn und -verlust innerhalb einer einzelnen beurteilten Teilfläche.

Auf rund 3.700 der 21.500 untersuchten Nutzungseinheiten hat sich die Grünbedeckung innerhalb nur dreier Jahre deutlich verändert. Positive Wirkungen auf das öffentliche Grün stammen vor allem vom Stadtgartenamt, von zahlreichen Projekten der Umweltschutzabteilung und vom „Forstamt und Landwirtschaftsbetrieb“, aber teilweise auch vom Wohn-/Siedlungsbau. Grünbelastende Effekte verursachen beispielsweise der Hochbau, der Straßenbau, und der Ausbau und die Erhaltung des Kabel-, Leitungs- und Kanalnetzes.

Trotz der Erweiterung von Wohnbereichen, Straßen, Gewerbe- und Industrieanlagen, Sport- und Erholungsflächen blieb die Nettogrünfläche von ganz Wien durch Begrünungsaktivitäten im Umfeld von Neubauten und durch Begrünung unversiegelter Flächen zwischen 1997 und 2000 nahezu konstant. Dies ist bemerkenswert, da beispielsweise bei etwa gleich bleibender Bevölkerungszahl die Wohnnutzfläche pro Person zwischen 1991 und 2000 von 33 m2 auf 35 m2 anstieg.

Die Grünflächenveränderungen werden durch mehrere Abteilungen der Stadtverwaltung, durch die Bezirksverwaltungen, Grundstücksbesitzerinnen und -besitzer, Bauherrn, Firmen und nicht zuletzt durch die Stadtbewohnerinnen und -bewohner und den Verkehr verursacht. Die Herausforderung der Politik ist es, einen Mix von Entscheidungen zu treffen, die positive Trends verstärken und schädliche Einflüsse beseitigen oder zumindest reduzieren. Grundlagen hiefür liefern Informationen aus dem BIOTOPMONITORING. Mit Ana-lysen der Luftbilder vom August 2005 wird die Grünraumentwicklung Wiens auch weiterhin aufmerksam verfolgt.

Mit den Echtdaten aus dem BIOTOPMONITORING als Beurteilungskriterien kann das bisher in der Wiener Umweltschutzabteilung entwickelte “Modell des Raumes“ (Ricica, Voigt, 1998) nunmehr problem- bzw. projektorientiert angewendet werden. Die langfristige Planungsverantwortung für die Entwicklung des Grünraumes ist schon derzeit aus der demographischen Verteilung der Altersgruppen und hier besonders in den Stadtentwicklungsgebieten abzulesen. Leben im locker bebauten Stadtgebiet zwischen dichter besiedeltem Gebiet und dem Grüngürtel in vielen Zählgebieten 25 – 30 % über 60-jährige so gibt es in den Stadterweiterungsgebieten im Nordosten und Süden Wiens viele Gebiete mit einem Anteil der unter 15-jährigen von 20-30%.

8 AUSBLICK

Nach Jahren der Methodenentwicklung verfügt Wien über einen flächendeckenden Überblick über Baum-, Strauch und Wiesenflächen sowie über Land- und Forstwirtschaft im Stadtgebiet. Mit der periodischen Gesamtdarstellung der Stadtvegetation über Eigentums- und Zuständigkeitsgrenzen hinweg, werden für Verwaltungsdienststellen erstmals gesamthafte Beurteilungen von Maßnahmen für die Stadtentwicklung möglich und die Erreichung der im Stadtentwicklungsplan Wien 2005 vorgegebenen Ziele überprüfbar.

Städtische Erholungsbereiche, Innenhöfe, begrünte Straßen, Parks, Naturdenkmäler und Wald zeigen in Wien die bisher erfolgreiche Planung, Einrichtung und Pflege der Stadtvegetation. Das BIOTOPMONITORING soll der Fortführung dieser Entwicklung, dem Ausarbeiten korrektiver Maßnahmen und der Sicherung der Wiener Stadtvegetation dienen.

9 LITERATUR:

BIOTOPMONITORING Berichte (1996-2002): http://www.wien.gv.at/umweltschutz/pool/biotop.html

BOLLNOW O.F. (2000): Mensch und Raum – 9. Auflage, Kohlhammer Verlag, Stuttgart, Berlin, Köln

BOLLNOW O.F. (1988): “Die Stadt, das Grün und der Mensch” – Vortrag in Japan; in: Zwischen Philosophie und Pädagogik, Norbert Friedrich Weitz Verlag, Aachen

GRUEHN D. unter Mitarbeit von LUTHER M. und KENNEWEG H. (2006): Bedeutung von Freiräumen und Grünflächen für den Wert von Grundstücken und Immobilien. ARC - system research GmbH, Wien

KEUL A.G. (1995): Wohlbefinden in der Stadt. In: Wohlbefinden in der Stadt - Umwelt- und Gesundheitspolitische Perspektiven. Keul (Hrsg), Beltz Verlag, Weinheim

LEBEN UND LEBENSQUALITÄT IN WIEN (2003): Grossstudie mit telefonischer Befragung von 8.300 Wienerinnen und Wienern.

http:// www.wien.gv.at/stadtentwicklung/lebeninwien/index.htm

MARTENS B., KEUL A. G. (2004): Evaluation in Progress - Strategies for Environmental Research and Implementation. 18th Confe-rence of the International Association for People-Environment Studies in Vienna

PILLMANN W., KELLNER K. KLAR J. (2002): Green Space Inventory in the City of Vienna: A BiotopMonitoring System based on Remote Sensing Methods. In: Urban Forests and Trees, Proceedings No. 1. DG Research, Office for Official Publicati-ons of the European Communities, 2002

PILLMANN W., KELLNER K., KLAR J. (2001): Grünrauminventar im städtischen Bereich – Methodik und Anwendung der flächende-ckenden Erfassung Wiener Grünräume. In: CORP2001, Technische Universität Wien

PIRHOFER G., STIMMER K. (2006): Pläne für Wien. Theorie und Praxis der Wiener Stadtplanung von 1945 bis 2005. Stadtentwicklung Wien 2007

RIES Ch., PILLMANN W., KELLNER K. STADLER P. (2002): Urban Green Space Management Information - Processing and use of re-mote sensing images and scanner data. In: Proceedings “EnviroInfo Vienna 2002”, Pillmann W., Tochtermann K. (eds.), Internat. Society for Environmental Protection, Vienna

RICICA K., VOIGT A. (1998): Raumverträglichkeit als Beitrag zur nachhaltigen Raumnutzung, Ein Leitfaden herausgegeben im Auf-trag der MA 22-Umweltschutz IRIS-ISIS Publications at ÖKK-Editions-vol.4 – Österreichischer Kunst- und Kulturver-lag, Wien 1998

RIENESL J. (2000): Wert der Natur - Naturschutzfachliche Bewertung als Beitrag zur Nachhaltigkeit. Wiener Beiträge zum Natur-schutz

SCHIPPERIJN J., PILLMANN W., TYRVÄINEN L. et al. (2005). Information for urban forest planning and management. In: Konijnendijk C.C., Nilsson K., Randrup T.B. et al. (eds.), Urban forests and trees. Springer, Berlin

SCHMIED A., PILLMANN W. (2003): Tree protection Legislation in European Cities. Urban Forests and Urban Greening UFUG 2 (2003):115-124

STRATEGIE FÜR DIE STÄDTISCHE UMWELT (2005): Mitteilung der Kommission an den Rat und das Europäische Parlament über eine thematische Strategie für die städtische Umwelt, KOM(2005) 718 endgültig, Brüssel, 11.1.2006

STEP 05 - STADTENTWICKLUNGSPLAN WIEN (2006): Stadtentwicklung und Stadtplanung, Magistratsabteilung 18, Magistrat der Stadt Wien

TOWARDS AN URBAN ATLAS: Assessment of spatial data on 25 European cities and urban areas (2002). Environmental Issue Report No. 30, European Environment Agency EEA, Copenhagen http://reports.eea.europa.eu/environmental_issue_report_2002_30/en

URBAN SPRAWL IN EUROPE (2006): http://reports.eea.europa.eu/eea_report_2006_10/en/eea_report_10_2006.pdf

WIENER ARTEN- UND LEBENSRAUMSCHUTZPRIOGRAMM, Netzwerk Natur (2000): Konzeption-Zusammenfassung. Herausgeber Wiener Umweltschutzabteilung MA 22 http://www.wien.gv.at/umweltschutz/naturschutz/wege/netzwerk.html

WILDWUCHS - VOM WERT DESSEN, WAS VON SELBST IST (2003). Redaktion: Mikocki J., Ricica K., Schreiner, Kastler. Herausgegeben von der Wiener Umweltschutzabteilung MA 22 anlässlich ihres 30-jährigen Bestehens.

🏆 *reviewed paper*

Wechselwirkungen zwischen Flächennutzung und Verkehr in einem dynamischen Umfeld – ein Modellsystem der bipolaren Hauptstadtregion Wien - Bratislava

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1 EINLEITUNG

Die österreichische Hauptstadt Wien und die slowakische Hauptstadt Bratislava liegen nur etwa 60 Kilometer voneinander entfernt. Zu Beginn des 20. Jahrhunderts waren die beiden Städte Teil der Österreichisch-Ungarischen Monarchie. Eine Straßenbahnlinie verband die beiden Städte miteinander und es gab einen regen wirtschaftlichen und kulturellen Austausch. Wiener Bürger fuhren z.B. zum Einkaufen oder für einen Opernbesuch nach Bratislava. Nach dem Zweiten Weltkrieg waren die beiden Städte jahrzehntelang durch den Eisernen Vorhang voneinander getrennt. Mit dem Ende des Kalten Krieges in den späten 1980ern begann die Isolation langsam zu bröckeln. Den bisherigen Höhepunkt in der Integration der Region Wien-Bratislava stellt der Beitritt der Slowakei zur Europäischen Union im Jahr 2004 dar. Durch diesen werden nach einer Übergangsfrist alle Handels- und Zollbarrieren verschwinden. In Verbindung mit der räumlichen Nähe entsteht dadurch eine dynamische Entwicklung des Raumes, welche die Region Wien-Bratislava zu einer einzigartigen Fallstudie macht. Dieser Extremfall bietet die Möglichkeit neue Erkenntnisse über die Dynamik der Wechselwirkungen zwischen Raum- und Verkehrsystem zu gewinnen.

Gleichgewichtsmodelle, die nur einen zukünftigen Zustand vorhersagen, sind für diese Situation ungeeignet. Als Konsequenz wurden in dem hier präsentierten Projekt zwei verschiedene Modelltypen angewendet, zum einen auf der Ebene der gesamten Region das integrierte, dynamische Flächennutzungsmodell MARS und zum anderen auf der Ebene des Korridors der Schnellbahnlinie S7 ein Cellular-Automata-Modell. Die Kombination dieser beiden Modelle bietet zahlreiche Synergien hinsichtlich der analysierbaren Fragestellungen.

Im ersten Schritt werden in der Region geplante und mögliche verkehrs- und raumplanerische Maßnahmen und Strategien untersucht. Eine davon ist z.B. die Verlängerung der Schnellbahnlinie S7 bis nach Bratislava. Mit Hilfe des Modells MARS werden die Auswirkungen verschiedener Szenarien auf die Gesamtregion untersucht. Mit MARS werden unter anderem die Entwicklung des Verkehrsaufkommens und die zeitlich-räumliche Arbeitsplatz- und Haushaltsmigration vorhergesagt. Diese Ergebnisse dienen in weiterer Folge als Rahmen und Input in die detaillierte, dis-aggregierte Modellierung der Flächennutzungsentwicklung innerhalb des Korridors der Schnellbahnlinie S7. Die zeitlich-räumliche Komponente der Modellergebnisse wird mit Hilfe der Software Animap in Form animierter GIS-Karten dargestellt.

2 DIE REGION WIEN – BRATISLAVA

2.1 Geschichte

Ende des 19., Anfang des 20. Jahrhunderts waren Wien und Bratislava Teil der Österreichisch-Ungarischen Monarchie (OECD, 2003). In dieser waren die beiden Staaten Österreich und Ungarn in relativ großer Unabhängigkeit unter einem gemeinsamen Monarchen vereint. Bratislava, damals nur unter seinem deutschen Namen Pressburg bzw. seinem ungarischen Namen Pozsony bekannt, war Teil des ungarischen Staates. Wien, die Hauptstadt Österreichs und der Monarchie, war damals mit ungefähr 2 Millionen Einwohnern die viertgrößte Stadt der Welt. Bratislava war mit seinen rund 70 Tausend Einwohnern eine aufstrebende Kleinstadt und nach 1900 die zweitwichtigste Industriestadt Ungarns. Wien und Bratislava waren durch Eisenbahn und Binnenschifffahrt verkehrlich gut erschlossen. 1914 wurde zwischen den beiden Städten mit großem Erfolg eine Straßenbahnverbindung eingeführt (OECD, 2003). Nichtsdestotrotz existierten zwischen Österreich und Ungarn zahlreiche Handelshemmnisse und Zölle. Firmen hatten es sehr schwer erfolgreich von außen Geschäfte abzuwickeln. Es war deshalb notwendig Zweigstellen in Ungarn zu eröffnen. Vor allem durch seine Nähe zu Wien profitierte Bratislava sehr stark von diesem Umstand.

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Nach dem Ende des Ersten Weltkriegs kam es 1918 zur Gründung der ersten Tschechoslowakischen Republik (ČSR) (Hanappi, 2006). In der folgenden Periode blieben trotz des Zerfalls der Donaumonarchie die Beziehungen zwischen den beiden Städten deutlich erkennbar (MA 18 - Stadtentwicklung und Stadtplanung, 2003). Zwischen 1939 und 1945 erlangte die Slowakei erstmals in der Geschichte die Unabhängigkeit, allerdings nur als Satellitenstaat des Deutschen Reichs. Nach Beendigung des Zweiten Weltkriegs wurde 1945 die Tschechoslowakische Republik wieder errichtet. 1948 übernahm die Kommunistische Partei die Führung im Land. In der Europäischen Nachkriegsordnung waren die beiden Metropolen Wien und Bratislava danach rund 40 Jahre lang durch den Eisernen Vorhang voneinander getrennt. Erst mit der Samtenen Revolution und dem Fall des Eisernen Vorhanges begann ab 1989 eine schrittweise Integration der beiden Städte zu einer funktionalen Region. 1993 wird die Slowakei ein selbständiger Staat. Der vorläufige Höhepunkt der Integration wurde 2004 mit dem EU-Beitritt der Slowakei erreicht. In der Zeit zwischen dem Ende des Zweiten Weltkriegs und dem Fall des Eisernen Vorhangs orientierte sich die Regionalentwicklung im österreichischen Teil des Grenzgebietes ausschließlich Richtung Westen und im slowakischen Teil ausschließlich Richtung Osten. Mit der Ostöffnung und vor allem seit dem EU-Beitritt der Mittel- und Osteuropäischen Länder (MOEL) hat sich die regionale Ausrichtung der räumlichen Entwicklung drastisch verändert. Der Korridor Wien – Bratislava wurde zur wichtigsten Entwicklungsachse der Region.

2.2 Sozio-Demographie und regionale Wirtschaft

Hinsichtlich ihrer Sozio-Demographie und Wirtschaftsstruktur weisen Wien und Bratislava deutliche Unterschiede aber auch einige Gemeinsamkeiten auf. Hinsichtlich der Einwohnerzahl wies Wien im letzten Jahrzehnt eine mehr oder weniger stagnierende Tendenz auf (Tabelle 1). Im gleichen Zeitraum wuchs die Bevölkerung im Wiener Umland stark an. Völlig konträr dazu verzeichnen sowohl Bratislava Stadt als auch der Kreis Bratislava einen relativ starken Bevölkerungsrückgang. Das Bruttoregionalprodukt (BRP) gemessen in Kaufkraftparitäten liegt sowohl in Wien als auch im Kreis Bratislava deutlich über dem nationalen Durchschnitt. Im Wiener Umland ist die Lage differenziert: der Süden Wiens liegt über dem Österreichischen Durchschnitt, der Norden und das Burgenland aber darunter. Bezogen auf die EU erreicht der Kreis Bratislava in etwa den Europäischen Durchschnitt. Wien und das südliche Wiener Umland weisen eine überdurchschnittliche Wirtschaftskraft auf, das nördliche Wiener Umland und der Norden des Burgenlands eine unterdurchschnittliche.

Region	Einwohner		BRP je Einwohner in Kaufkraftparität 1998	
	2001 (in 1000)	1991-2001 (%)	Index national = 100	Index EU = 100
Bratislava Stadt	428.7	-13.5		
Kreis Bratislava	599.0	-7.4	204	99
Wien	1550.1	+0.7	146	163
Wiener Umland Nord	278.8	+11.2	73	81
Wiener Umland Süd	294.2	+8.0	121	135
Nord Burgenland	141.3	+6.6	71	80

Tabelle 1: Vergleich einiger sozio-demographischer und wirtschaftlicher Indikatoren
Quelle: (Hrdina et al., 2002) S. 4, (MA 18 - Stadtentwicklung und Stadtplanung, 2003) S. 15 f., S. 123

Abbildung 1 zeigt einen Vergleich der Regionen hinsichtlich des Anteils der Arbeitskräfte nach Sektoren. Der Anteil der Beschäftigten im Servicesektor ist mit ungefähr 80% in Wien und im Kreis Bratislava deutlich höher als in Niederösterreich und im Burgenland mit etwas unter 70%. Der Kreis Bratislava hat im Vergleich der vier Regionen den höchsten Anteil im marktorientierten Servicesektor und gleichzeitig den niedrigsten Anteil im nicht marktorientierten Servicesektor.

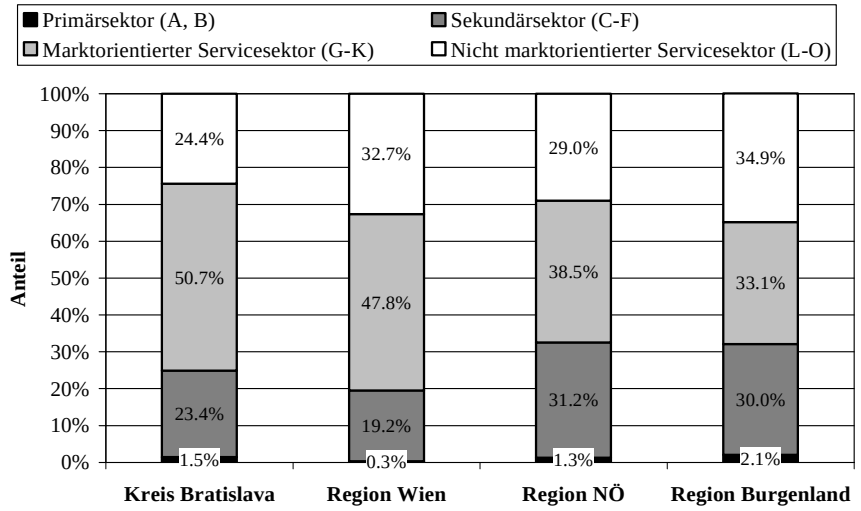

Abbildung 1: Anteil der Beschäftigten nach Sektoren und Region, Quelle: (MA 18 - Stadtentwicklung und Stadtplanung, 2003) S 127 f.

3 DAS MODELL MARS DER REGION WIEN-BRATISLAVA

3.1 Grundlagen

MARS (Metropolitan Activity Relocation Simulator) ist ein aggregiertes, dynamisches Flächennutzungs- und Verkehrsmodell. Das Modell basiert auf der Hypothese, dass Städte selbstorganisierende Organismen sind und daher die Prinzipien der Synergetik zur Beschreibung des Systemverhaltens angewendet werden können. Die methodologische Basis von MARS ist Systems Dynamics, eine in den 1960er Jahren am MIT entwickelte Methodik zur Beschreibung komplexer dynamischer Systeme[27] . Technische Details der Programmierung des Modells und seine Verknüpfung mit der dynamischen Kartographieapplikation ANIMAP werden in einem parallelen CORP-Beitrag präsentiert (Emberger and Riedl, 2007).

Die aktuellste Version von MARS ist in der systemdynamischen Programmierumgebung Vensim implementiert. Dieses Werkzeug wurde speziell in Hinblick auf dynamische Probleme entwickelt und eignet sich daher optimal für die Modellierung dynamischer Prozesse im Bereich der Siedlungsstruktur- und Verkehrsentwicklung. Das MARS-Modell umfasst mehrere modulare Submodelle. Dazu gehört ein Verkehrsmodell, welches das Verkehrsverhalten der Bevölkerung bei gegebenen Wohn- und Arbeitsorten simuliert. Es werden dabei die aggregierten Wegezwecke Arbeitspendeln [28] und Sonstige (Einkauf, Freizeit, etc.) unterschieden. Ein Wohnraumentwicklungs-Modell bildet die Bauentscheidungen von Wohnraumentwicklern ab, ein Wohnstandortentscheidungs-Modell die Wohnortentscheidungen der Haushalte. Analog dazu werden Entwicklung und Standortentscheidungen von Arbeitsstätten in einem Arbeitsstätten-Entwicklungs-Modell und einem Arbeitsstättenstandort-Modell simuliert. Dazu kommen Modelle, die Indikatoren wie Treibstoffverbrauch und Schadstoff-Emissionen abbilden. Die einzelnen Teilmodelle sind eng miteinander verknüpft, wie in Abbildung 2 dargestellt. Ein Modellauf umfasst im Allgemeinen einer Dauer von 30 Jahren, wobei die einzelnen Submodelle iterativ ablaufen. Der wichtigste Zusammenhang zwischen dem Verkehr- und den Flächennutzungsmodellen besteht aus Erreichbarkeitsindikatoren, die als Output des Verkehrsmodells in die Flächennutzungsmodelle eingehen, und in der Verteilung der Wohnorte und Arbeitsplätze, die als Output der Flächennutzungsmodelle im Verkehrsmodell berücksichtigt werden.

Entsprechend den Prinzipien von System Dynamics sind die Wirkungsmechanismen in MARS qualitativ in Form von Causal-Loop-Diagrammen dargestellt und direkt mit dem Programmcode zur quantitativen Simulation verbunden. Als Beispiel sei hier die Submodell zur Wohnraum-Entwicklung beschrieben (Abbildung 3). Der Rückkoppelungskreis H1 ist stabilisierend: Die Attraktivität einer Zone aus der Sicht von Wohnraumentwicklern hängt von der zu erreichenden Miete ab. Das Niveau der Mieten wird von überschüssiger Nachfrage nach Wohnraum angetrieben,

[27] Eine umfassende Beschreibung der Grundprinzipien und Methoden von Systems Dynamics gibt z.B. (Sterman, 2000)
[28] Beinhaltet auch die Wege zu Ausbildungsstätten.

die wiederum vom vorhandenen Bestand an Wohnungen und der Entwicklung von neuem Wohnraum abhängt. Durch die Entwicklung von zusätzlichem Wohnraum wächst dessen Bestand, was die überschüssige Nachfrage in der Zone reduziert, die erzielbaren Mieten senkt und die Attraktivität der Zone für Wohnraumentwickler verringert – der Wirkungskreis ist insgesamt stabilisierend. Der Regelkreis H2 hingegen ist eskalierend, da neuer Wohnraum die überschüssige Nachfrage nach Wohnraum reduziert, was in weiterer Folge Mieten und Grundpreise senkt und – unter ansonsten gleichen Bedingungen – die Wohnraumentwicklung weiter attraktiviert. Die Rückkoppelung H3 bildet die Beschränkung die Wechselwirkung zwischen Attraktivität einer Zone und Flächenverfügbarkeit der Zone ab; wenn weniger Land verfügbar ist, sinkt die Attraktivität der Zone – der Regelkreis ist stabilisierend. Dieser Zusammenhang wird in Regelkreis H4 um den Einfluss der Flächenverfügbarkeit auf den Grundpreis erweitert. Weitere Einflussgrößen sind die Anzahl der Einwohner, die Menge an Grünraum und die Erreichbarkeit von Aktivitäten in anderen Zonen; diese kommen als Input aus anderen Submodellen von MARS.

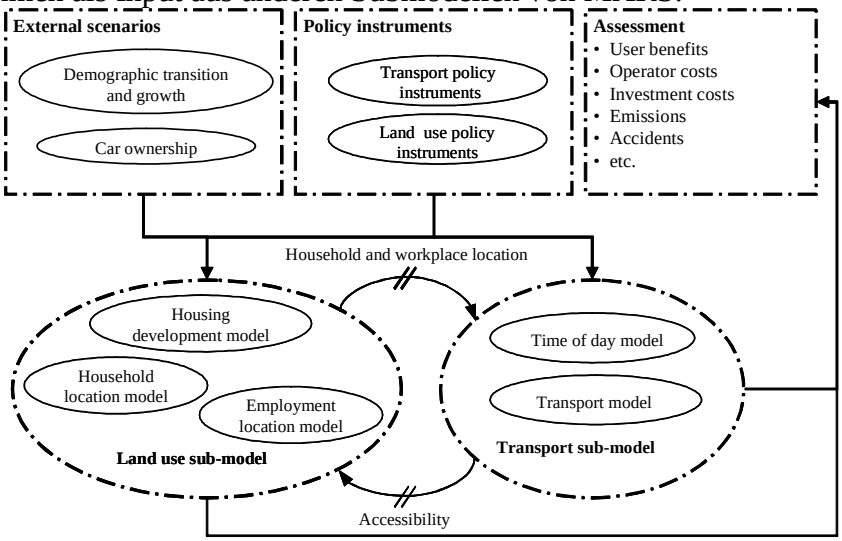

Abbildung 2: Grundstruktur des MARS Modells: Submodelle und deren Verknüpfung

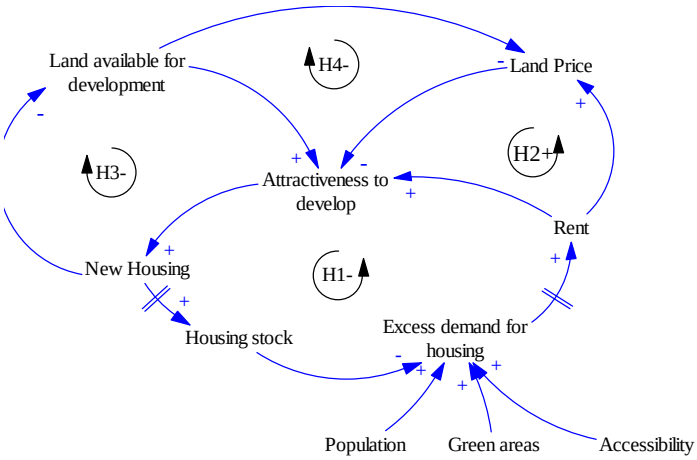

Abbildung 3: Causal-Loop-Diagramm des Wohnraum-Entwicklungs-Modells

3.2 Untersuchungsgebiet

Abbildung 4 zeigt die im Projekt PLUTO (Prediction of Land Use and Transport changes due to Open borders – a modelling framework for the Vienna – Bratislava metropolitan region) für die Anwendung des Modells MARS gewählte Abgrenzung des Untersuchungsgebietes. Das rund 15.000 Quadratkilometer große Untersuchungsgebiet umfasst die Stadt Wien, weite Teile Niederösterreichs, einen Teil des nördlichen Burgenlands und den Kreis Bratislava.

Für die Berechnungen mit dem Modell MARS wurde das Gebiet in 71 Zonen unterteilt. Die Zoneneinteilung orientierte sich an inhaltlichen und technischen Aspekten sowie an der Frage der Datenverfügbarkeit. In inhaltlicher Hinsicht wurde darauf geachtet, dass die Zonen einerseits in sich möglichst homogen sind, sich aber untereinander möglichst deutlich unterscheiden. Dabei wurden strukturelle und funktionale Charakteristika wie Bebauungs- und Besiedelungsdichte, Aus- und Einpendleranteile und Wirtschaftsstrukturen berücksichtigt. So wurden beispielsweise einige „lokale“ Zentren (z.B. St. Pölten oder Eisenstadt) als separate Zone, getrennt von ihrem Umland erfasst. Außerdem wurde in Hinblick auf die Modellierbarkeit von Infrastrukturmaßnahmen darauf geachtet, dass die Zonen möglichst nicht in den Einflussbereich mehrerer Verkehrsachsen fallen. Inhaltliche Überlegungen legten daher tendenziell eine möglichst feine Zoneneinteilung nahe.

Gleichzeitig wurden aus Gründen der Datenverfügbarkeit auf die Grenzen von Verwaltungseinheiten über der Gemeindeebene Rücksicht genommen. Speziell im slowakischen Teil, teilweise aber auch für Österreich, liegen auf der Ebene der Gemeinden nur sehr grundlegende Indikatoren (im wesentlichen Einwohner und Beschäftigte) in regional differenzierter Form vor. Besonders problematisch ist der Bereich der Immobilien-bezogenen Daten in der Slowakei. Hier gibt es derzeit lediglich Daten über Mietpreise für Wohnraum auf nationaler Ebene, d.h. ohne regionale Differenzierung. Statistisch repräsentative Informationen über Preise für Immobilieneigentum (Grundstücke und Wohnungen/Häuser) fehlen völlig (Cár, 2006). Auch im Bereich der verkehrsbezogenen Daten – beispielsweise bezüglich der Pendlerverflechtungen – bestehen derzeit noch erhebliche Lücken im Datenangebot. Bei der Abgrenzung der Region Wien-Bratislava wurde der slowakischen Teil daher vorläufig auf die Region („Kraj“) Bratislava eingeschränkt.

Modelltechnische Erwägungen hatten insofern einen Einfluss auf die Zoneneinteilung, als die Anzahl der Zonen limitiert werden musste, um Probleme mit der Stabilität und Laufzeit des Modells zu vermeiden. Das auf diese Art abgegrenzte Untersuchungsgebiet umfasst rd. 10.500 km², auf denen 3,4 Mio. Menschen leben und 1,6 Mio. Arbeitsplätze existieren (Tabelle 2). Der Vergleich zwischen dem österreichischen und dem slowakischen Teil des Untersuchungsgebietes zeigt, dass der österreichische Teil in absoluten Indikatoren wie Fläche, Einwohner- und Beschäftigtenzahlen gemessen wesentlich größer ist: den 8.479 km² in Österreich stehen 1.979 km² in der Slowakei gegenüber; bei den Einwohner ist das Verhältnis bei 2,8 Mio. (Österreich) zu 0,6 Mio. (Slowakei) und bei den Arbeitsplätzen 1,3 Mio. (Österreich) zu 0,3 Mio. (Slowakei).

Bei der Zoneneinteilung wurde – wie beschrieben – versucht, möglichst in sich homogene Zonen zu definieren. Zwischen den einzelnen Regionen treten hingegen deutliche Unterschiede auf. Als Beispiel: Die

Zone mit der geringsten Anzahl von Arbeitsplätzen – der Bezirk Čunovo am Südostrand von Bratislava – weist 186 Arbeitsplätze auf, der historische Kern von Wien (1. Wiener Gemeindebezirk) dagegen rd. 102.000. Im Allgemeinen liegen zwischen den kleinsten und größten Zonen bei den absoluten Indikatoren in etwa 3 Größenordnungen und die Standardabweichungen der Indikatoren sind von ähnlicher Größenordnung wie die Mittelwerte. In dieser Beziehung gibt es keinen wesentlichen Unterschied zwischen dem österreichischen und dem slowakischen Teil. Auch hinsichtlich der meisten relativen Indikatoren wie Siedlungsdichte, Fahrzeugbesitz und Grundpreis unterscheiden sich die Zonen deutlich (Tabelle 3).

	Fläche (km²)			Einwohner			Arbeitsplätze		
	Gesamt	Österreich	Slowakei	Gesamt	Österreich	Slowakei	Gesamt	Österreich	Slowakei
Insgesamt	10,457.4	8,478.5	1,978.9	3,398,362	2,775,040	623,322	1,643,878	1,303,558	340,320
Minimum	1.1	1.1	6.5	787	4,899	787	186	4,242	186
Maximum	877.1	820.9	877.1	150,636	150,636	124,685	101,668	101,668	100,000
Durchschnitt	147.3	166.2	98.9	47,864	54,413	31,166	23,153	25,560	17,016
Standardabw.	212.5	211.8	211.9	41,367	33,015	32,026	18,700	19,165	23,446

Tabelle 2: Die 71 MARS Modellzonen in absoluten Indikatoren (statistische Kennzahlen)

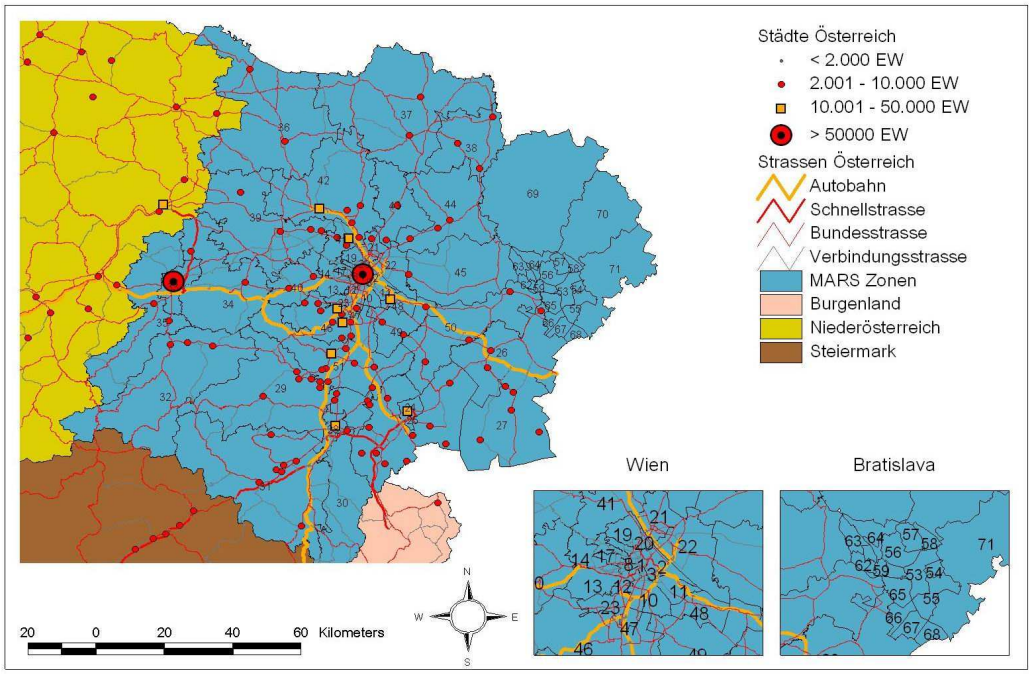

Abbildung 4: Untersuchungsgebiet und Einteilung in 71 Zonen

3.3 Kalibrierung

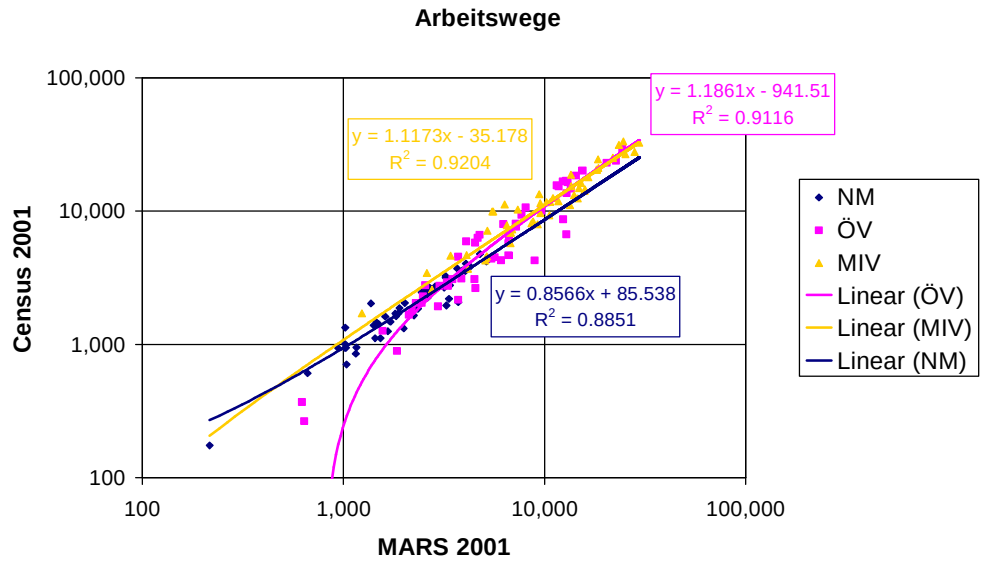

Abbildung 5: Vergleich der Zahl der Arbeitswege nach Quellzone und Verkehrsmittel für das Basisjahr 2001 mit den Ergebnissen der Pendlerstatistik; Quellen: (Statistik Austria, 2004a; b; c)

Für die hier vorgestellte Version des Modells MARS der Region Wien – Bratislava wurde noch keine Kalibrierung des Flächennutzungsmodells durchgeführt. Es wurden die Parameter des Modells von Wien verwendet (Pfaffenbichler, 2003). Einer der nächsten Arbeitsschritte ist deshalb die Neukalibrierung des Modells hinsichtlich der Änderung der Flächennutzungen im Zeitraum 1991 bis 2001. Der Verkehrsmodellteil wurde mit den Daten des Quellpendelverkehrs unterschieden nach Verkehrsmitteln aus der Volkszählung 2001 (Statistik Austria, 2004a; b; c) kalibriert. Leider konnten für den slowakischen Teil des Untersuchungsgebietes bisher keine entsprechenden Daten gefunden werden. Abbildung 5 zeigt eine Gegenüberstellung der mit Hilfe des Modells MARS berechneten Pendlerwege mit den Daten der Volkszählung. Die Übereinstimmung ist mit einem R^2 von ungefähr 0.9 und einer Steigung nahe dem Wert 1 für alle drei Verkehrsmittel als gut einzustufen (Durch die doppelt logarithmische Darstellung erscheint die Regressionsgerade nicht notwendigerweise als Gerade).

4 DAS CELLULAR-AUTOMATA MODELL DES KORRIDORS S7 ZWISCHEN WIEN UND BRATISLAVA

Abbildung 6 zeigt das für das Cellular-Automata Modell gewählte Untersuchungsgebiet. Die Darstellung beinhalte das Stadtgebiet von Wien, die Gewässerflächen (blaue Linien), wichtige Straßenverbindungen (gelbe Linien), Bahnlinien (rote Linien), Bahnhöfe und „Keimlinge“ der Neuansiedlungen. Abbildung 6 ist das Resultat einer ersten Bearbeitung der im Modell berücksichtigten Parameter. Einer der für die „Keimlinge“ besonders wichtigen Parameter ist die räumliche Nähe zu einem Bahnhof. Die meisten Siedlungen haben sich innerhalb des hellgrünen Puffers rund um die Bahnhöfe entwickelt. Ein weiterer relevanter Faktor ist die Nähe zu hochrangiger Straßeninfrastruktur. Die Nähe zu Wasserflächen stellt ebenfalls einen Attraktivitätsfaktor dar. Es ist evident, dass das urbane Zentrum Wien für die Entwicklung der Siedlungsfläche eine große Anziehungskraft ausübt. Die Neigung des Geländes im gesamten Untersuchungsgebiet ist so gering, dass sie als konstant angenommen werden kann und daher im Cellular-Automata Modell keine Auswirkung auf die Siedlungstätigkeit hat. Zwar gibt es im Umfeld von Wien noch freie Flächen innerhalb des Bahnhofsnähepuffers, das größte Potential liegt aber im Osten des Untersuchungsgebiets Richtung Bratislava. Die Öffnung der Grenzen, die mögliche Verlängerung der Bahnlinie (siehe Abschnitt 5.1) und die dadurch wirksam werdende Anziehungskraft des Ballungsraumes Bratislava erhöhen dieses Potential noch zusätzlich. Der nächste Arbeitsschritt in der Entwicklung des Cellular-Automata Modells ist daher die Vervollständigung der Datenbasis auf der slowakischen Seite des Untersuchungsgebiets.

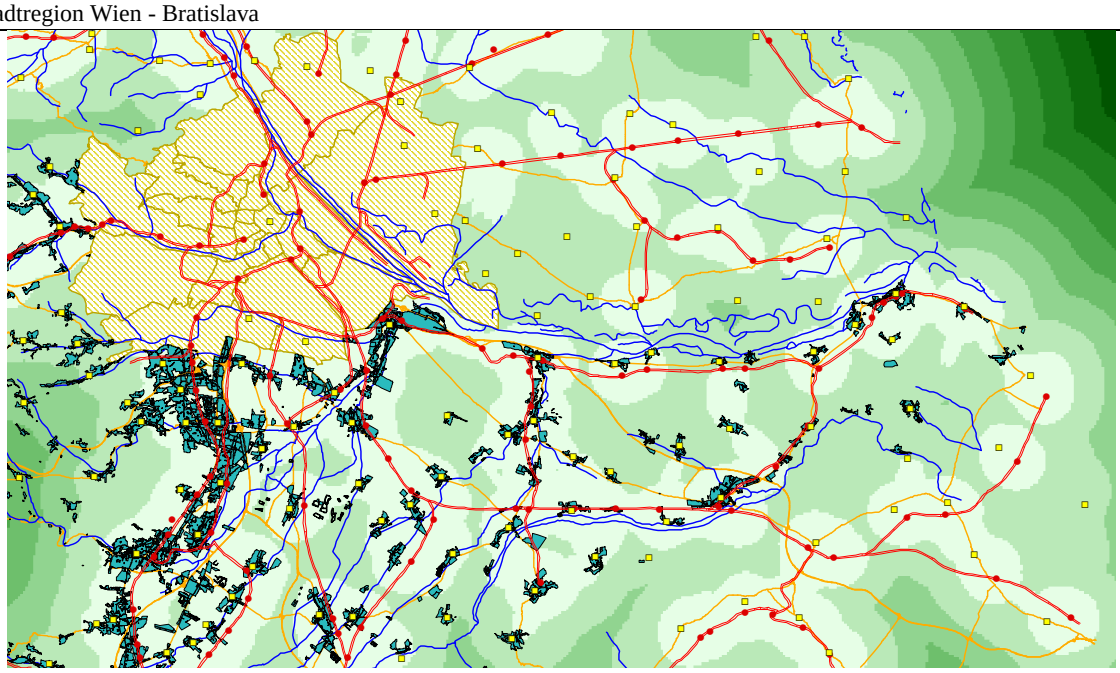

Abbildung 6: Der Korridor der Eisenbahnlinie S7 zwischen Wien und Bratislava

5 VERKEHRLICHE MASSNAHMEN

Ziel der Anwendung der Modellkombination MARS - Cellular-Automata ist die Beurteilung der Auswirkungen verschiedener verkehrsplanerischer und raumordnungspolitischer Maßnahmen. Die folgenden Abschnitte beschreiben zwei der zu untersuchenden verkehrsplanerischen Maßnahmen.

5.1 Öffentlicher Verkehr

Derzeit bestehen drei Möglichkeiten mit dem öffentlichen Verkehr von Wien nach Bratislava zu gelangen (Amon, 2004) S. 33:

- mit der Bahn nördlich der Donau über Marchegg nach Bratislava,
- mit der Bahn südlich der Donau über Parndorf nach Petrzalka und
- mit der Buslinie der Firma Eurolines.

Der so genannte Marchegger Ast ist nicht elektrifiziert, eingleisig, auf eine Höchstgeschwindigkeit von 120 km/h ausgelegt und 66 Kilometer lang. Die südliche Strecke über Parndorf ist elektrifiziert, zum Teil zweigleisig, auf 140 km/h ausgelegt und 74 Kilometer lang. Kürzlich wurde das Angebot wesentlich verbessert. Werktags verkehren derzeit 37 direkte Züge von Wien Südbahnhof nach Bratislava, davon 18 über den Marchegger Ast nach Bratislava Hautbahnhof und 19 über Parndorf nach Bratislava Petrzalka [29]. Die Fahrtzeit ist für beide Varianten relativ ähnlich. Die minimale Fahrzeit beträgt 47 Minuten, die maximale 1:10 h. Die große Mehrheit der Verbindungen benötigt knapp unter einer Stunde.

Als ein Maßnahme zur Attraktivierung des öffentlichen Verkehrs schlägt (Amon, 2004) den zweigleisigen Ausbau und die Beschleunigung des Marchegger Astes auf eine Höchstgeschwindigkeit von 160 km/h vor. Die Fahrzeit soll dadurch auf 75% der Dauer einer Pkw-Fahrt reduziert werden. Eine weitere Möglichkeit zur Attraktivierung des öffentlichen Verkehrs stellt die Verlängerung der Schnellbahnlinie S7 nach Bratislava Petrzalka dar. Mit einer Trassenführung über Petronell und Kittsee ist eine Fahrzeit von 41 Minuten möglich (Topalgökceli, 2005).

5.2 Motorisierter Individualverkehr

Die österreichische Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft ASFINAG betreibt derzeit im Großraum Wien etliche Planungs- und Neubauprojekte (ASFINAG, 2006). Von besonderer Bedeutung für den Raum Wien-Bratislava sind dabei die teilweise bereits fertig gestellte Wiener Außenring Schnellstraße S1 und die im Bau befindliche Nordost Autobahn A6 Spange Kittsee. Mit der geplanten

[29] Quelle: Fahrplanabfrage www.oebb.at am 27.2.2007

Eröffnung der Spange Kittsee Ende 2007 besteht eine durchgängige Autobahnverbindung zwischen Wien und Bratislava. Die kürzeste Verbindung der beiden Stadtzentren führt über die Preßburger Bundesstraße B9 mit dem Nadelöhr Hainburger Tor und ist circa 68 Kilometer lang4. Die Fahrzeit über diese Strecke beträgt etwa 59 Minuten [30]. Die Verbindung über die Nordost Autobahn A6 ist etwa 78 Kilometer deutlich länger [31]. Durch die höheren möglichen Geschwindigkeiten reduziert sich die Fahrzeit trotzdem auch rund 55 Minuten.

6 ERSTE ERGEBNISSE

Sowohl das Modell MARS als auch das Cellular-Automata-Modell des Korridors Wien-Bratislava befinden sich derzeit noch in Entwicklung. Das Modell MARS ist noch nicht vollständig kalibriert und zur Abbildung der Maßnahmen müssen noch einige Daten erhoben werden. Im Folgenden werden erste Ergebnisse des Modells MARS für das Nullszenario, d.h. keinerlei Änderungen in der Verkehrsinfrastruktur, präsentiert. Abbildung 8 zeigt die prognostizierte räumlich Entwicklung der Veränderungen der Einwohnerzahlen zwischen 2006 und 2016. Wien und sein südliches Umland verlieren in diesem Szenario Einwohner. Das nördliche Umland und der Raum zwischen Wien und Bratislava dagegen gewinnen Einwohner. Aufgrund der noch ausständigen Neukalibrierung des Flächennutzungsmodells sind diese Ergebnisse allerdings mit Vorsicht zu genießen. Abbildung 9 stellt den Verkehrsaufwand für Pendlerwege mit dem Auto bezogen auf die Einwohnerzahl dar. Der linke Teil der Abbildung zeigt die räumliche Aufteilung dieses Indikators im Jahr 2006. Die niedrigsten Entfernungen werden in den Stadtzentren von Wien und Bratislava zurückgelegt. Die mit dem Pkw zur Arbeitsstätte zurückgelegten Weglängen steigen mit der Entfernung zu den Zentren sukzessive an. Der rechte Teil der Abbildung zeigt die Veränderungen zwischen 2006 und 2016. Die zurückgelegten Entfernungen steigen in allen Zonen an. Besonders stark sind die Zunahmen in Bratislava, Wien und dem nördlichen Niederösterreich. Aus Platzgründen können die entsprechenden öffentlichen Verkehr und die nicht motorisierten Verkehrsteilnehmer hier nicht dargestellt werden.

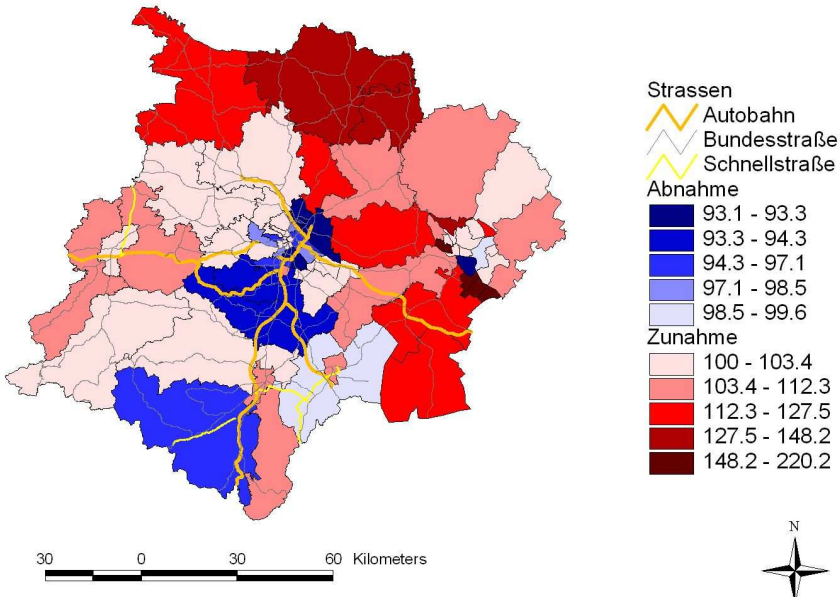

Abbildung 8: Entwicklung der Zahl der Einwohner 2006 bis 2016 (Index 2006 = 100)

[30] Quelle: Routenplaner auf www.herold.at, Zugriff: 7.3.2007
[31] Quelle: Routenplaner auf www.herold.at, Zugriff: 7.3.2007 und (ASFINAG, 2006)

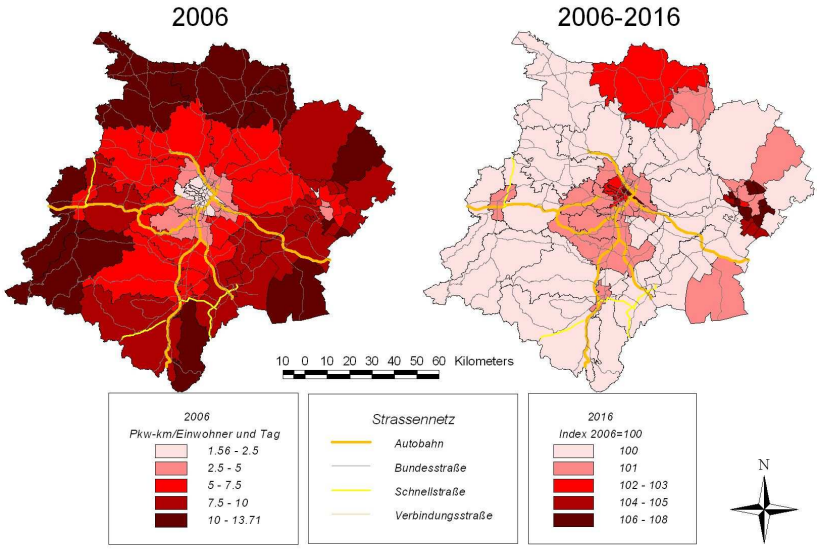

Abbildung 9: Verkehrsaufwand für Arbeitswege in der Morgenspitze in Pkw-Kilometer je Einwohner 2006 und Änderungen bis 2016

7 SCHLUSSFOLGERUNGEN

Der Wegfall des Eisernen Vorhangs löste im Raum Wien – Bratislava eine äußerst dynamische Entwicklungsphase aus. Statische Modelle sind in dieser Situation keine geeigneten Prognoseinstrumente. Deshalb wird in dem hier präsentierten Projekt ein dynamisches Modellsystem entwickelt. Dieses besteht auf der strategischen Ebene aus einem den Prinzipien von Systems Dynamics folgenden, integrierten Flächennutzungs- und Verkehrsmodell und auf der Detailebene aus einem Cellular-Automata Modell. Beide Modelle befinden sich derzeit noch im Entwicklungsstadium. Die hier präsentierten ersten Ergebnisse sind aber viel versprechend.

Eine große Schwierigkeit stellt die Datenverfügbarkeit dar. Vor allem im slowakischen Teil des Untersuchungsgebietes ausreichend repräsentative und räumlich differenzierten Date kaum vorhanden bzw. zugänglich. Dies betrifft insbesondere den Immobilien- und Verkehrsbereich. In den bisherigen Arbeiten wurde versucht, die derzeit noch bestehenden, erheblichen Lücken durch Informationen von der nationalen Ebene zu füllen. Auf diese Art können, auch wenn innerslowakische Disparitäten fehlen, zumindest die Unterschiede zwischen dem österreichischen und dem slowakischen Teil berücksichtigt werden. Für den Fall, dass in Zukunft zusätzliche Daten beschafft werden können, soll das Untersuchungsgebiet auch im slowakischen Teil ausgeweitet werden, um so auch das lokal bedeutende Zentrum Trnava zu berücksichtigen.

Der Verkehrsteil des Modells MARS wurde für das Jahr 2001 kalibriert. Allerdings sind räumlich ausreichend differenzierte Daten nur für den Pendlerverkehr und nur für den österreichischen Teil des Untersuchungsgebiets verfügbar. Für andere Wegezwecke sind lediglich räumlich aggregierte Ergebnisse aus Haushaltsbefragungen zugänglich. Um die Parameter für das Flächennutzungsmodell neu zu bestimmen, wird im nächsten Arbeitsschritt ein Modell mit dem Basisjahr 1991 aufgesetzt. Der Flächennutzungsteil wird dann auf die Änderungen der Wohneinheiten, Einwohnerzahlen und Arbeitsplätze zwischen 1991 und 2001. Die so ermittelten Parameter werden dann im Modell mit dem Basisjahr 2001 verwendet. Mit diesem werden dann die großräumigen Auswirkungen von Maßnahmen wie der Verlängerung der Schnellbahnlinie S7, des Baus der Spange Kittsee und verschiedener raumordnungspolitischer Szenarien prognostiziert. Die großräumigen Entwicklungen bilden einen Teil des Inputs in das Cellular-Automata Modell.

8 DANKSAGUNG

Wir möchten uns bei der Wiener Wirtschaftskammer dafür bedanken, dass sie das, diesem Beitrag zugrundeliegende Projekt PLUTO (Prediction of Land Use and Transport changes due to Open borders – a modelling framework for the Vienna – Bratislava metropolitan region) durch die Zuerkennung des Wiener Wirtschaftskammerpreises 2006 ermöglicht hat.

9 LITERATUR

Amon, B. (2004). "Optionen zur angebotsseitigen Verbesserung des grenzüberschreitenden öffentlichen Personenverkehrs in der Europaregion Wien." Diplomarbeit, Ass. Prof. Dipl. Ing. Dr. Bardo Hörl, Institut für Verkehrssystemplanung, Fakultät für Architektur und Raumplanung, Technische Universität Wien, Wien.

ASFINAG. (2006). "Planungs- und Neubauprojekte in Österreich." Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft (ASFINAG), Wien. http://www.asfinag.at/index.php?idtopic=270, 8.3.2007.

Cár, M. (2006). "Monitoring Residential Property Prices in Slovakia." BIATEC 14 (1), 9–15.

Emberger, G., and Riedl, L. (2007). ""MARS meets ANIMAP" - Die Koppelung der Modelsuite MARS mit dynamischer Internet-Karographie." REAL CORP 007: To Plan Is Not Enough, Vienna.

Hanappi, I. (2006). Bratislava - Gehen, Sehen & Genießen, Falters CITY walks, Falter Verlag, Wien.

Hrdina, V., Hanus, J., Slimak, D., et al. (2002). "Background Report on the Territorial Review of Vienna - Bratislava Region." AUREX, s.r.o. (architecture, urban planning, spatial and regional planning, ecology and environment, informatics); Commissioned by OECD, Bratislava.

MA 18 - Stadtentwicklung und Stadtplanung. (2003). Vienna - Bratislava Region, Austrian Background Report for the OECD Territorial Review and 'Assessment and Recommendations' of the OECD, Werkstattberichte, Nr. 59, Stadtentwicklung Wien, MA 18 - Stadtentwicklung und Stadtplanung, Wien.

OECD. (2003). OECD Territorial Review Vienna-Bratislava, Austria/Slovak Republic, Organisation for Economic Co-operation and Development, Paris.

Pfaffenbichler, P. (2003). "The strategic, dynamic and integrated urban land use and transport model MARS (Metropolitan Activity Relocation Simulator) - Development, testing and application." Doctoral thesis, Institute for Transport Planning and Traffic Engineering, Vienna University of Technology, Vienna. http://www.ivv.tuwien.ac.at/publications/online/MARS_smallest_size.pdf

Statistik Austria. (2004a). Volkszählung Hauptergebnisse II - Burgenland, Herausgegeben von Statistik Austria, Wien.

Statistik Austria. (2004b). Volkszählung Hauptergebnisse II - Niederösterreich, Herausgegeben von Statistik Austria, Wien.

Statistik Austria. (2004c). Volkszählung Hauptergebnisse II - Wien, Herausgegeben von Statistik Austria, Wien.

Sterman, J. D. (2000). Business Dynamics - Systems Thinking and Modeling for a Complex World, McGraw-Hill Higher Education.

Topalgökceli, M. (2005). "Vergleich von Trassenvarianten einer Bahnverbindung zwischen Wien und Bratislava unter besonderer Berücksichtigung der Lage des Flughafens." Diplomarbeit, Univ. Prof. Dipl. Ing. Dr. Norbert Ostermann and Univ. Ass. Dipl. Ing. Dr. Bernhard Rüger, Institut für Eisenbahnwesen, Verkehrswirtschaft und Seilbahnen, Fakultät für Bauingenieurwesen, Technische Universität Wien, Wien.

🏆 *reviewed paper*

ÜBERBAUUNGSORDNUNGEN DURCH KOOPERATION VON STAAT UND PRIVATEN

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1 PROBLEMSTELLUNG : BÜRGERNÄHE UND FLEXIBILISIERUNG

1.1 Ausgangspunkt: Hoheitliche Gestaltung der Raumordnung

Die Entwicklung einer Stadtbauordnung ist eine öffentliche Aufgabe, zu deren Erfüllung grundsätzlich hoheitliche Instrumente einzusetzen sind. Einerseits werden Interessen der Allgemeinheit berührt und wahrgenommen, die in einem offenen, politischen Diskurs festgestellt und austariert werden müssen. Andererseits müssen zu Gunsten der Einzelnen (Grundeigentümer, Bauherrschaften, Investoren, je auch als Drittbetroffene) nach allen Seiten Transparenz und Sicherheit der Entscheidungen gewährleistet sein. Unter beiden Gesichtspunkten müssen die allgemeinen Verfahren der Entscheidungen und der Rechtsvorkehren (Beschwerdewege) für alle Betroffenen in gleicher Weisein beschritten werden können. Diesen zentralen Anliegen der Demokratie und des Individualrechtsschutzes (Eigentumsgarantie, Rechtssicherheit) kann im Grunde nur durch hoheitliche und einseitige Akte des Staates (Raumordnungs- und Baugesetze, Flächenwidmungs- und Bebauungspläne, individuelle Verwaltungsakte) Genüge getan werden.

Freilich ist es längst geboten, dass die staatlichen Behörden, vorzugsweise der Exekutivebene, mit den betroffenen Privaten das Gespräch suchen, ihre Interessen ergründen, darauf eingehen und namentlich angedrohte behördliche Massnahmen erörtern. Umgekehrt geht der sorgfältige Grundeigentümer und Investor frühzeitig auf die Verwaltung zu, unterbreitet seine Vorstellungen, sucht nach Übereinstimmungen. Hier der Staat, der schlechthin von oben herab diktiert, dort der Private, der drohend den Staat unter Druck setzt, sind nicht überlebensfähige, sind überlebte Handlungsweisen. Sowohl das planende Gemeinwesen als auch die von Planung Betroffenen (und Begünstigten) suchen die Zusammenarbeit. Gewisse Kooperationen (informeller wie formeller Art) sind also längst existent. Dennoch spielt die hoheitlich-einseitige Planfestsetzung nach wie vor die zentrale Rolle und stellt das letztlich massgebende Instrument der Raumordnung und der Stadtentwicklung dar.

1.2 Optimierung der Steuerungsfunktion von Planungsakten

Die Steuerungswirkung der hoheitlich-einseitigen Planung ist begrenzt. Die vom Gemeinwesen für Bauland vorgesehenen und vorgeschriebenen Nutzungen werden häufig nicht realisiert, weil das Land beispielsweise als Kapitalanlage gehortet wird. Dadurch geht Bauland «verloren» und muss andernorts, meist zu Lasten unbebauter und eigentlich für andere Zwecke zu verwendender Flächen, neu geschaffen werden [9, S. 33]. Sodann besteht häufig keine Kongruenz zwischen den Vorstellungen des Gemeinwesens an einer bestimmten Stadtbauordnung und den Bedürfnissen der Eigentümer an einer bestimmten Nutzung ihrer Grundstücke. Einseitigkeit gibt es aber auch auf der Seite der Privaten: Zum Beispiel wird die Wahl von Standorten durch Betriebe und Investoren nicht selten durch kurzfristige, unmittelbare Nachfragedefinition gelenkt und wenig an weiten Horizonten der Betriebs- und Raumentwicklung ausgerichtet. Diese Mängel sollen durch Kooperation von Staat und Privaten zu beheben oder wenigstens zu mildern versucht werden.

Die klassischen Nutzungsordnungen sind Rahmenordnungen: Sie regeln die zulässigen Nutzungen. Damit steuern sie aber nur den Ausschluss der nicht erlaubten Nutzungen (Negativplanung). Sie können nicht gewährleisten, dass die vorgesehenen Nutzungen tatsächlich realisiert werden. Eine Positivplanung könnte etwa durch hoheitliche Regelungen angestrebt werden, die die Grundeigentümer in Pflicht nehmen, die durch Planung festgesetzten Nutzungen zu realisieren. So könnten in die Baugesetze allgemeine Nutzungspflichten aufgenommen werden; als Sanktion könnte zum Beispiel die Rückstufung der Grundstücke in einen Status von Nichtbauland vorgesehen werden. Denkbar wäre auch, dass die Planungsakte, die die Nutzungen für ein umgrenztes Areal festsetzten, selbst konkrete Nutzungspflichten vorsähen. Der mangelnden Steuerungsfähigkeit der hoheitlich-einseitigen Planung kann aber auch – unter Vermeidung neuer hoheitlicher, vielleicht auch unverhältnismässiger Regulierung (Verletzung der Eigentumsgarantie?) – durch anreizbildende Kooperationen zwischen Staat und Privaten entgegen gewirkt werden. Dadurch kann sich der hoheitliche Eingriff im Sinne des Verhältnismässigkeitsgrundsatzes zu einem «Interventionsminimum» [12, S. 974] reduzieren.

1.3 Gesellschaftlicher Wandel: Versuche des Ausgleichs und neues Bürgerverständnis

Der Wandel der Gesellschaft erfasst auch das Verhältnis von Staat und Privaten. Hier interessiert, dass die individuelle Bedürfnisverfolgung immer stärker hervortritt und kollektives Denken abgeschwächt wird. Damit einher geht eine veränderte Einschätzung der Stellung des Bürgers zum Staat. Das Konzept der Subordination des Bürgers unter den Staat: der Bürger als «Rechtsunterworfener», weicht einem mehr partnerschaftlichen Verständnis des Verhältnisses von Staat und Privaten. Der Bürger bildet Ansprüche auf Teilhabe und Rücksichtnahme aus; der Staat erscheint ihm vermehrt in seiner dienenden Funktion. Der Staat seinerseits reagiert darauf mit einer Umorientierung der Verwaltungsführung und -tätigkeit an Kriterien der Dienstleistung, der Produkt- und Ergebnissteuerung, der Nutzensteuerung (New Public Management oder neuer: Public Management). Die Rechts- und Planverwirklichung ist dadurch nicht allein auf den Erlass hoheitlich-einseitiger Akte fokussiert, sondern erheischt den Einsatz wirkungsorientierter Instrumente, zu denen namentlich der Vertrag gerechnet wird.

1.4 Akzeptanzerfordernisse und Flexibilisierung der Problemlösung

Damit einher gehen Erfordernisse der Erleichterung und Flexibilisierung der Problemlösung. Man rechnet damit, dass Lösungen, die von den Betroffenen akzeptiert werden oder worden sind, leichter und schneller umgesetzt werden. Und: Wer akzeptiert, ist zur verzögernden Beschwerde nicht berechtigt. Hinzu kommt, dass die Vorstellung Raum gewinnt, dass starre Instrumente mit stark formalisierter Ausprägung durch bewegliche Formen abgelöst oder wenigstens ergänzt werden sollen. Dadurch sollen inhaltliche, zeitliche, soziale und finanzielle Beengungen aufgebrochen werden. Kooperatives Handeln ist schneller, bietet mehr Flexibilität und vermag deshalb die (wirtschaftlichen, sozialen, politischen) Kosten zu senken. Zu bedenken ist allerdings auch, dass einmal getroffene Planungsentscheide leichter abänderbar sind, wenn sie in hoheitliche Formen gegossen worden sind als wenn sie auf Vertrag beruhen, dessen Abänderung die Zustimmung der Vertragspartner voraussetzt.

2 VERFASSUNGSRECHTLICHE ANKNÜPFUNG

2.1 Offenheit und Geschlossenheit der Verfassung

Die Verfassung eines demokratischen Staates bildet dessen rechtliche Grundordnung. Sie begründet die staatliche Organisation als Rechtsgemeinschaft (Kurt Eichenberger) und schafft eine bestimmte Ordnung der Erfüllung von öffentlichen Aufgaben, die sie konstituiert. Hierzu stellt sie die unerlässlichen Mittel und Instrumente zur Verfügung.

Eine offene Verfassung lässt bei gleichbleibendem Verfassungstext zeitgemässe Entwicklungen zu, die von den nachfolgenden Behörden (Gesetzgeber, Verwaltung, Gerichte), dem gesellschaftlichen Wandel folgend, ausgebildet werden können. Eine geschlossene Verfassung bietet demgegenüber keine Flexibilität, sondern normiert streng und abschliessend. Eine und dieselbe Verfassung kann offene und geschlossene Elemente und sämtliche Zwischenformen enthalten; ihre Normen sind einzeln danach zu befragen. Im Allgemeinen neigt das Verfassungsverständnis zur Annahme eher offener Verfassungsnormen.

2.2 Keine Vorausbestimmung der Handlungsformenwahl durch die Verfassung

Die Frage, ob von offener oder geschlossener Verfassung auszugehen ist, erweist sich als wegleitend für die nächste Frage, ob die Verfassung die Wahl der Handlungsformen vorweg eindeutig bestimmen muss. Wird die Frage bejaht, so können Gesetzgeber und Verwaltung kooperative Handlungsformen nur einsetzen, wenn dies von der Verfassung ausdrücklich erlaubt oder vorgeschrieben ist. In seinem Erkenntnis vom 13. Oktober 1999 zur Salzburger Vertragsraumordnung (G77/99, V29/99) hat der österreichische Verfassungsgerichtshof entschieden, dass eine zwingende Verknüpfung eines (privatrechtlichen) Vertrags mit der Erlassung von Raumordnungsplänen «vom System der Bundesverfassung nicht vorgesehen» sei. Daraus ist abgeleitet worden, mangels ausdrücklicher Zulassungsnorm verbiete die Verfassung den Einsatz von Verträgen in der Raumordnung. Indessen muss das genannte Erkenntnis anders gelesen werden: Es ist verfassungswidrig, dass der Abschluss eines Vertrags der Erlassung eines Planungsakts zwingend vorangehen muss, so dass infolge der Weigerung, einen Vertrag abzuschliessen, die Planungsmassnahme ausbleibt und dadurch verfassungsmässige Rechte (Eigentum, Rechtsgleichheit, Rechtsschutzgarantie) unverhältnismässig

eingeschränkt werden [19; 9, S. 87 ff.]. Es ging mit andern Worten nicht darum, dass das Planungsinstrumentarium in der Verfassung bestimmt geregelt sein muss, sondern um den generell geltenden Grundsatz, dass verfassungsmässige Rechte der Bürger durch Rechtsanwendung und -durchsetzung nicht in verfassungswidriger Weise eingeschränkt werden.

Es kann nicht Aufgabe der Verfassung sein, die Handlungsformen der Verwaltung im Einzelnen vorzuschreiben. Der Umstand allein, dass die Verfassung die Verwendung des Vertrags im Zusammenhang mit einer Planfestsetzung nicht vorsieht, kann nicht zur Unzulässigkeit der Massnahme führen. Namentlich im Planungsrecht muss just von Verfassungs wegen Offenheit darüber bestehen, wie die Ziele erreicht werden. Zentral ist indessen, dass den einzelnen Planungsmassnahmen und Planungsverordnungen ein Gesetz zugrunde liegen muss (Legalitätsprinzip).

2.3 Legalitätsprinzip

Art. 18 Abs. 1 des Bundes-Verfassungsgesetzes von Österreich (B-VG) enthält dieses Legalitätsprinzip; er schreibt vor, dass die gesamte staatliche Verwaltung nur auf Grund der Gesetze ausgeübt werden darf. Art. 18 Abs. 2 B-VG bestimmt, dass jede Verwaltungsbehörde auf Grund der Gesetze innerhalb ihres Wirkungsbereiches Verordnungen erlassen kann; damit wird nur der sogenannten sekundären Rechtssetzung der Boden bereitet, die sich freilich als gesetzmässig erweisen muss. Die Verfassungen anderer demokratischer Rechtsstaaten regeln das Legalitätsprinzip in nicht wesentlich abweichender Weise. Jegliches Handeln der Verwaltung muss auf ein Gesetz zurückgeführt werden können.

Kooperatives Handeln von Staat und Privaten tritt in verschiedensten Formen auf, vom Aushandeln von Planinhalten im Vorfeld der Planfestsetzung bis zum planersetzenden Vertrag. Welche Formen müssen vom Gesetz vorbestimmt sein und in welcher Dichte und Bestimmtheit? Verlangt das Legalitätsprinzip eine gesetzliche Grundlage für Verständigungen, die von den Parteien im Vorfeld von Planfestsetzungsarbeiten gesucht werden? Solange die Kooperation sich auf die Vorbereitung von Planakten des Gemeinwesens beschränkt und selbst nicht in eigenständige Handlungsformen (z.B. den Vertrag) ausmündet, ist eine gesetzliche Grundlage nicht erforderlich. Soweit dagegen die Privaten Pflichten oder Rechte übernehmen sollen (Durchführung städtebaulicher Massnahmen, Finanzierungsleistungen), erscheint eine Gesetzesgrundlage unentbehrlich [8 für privatrechtliche Verträge]. Die Grenzziehung ist keineswegs eindeutig. Der Gesetzgeber regelt eher zu viel [14: Vergesetzlichung], wohl in der Annahme, dass die Neuheit des vertraglichen Instrumentariums in der Raumordnung und Stadtplanung Ausführlichkeit und Einlässlichkeit erwarten lasse. Zu weit geht der Gesetzgeber, der die Vertragsform nicht nur für die Ausarbeitung städtbaulicher Planungen zulässig erklärt, sondern auch noch für die einzelnen Berichte, die zur städtebaulichen Planung notwendig sind [1, S. 330].

Das Legalitätsprinzip stellt auch eine Schranke der Vertragsgestaltung dar. Besteht beispielsweise auf die Aufstellung von Bauleitplänen kein Anspruch, so kann ein solcher Anspruch auch nicht durch Vertrag begründet werden [10]. Mit städtbaulichen Verträgen dürfen hoheitliche Planungsformen nicht umgangen und keine Interessen verfolgt werden, die nicht öffentliche Interessen der Stadtplanung sind [9, S. 286].

2.4 Prinzip des Sachzusammenhangs

Verfassungsrechtlich geboten ist ein zielorientierter Zusammenhang von kooperativem Handeln und hoheitlich-einseitiger Planfestsetzung. Namentlich vertragliche Bindungen sind nur insoweit zulässig, als sie in einem sachlichen Zusammenhang mit der Planung stehen. Das Gebot des Sachzusammenhangs wird auch als Koppelungsverbot bezeichnet. Richtungsweisend ein Urteil des Bayerischen Verwaltungsgerichtshofs vom 12. Mai 2004 (20 N 04.329 und 336): Die Gemeinde Wenzenbach, Landkreis Regensburg, hatte einen Bebauungsplan aufgestellt und mit der Baugebietsausweisung den Grundeigentümer vertraglich verpflichtet, sein ebenfalls im Gemeindegebiet, aber abseits des Baugebiets gelegenes Schloss zu sanieren. Die Bindung des Grundeigentümers wurde nicht direkt an den Bebauungsplan gekoppelt, sondern in einem «Nachfolgelastenvertrag» vereinbart, in dem sich der Eigentümer zur Zahlung eines Infrastrukturbeitrags verpflichtet hatte. Der BayVGH entschied, dass der Bebauungsplan abwägungsfehlerhaft und nichtig sei, weil zwischen der Baugebietsausweisung und der Sanierung des Schlosses trotz des Austauschverhältnisses keinerlei planungsrechtlicher Zusammenhang besteht. Der städtebauliche Vertrag konnte selbstverständlich wegen Verstoßes gegen das Koppelungsverbot ebenfalls keinen Bestand haben.

2.5 Staatliche und gesellschaftliche Verantwortung

Zum Abschluss der verfassungsrechtlichen Betrachtungen ist darauf hinzuweisen, dass im Einbezug betroffener Privater, in der Kooperation von Staat und Privaten, grundsätzlich kein (fragwürdiger) Verzicht des Staates auf Hoheitsbefugnisse liegt. In praktisch die meisten Aufgabenerfüllungen teilen sich Staat und Private. In der Raumordnung besteht die Verantwortung des Gemeinwesens in der Sorge für die Raumentwicklung, der Aufstellung einer Raumordnung, der Festlegung und Zulassung von Nutzungen und der Zuweisung der nutzungsfähigen Flächen sowie in der Zurverfügungstellung der Verfahren. Die Verantwortung der Privaten geht auf Teilnahme an den Entwicklungs- und Realisierungsprozessen, der Mitgestaltung des Raums, der Aktivierung von Vermögenswerten, namentlich Grundeigentum und Finanzen auf der Grundlage der Gemeinwohlverpflichtung des Eigentums [10]. Wenn sich auch die Interessen von Staat und Privaten nicht durchwegs decken, laufen sie einander doch nicht inhärent zuwider. Jedenfalls liegt die Verantwortung für die Raumordnung nicht allein beim Staat; die Privaten werden in eine Art Mitwirkungs- und Erfüllungsverantwortung eingebunden. Raumordnung und Siedlungsentwicklung sind gemeinsame Aufgaben von Staat und Privaten.

Das Gesamthafte des zu Verantwortenden kommt erst recht auf der Ebene der vom Staat zu ergreifenden Massnahmen zum Ausdruck. Der Staat kann seine Massnahmen der Raumordnung sowohl als hoheitlich-einseitige wie auch als nicht hoheitliche, nicht einseitige ausgestalten. Die Aufgabe der Raumordnung, als Gesamtaufgabe verstanden, umfasst beide – alle – Typen. In jedem Fall handelt es sich um Rechtstypen zur Erfüllung einer öffentlichen Aufgabe. Der viel beschworene ökonomische Ansatz besteht denn auch nicht darin, dass privatwirtschaftliche Mittel eingesetzt werden – von Privatwirtschaft kann keine Rede sein –, sondern vielmehr darin, dass sich das Raumordnungs- und Städtebaurecht anderen als hoheitlich-einseitigen Regelungsformen, nämlich solchen des Konsenses und der Kooperation, öffnet.

3 RECHTLICHE PROBLEME VERTRAGLICHER LÖSUNGEN

3.1 Probleme aus der Planungshoheit des Gemeinwesens

Der Vertrag ist eine Form kooperativen Handelns von staatlichen Behörden und Privaten. Die Besonderheiten des Vertrags als Instrument im Raumordnungs- und Städtebaurecht werfen rechtliche Probleme auf, von denen einige kurz angesprochen werden sollen. – In erster Linie stellt sich das Problem des Verhältnisses von Hoheitsrechten des Staates zu zweiseitigen Vereinbarungen mit Privaten: Wieweit können die Zuständigkeiten des Staates in der Festsetzung planerischer Anordnungen durch Vertrag abgelöst werden, oder anders: wieweit müssen sich hoheitlich-einseitige Planfestsetzungen nach wie vor behaupten? Es herrscht allgemein die Auffassung vor, das hoheitliche Instrumentarium könne durch Verträge nicht ersetzt, sondern nur ergänzt werden; der Staat müsse seine Hoheit in der Raumordnung und Stadtentwicklung aufrecht erhalten. – Im gleichen Verhältnis stellt sich die Frage, ob der Vertrag auch für Probleme eingesetzt werden kann, die mit dem traditionellen hoheitlichen Instrumentarium nicht gelöst werden könnten: Abgesehen von einer klaren gesetzlichen, einschränkenden Regelung müssten gerade massnahmenneutrale Normierungen zur Bejahung der Frage Anlass geben. Sonst würde der Vertrag seine besondere Funktionalität einbüssen [7; 23, S. 116].

Wenn als Leistung des Gemeinwesens die Erlassung einer Planungsmassnahme vereinbart wird, kann es sich nicht um einen umfassend zweiseitigen Vertrag handeln. Denn ein Hoheitsakt kann nicht Gegenstand eines Vertrags sein. Die Leistung des Gemeinwesens ist vielmehr blosse Bedingung der Leistung des Privaten (z.B. der plankonformen Grundstücksnutzung) [2, 5]. Die vertragliche Leistung des Gemeinwesens kann nur sein, die Planfestsetzung in die Wege zu leiten. Zudem könnte sich das Gemeinwesen nur binden, wenn diejenige Behörde den Vertrag abschliesst, die zur Beschlussfassung über den Plan zuständig ist. Eine Bindung des Gemeinwesens an einen vertraglich vereinbarten Planinhalt ist im allgemeinen unzulässig.

3.2 Probleme aus der Natur des Vertrags

Der Vertrag verpflichtet und berechtigt nur die Vertragsparteien (res inter alios acta aliis non nocet): Der Vertrag eignet sich demnach nicht für Regelungen, die weitere an einer Planung Interessierte betreffen (können). – Damit hängt zusammen, dass Planfestsetzungen, anders eben als Verträge, drittbeschwerdefähig sind. Ihre Korrektur durch ein Gericht berührt den Vertrag, sofern dieser in irgendweiner Weise an den Plan

gebunden und nicht eigenständig rechtswirksam sein kann. – Eine grundsätzliche Problematik ist die mangelnde Gleichstellung von Staat und Privaten. Verträge setzen die Gleichordnung (Horizontalrelation) geradezu voraus. Unzulässig wäre, wenn der Staat seine Macht ausnützen würde, um auf vertraglichem Weg zu erreichen, was er mit traditionellen Mitteln nicht erreichen könnte [5]. Es gilt das Übermassverbot bzw. das Gebot der Angemessenheit der Gegenleistung des Privaten [13; 21, S. 322 f.]. Die Gleichordnung ist allerdings auch im reinen Privatrechtsverkehr häufig nicht vorhanden (etwa im Verhältnis von Bank und Kunden).

3.3 Probleme aus der Planungspflicht des Gemeinwesens

Der Vertrag kann keine Gegenstände miteinander verknüpfen, die nicht in einem engen Sachzusammenhang stehen (Koppelungsverbot, oben Ziffer 2.4) – Was vertraglich festzulegende finanzielle Gegenleistungen der Privaten angeht, dürfen sie nicht dazu dienen, Planungsakte des Gemeinwesens käuflich zu machen. Das ist nicht der Fall, wenn die finanzielle Leistung des Privaten (wie z.B. ein Erschliessungsbeitrag) zwingender Bestandteil der Planungsanordnung ist, dazu bestimmt, «sachlich begründete Hindernisse eines Planungsvorhabens zu beseitigen» [7, S. 181] – Verträge dürfen nicht eingesetzt werden, um das Gemeinwesen zu begünstigenden Zusicherungen zu veranlassen, die sich als einseitig und nicht neutral erweisen. Der Investor als Vertragspartner muss sich eine umfassende (planerische) Abwägung durch das Gemeinwesen auch in der Vertragsaushandlung gefallen lassen und die Gemeinde selbst muss die ihr obliegende umfassende Abwägung vornehmen. Eine zu enge Nähe von Investor und Gemeinwesen kann schon ein Indiz für einen Abwägungsfehler sein [29].

3.4 Rechtsfolgen fehlerhafter Vertragsgestaltung

Die Folgen fehlerhafter, vor allem nichtiger Verträge und Planungsmassnahmen können die Unwirksamkeit der Planung oder die Pflicht zur Rückabwicklung der Verträge sein. Der Anspruch einer Grundeigentümerin auf Rückerstattung ihrer vertraglich vereinbarten Geldleistung wurde wegen Nichtigkeit des Vertrags geschützt, obschon die Gemeinde ihre Gegenleistung, die Baugenehmigung, erbracht hatte [1, S. 327]. – Der Abschluss rechtswidriger Verträge kann die Straftatbestände der Bestechung, Vorteilsnahme, Vorteilsgewährung, Korruption o.ä. erfüllen [21].

3.5 Zur Rechtsnatur der Verträge

Insbesondere für die Anfechtungs- und Durchsetzungsverfahren ist es wichtig zu entscheiden, ob ein privatrechtlicher oder ein verwaltungsrechtlicher Vertrag abgeschlossen wird. Die Prüfung kann zunächst nach funktionellen Gesichtspunkten durchgeführt werden: Wenn mit dem Vertrag an der Erfüllung einer öffentlichen Aufgabe partizipiert werden soll, ist er verwaltungsrechtlicher Natur. Das ist dann der Fall, wenn der Vertrag unmittelbar zur Bildung oder Durchführung planungsrechtlicher Massnahmen beiträgt (Verträge über die Grundstücksnutzung, die Erschliessung), oder wenn er selbst direkt öffentliche Interessen des Gemeinwesens wahrnimmt (Verträge zur Deckung des Wohnbedarfs). Andererseits können vorbereitende Verträge privatrechtlicher Art sein: Grundstückskaufverträge, Parzellarordnungs- und Umlegungsverträge. Wesentlich ist, dass seine Beteiligung an einem städtebaulichen Vertrag das Gemeinwesen in keinem Fall in die Stellung eines Privaten versetzen und ihm Privatautonomie verleihen kann. Es ist an die Erfüllung der öffentlichen Interessen gebunden, damit bei der Wahl und der Ausgestaltung des Instrumentariums an die verfassungsrechtlichen Grundsätze (vor allem die Verhältnismässigkeit) gebunden.

In den folgenden Kapiteln sollen Modelle vorgestellt werden, die die Kooperationen typisieren. Es sollen Modelle sein, d.h. sie kennzeichnen eine bestimmte Idee des Zusammenwirkens, sie sind nicht absolut und in sich geschlossen gedacht, und sie sind mit andern und weiteren Modellen kombinierbar. Zuzugeben ist, dass wie alle Modelle und Typisierungen auch die hier präsentierten an Unvollständigkeit und Inkohärenz leiden: Jeder Leser würde Modelle und Typen anders bilden und zusammenstellen. Das hält nicht davon ab, Versuche zu wagen.

4 KOOPERATIONSMODELLE AUF HOHEITLICHER BASIS

Von Kooperationsmodellen auf hoheitlicher Basis kann man sprechen, wenn die Kooperationsvorgänge in die vom Staat hoheitlich festzusetzenden Raumordnungsmassnahmen eingebunden sind.

4.1 Rechtliches Gehör, Konsultation, informale Absprachen

Das Gemeinwesen macht von seiner Kompetenz zur Planfestsetzung nicht ohne die Mitwirkung der Privaten (Betroffenen) Gebrauch. Diese Mitwirkung kann formaler Art sein. Das ist namentlich insofern der Fall, als Verfassung oder Gesetz Privaten einen Rechtsanspruch gewähren, vor Erlass sie berührender staatlicher Anordnungen angehört zu werden; das sind vor allem die Eigentümer der beplanten Grundstücke, können aber auch «Nachbarn» bzw. «Dritte» dieser Grundstücke sein, deren Situation sich durch die Planungsmassnahme verändert. Formal ist sodann auch der allgemeine Anspruch der Bürger, sich im Auflageverfahren zu beteiligen.

Die Mitwirkung Privater kann informaler Art sein, d.h. nicht oder weniger vom Recht strukturiert. Beispielsweise werden Private (Grundeigentümer, Investoren, Dritte) zur Meinungsäusserung im Sinne des Versuchs informaler Konsensfindung einbezogen; Beweggrund kann etwa die sachliche Optimierung eines Bebauungsplans oder/und die Gewinnung von Akzeptanz durch die Betroffenen sein. Ferner von Interesse sind die informalen Absprachen, die sich vornehmlich dadurch auszeichnen, dass sie faktische (weitergehend auch rechtliche?) Bindungen der staatlichen Behörden bewirken, wodurch deren hoheitliche Entscheidungen beeinflusst werden. Die Absprachen können unter Ausschluss der Öffentlichkeit und insbesondere weiterer Interessierter stattfinden, weil «man unter sich» sein will. Mitwirken können aber auch Drittinteressierte, etwa Landschafts- oder Denkmalschutzverbände, die sich ihr Prozessverhalten nicht selten – verpönterweise – abgelten lassen. Informale Absprachen bergen die Gefahr, die umfassende Abwägungspflicht der Behörden in rechtswidriger Weise zu beeinträchtigen [18].

4.2 Planvorbereitende Verträge

Gegenstand eines Vertrags zwischen Gemeinwesen und Privaten können Massnahmen sein, deren Durchführung Voraussetzung für die Umsetzung einer Überbauungsordnung ist. Die Massnahmen müssen in dem Zeitpunkt, da an die Realisierung des Überbauungsplans herangetreten wird, bereits durchgeführt sein. Es geht zum Beispiel um Neuordnungen von Grundstücken, Erschliessungsmassnahmen, Bodensanierungen, Altlastenbereinigungen. Die Verträge werden im Vorfeld der gemeindlichen Planfestsetzung abgeschlossen, wobei vereinbart werden kann, dass die Massnahmen erst nach der Beschlussfassung über die Überbauungsordnung ausgeführt werden. Wenn die Massnahmen (sachlich und finanziell) ohnehin Sache der Grundeigentümer sind, bestünde die Gegenleistung des Gemeinwesens etwa in der Besorgung des Planungsverfahrens. Sind die Massnahmen aber an sich vom Gemeinwesen zu treffen, so handelt es sich um eine Vorleistung der Privaten, mit der die Planungsaktivität des Gemeinwesens, das sich zudem zur Bereinigung der Kostenverlegung verpflichten kann, katalysiert wird. Problematisch ist es, wenn das Gemeinwesen dem Grundeigentümer Zusicherungen über Verfahren und Inhalte der Planfestsetzung abgibt. Es kann sich höchstens um unverbindliche Absichtserklärungen handeln (s. oben 3.1).

4.3 Verträge zur Plansicherung

Gegenstand von Verträgen zwischen Gemeinde und Grundeigentümern können Massnahmen sein, die die Realisierung einer Überbauungsordnung sichern. Das können insbesondere Verträge über die Grundstücksnutzung sein (vgl. § 11 Abs. 1 Ziffer 2 des deutschen Baugesetzbuchs), mit denen beispielsweise eine Bauverpflichtung der Grundeigentümer oder eine Verpflichtung, einen bestimmten (Flächen- oder Raum-) Anteil für Wohnnutzung zur Verfügung zu halten, begründet wird [1, S. 331; 13, S. 67 ff.; 20, S. 133]. Die Verträge werden als Planverwirklichungsverträge [1, S. 331], Verwendungsverträge [9, S. 290 ff.], Baurealisierungsverträge [13, S. 67] bezeichnet. Der Private könnte zur Beachtung strengerer Standards verpflichtet werden, als das Gesetz vorsieht, etwa im Bereich von Immissionsgrenzwerten [9, S. 292]. Die Verträge werden im Vorfeld der Planfestsetzung abgeschlossen. Auch bei diesen Verträgen besteht zwar die Gefahr fehlerhafter Abwägung, doch liegt das Hauptproblem solcher Verträge darin, dass sie dem Gemeinwesen Anreiz geben könnten, seine Planungspflicht zu Gunsten vertraglicher Planrealisierungsvereinbarungen zu vernachlässigen.

4.4 Durchführende Verträge

Denkbar ist sodann, dass nach Erlassung der hoheitlichen Planungsakte Verträge zwischen Gemeinwesen und Grundeigentümern über Einzelheiten der Bauten und Anlagen abgeschlossen werden. Ungelöste Nutzungsfragen, offene Gestaltungsprobleme, technische Belange u.ä. können auf vertraglichem Weg geklärt werden. Dass einzelne Punkte in der Überbauungsordnung nicht gelöst worden sind, liegt daran, dass

Details der Realisierung auf die Ebene der Bauprojektierung und -genehmigung verwiesen werden. Der Vertrag würde gewissermassen (auch) der Vorbereitung des Baugesuchs dienen.

5 KOOPERATIONSMODELLE AUF PRIVATER BASIS

5.1 Entwurfserstellung durch Private

Eine erste Frage ist, wieweit die Gemeinde Private an der Ausarbeitung eines Bebauungsplans beteiligen kann, ohne die ihr gesetzlich obliegende Planungspflicht und die Anhörungsrechte der Bürger zu verletzen. Wesentlich ist, dass die Rollen klar verteilt sind: die Gemeinde ist Bestellerin der Bebauungsordnung, der Private ist blosser Beauftragter und besorgt ein fremdes Geschäft. Das ist die Konstellation, wenn die Gemeinde einem privaten Planungsbüro, das mit dem Investor nicht identisch ist, den Auftrag zur Erstellung eines Planentwurfs erteilt. Die umfassende Abwägung durch die Gemeinde ist grundsätzlich gewährleistet. Eine besondere gesetzliche Grundlage für die vertragliche Bindung ist nicht erforderlich.

5.2 Private Bebauungsordnungen

Nicht mehr eindeutig ist die Zuordnung der Aufgaben, wenn der Entwurf vom Investor oder Grundeigentümer selbst erstellt werden soll. Die Planungsfreiheit der Gemeinde erscheint – auch bloss abstrakt – als eingeschränkt. Das Planungsresultat des Privaten hat daher eher als sogenannte private Bebauungsordnung zu gelten. Indes ist das Demokratiedefizit offensichtlich, wenn ein Privater Bebauungspläne beschliesst. Auch die umfassende Abwägung ist nicht ohne Weiteres gewährleistet. Ein kommunales Auflage- und Prüfungsverfahren ist unumgänglich; der private Bebauungsplan bedarf zu seiner rechtlichen Perfektionierung der Genehmigung durch die Gemeinde. Dieses Modell ist gesetzlich abzustützen.

Ein anderes Modell geht dahin, dass die Gemeinde lediglich eine raumplanerische Rahmenordnung für ein bestimmtes Areal erlässt und insoweit ihre Planungspflicht wahrnimmt. Sie widmet das Areal einer bestimmten Nutzungsart und legt auch noch die höchstzulässigen Geschossflächen fest, damit die Nutzungsdichte hoheitlich bestimmt ist. Die konkretisierende Ordnung (Festlegung von Bauweise, Anordnung und Dimensionierung der Bauten usw.) aber wird abschliessend den Privaten überlassen. Der Staat kann damit den Privaten Freiräume gewähren. Man kann sich dieses Modell als Abbild der rechtlichen Stufenordnung vorstellen: demokratisch fundierte Grundordnung (kommunaler Bebauungsplan) – präzisierende, ausfüllende Sekundärordnung (private Planung). Diese zweigestufte Planung mit zwar abgeleiteter, aber eigenständiger Privatkompetenz benötigt eine klare Rechtsgrundlage.

Das kooperative Element besteht darin, dass die Gemeinde auf ein Stück ihrer Planungstätigkeit zu Gunsten privater Aktivitäten verzichtet. Die Erstellung privater Bebauungspläne ohne jede Einschaltung der Gemeinde (verbindliche Rahmensetzung im Voraus, Genehmigung privater Pläne im Nachhinein) erscheint aber rechtlich nicht vertretbar.

5.3 Städtebauliche Wettbewerbe

Eine Qualitätssteigerung im Städtebau versprechen die städtebaulichen Wettbewerbe. Der Staat verzichtet gegenüber den Grundeigentümern auf die Aufstellung besonderer Vorschriften zum Beispiel über die Gestaltung der Bauten. Er vertraut den Privaten ein Verfahren an, das Gestaltungen optimieren soll. Auch hier besteht die vertragliche Leistung des Staates in einem Regulierungsverzicht, und in der Anerkennung der privaten Lösung als realisierbares Resultat. Der Private verpflichtet sich, ein Wettbewerbsverfahren nach besten Standards durchzuführen.

6 EIGENSTÄNDIGE KOOPERATIONSMODELLE

6.1 Objektschutz

In Kapitel 4 ging es um Verträge, die in irgendeiner Weise in die hoheitlichen Planungsmassnahmen eingebunden sind. In Kapitel 5 wurden Kooperationen vorgestellt, die den Privaten Eigenverantwortung belassen. Im vorliegenden Kapitel sollen Verträge besprochen werden, die an die Stelle hoheitlicher planerischer Akte treten. Dabei ist zu beachten, dass der Staat sich nicht in unzulässiger Weise der Planungshoheit begibt. Er nutzt vielmehr die Möglichkeiten des Vertrags zu selbstständiger Regulierung, für die er eine klare gesetzliche Grundlage setzt. Im Natur- und Heimatschutzrecht begegnet man solchen

eigenständigen Planungsverträgen. Objekte werden durch Vertrag zwischen Gemeinwesen und Eigentümer unter Schutz gestellt; der Vertrag regelt Erhaltungspflichten der Eigentümer und Abgeltungspflichten des Staates (aus den Pflichten korrelieren Ansprüche). Im Bereich des Biotopschutzes unterbreitet der Eigentümer dem Staat die Offerte für die Programme des ökologischen Ausgleichs; die Behörde befindet über das Akzept und bringt allenfalls, als Gegenofferte, Auflagen ein. Am Ende wird über den gemeinsamen Konsens entschieden und der Vertrag unter gegenseitiger Willensübereinstimmung abgeschlossen [24].

6.2 Nutzung von öffentlichem Grund

Für die Inanspruchnahme von öffentlichem Grund für die Realisierung privater Vorhaben wird die Verleihung von hoheitlichen Rechten benötigt. Abgetreten wird nicht das Eigentum am öffentlichen Grund, sondern das Recht, ihn zu nutzen. Zu einem erheblichen Teil bergen diese Rechtseinräumungen vertragliche Elemente. Eine einseitge Entziehung der Rechte oder von Teilen von ihnen ist nur wiederum durch gegenseitige Übereinkunft möglich; für den Fall, dass das öffentliche Interesse einen Rechtsentzug rechtfertigen würde, muss der Konzessionsinhaber entschädigt werden. Einerseits steht das ihm verliehene Recht unter dem Schutz der Eigentumsgarantie, andererseits geniesst der Rechtsinhaber den Vertrauensschutz, wie er im Vertragsrecht als grundlegendes, ja konstitutives Prinzip anerkannt ist.

7 SEKTORIELLE UND INTEGRATIVE VERTRÄGE

Städtebauliche Verträge können unterschiedliche Systemweiten aufweisen. Ihr Geltungsbereich kann räumlich und sachlich eng begrenzt sein. Das trifft wohl auf die meisten städtebaulichen Verträge zu, da sie vorwiegend der Vorbereitung und Sicherung der Verwirklichung von örtlich begrenzten Bauleitplanungen dienen (vertragliche Einzelfallregelung). Demgegenüber haben Verträge, die etwa zur Durchführung von Bebauungsplänen eingesetzt werden, ganze Bündel von Realisierungsmassnahmen zu Lasten des Grundeigentümers zum Gegenstand. Noch weiter gehen Vertragswerke und –geflechte, die räumlich integrierend wirken, weil sie systematisch eine Vielzahl von Raumplanungsaufgaben als Einheit erfüllen sollen. Erwähnt wird das sogenannte Einheimischenmodell, das Verträge zwischen dem Gemeinwesen und Grundeigentümern erfasst, in denen diese sich verpflichten, ihr Grundeigentum nur an Einheimische zu veräussern; die Rechte und Pflichten reichen von Veräusserungspflichten des Eigentümers bis zu Vorkaufs- und Kaufsrechten der Gemeinde [29]. Das Integrative besteht darin, dass solche Verträge weitreichende Konsequenzen raumplanerischer, wirtschaftlicher und sozialer Art haben. Diese weit fassende Charakteristik weisen sodann auch Verträge über die Baulandmobilisierung und Nutzung brachliegender Flächen auf [28].

8 LITERATUR

[1] BATTIS, U./KRAUTZBERGER M./LÖHR R.-P.: Baugesetzbuch, Kommentar 9. Auflage, München 2005.

[2] BINDER, M.: Zivilrechtliche Aspekte der Vertragsraumordnung unter besonderer Berücksichtigung der Salzburger Situation, in: (österreichische) Zeitschrift für Verwaltung ZfV 20 1995, S. 609-626.

[3] BURMEISTER, J.: Verträge und Absprachen zwischen der Verwaltung und Privaten, Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer VVDStRL 52 1993, S. 190-247.

[4] BURMEISTER, Th.: Der städtebauliche Vertrag als rechtliches Instrument der Kooperation mit Privaten bei der Baulandentwicklung und -erschließung , Berlin 2003.

[5] DULLINGER, S.: Vertragsraumordnung aus privatrechtlicher Sicht, in: (österreichische) Zeitschrift für Verwaltung ZfV 22 1997, S. 11-21.

[6] HENGSTSCHLÄGER, J.: Verträge und Absprachen zwischen der Verwaltung und Privaten in Österreich, Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer VVDStRL 52 1993, S. 298-313.

[7] HUBER, P.M.: Rechtliche Grenzen von Planungswertausgleich und städtbaulichen Verträgen, in: Die Öffentliche Verwaltung DöV 52 1999, S. 173-183 (Deutschland).

[8] KALSS, S.: Vereinbarungen über die Verwendung von Grundflächen, in: (österreichische) Zeitschrift für Verwaltung ZfV 18 1993, S. 551-566.

[9] KLEEWEIN, W.: Vertragsraumordnung. Zugleich ein Beitrag zum Einsatz privatrechtlicher Verträge im Verwaltungsrecht, Wien/Graz 2003.

[10] KRAUTZBERGER, M.: Zum Stellenwert von städtebaulichen Verträgen im heutigen Städtebaurecht, in: Umwelt und Planungsrecht UPR 2006, S. 1-4.

[11] KREBS, W.; Konsensuales Verwaltungshandeln im Städtebaurecht, in: Die Öffentliche Verwaltung DöV 42 1989, S. 974 ff. (Deutschland).

[12] KREBS, W.: Verträge und Absprachen zwischen der Verwaltung und Privaten, Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer VVDStRL 52 1993, S. 248-284.

[13] LAHNOR U., Städtebauliche Verträge nach § 11 BauGB unter besonderer Berücksichtigung der Angemessenheit (§ 11 Absatz 2 Satz 1 BauGB), Frankfurt a.M. u.a. 1998.

[14] LORZ, A.: Unzulänglichkeiten des Verwaltunsgvertragsrechts am Beispiel der städtebaulichen Verträge, in: Die Öffentliche Verwaltung DÖV 55 2002, S. 177-186 (Deutschland).

[15] LUTZ J., Vertragsraumordnung am Beispiel Tirol, Bayern und Südtirol. Ein Rechtsvergleich, Innsbruck/Wien/München 2000.
[16] MAST, F.: Der verwaltungsrechtliche Vertrag als Alternative zur Tiroler Vertragsraumordnung?, Wien 2003.
[17] MORAND, Ch.-A.: Les nouveaux instruments d'action de l'Etat et le Droit, in: Ch.-A. Morand (Hrsg.), Les instruments d'action de l'Etat, Basel/Frankfurt a.M. 1991, S. 237-252.
[18] NÜSSLE, T.: Demokratie in der Nutzungsplanung und Grenzen für informale Absprachen, Zürich 2005.
[19] ÖHLINGER, Th.: Phantasie und Recht oder Vertragsraumordnung und Bundesverfassung, in: Ein Leben in Praxis und Wissenschaft, Festschrift für Walter Barfuß, Wien 2002, S. 197-208.
[20] OEHMEN, K./BÖNKER, Chr.: Einführung in das öffentliche Baurecht, Düsseldorf 1999.
[21] OTTO, Chr.-W.: Unzulässige Klauseln in städtbaulichen Verträgen und Fragen zu ihrer strafrechtlichen Relevanz, in: Zeitschrift für deutsches und internationales Bau- und Vergaberecht ZfBR 2006, S. 320-326.
[22] PFENNINGER, H.: Rechtliche Aspekte des informellen Verwaltungshandelns, Freiburg/Schweiz 1996.
[23] RUCH, A.: Das Recht in der Raumordnung, Basel/Frankfurt a.M. 1997.
[24] RUCH, A.: Kooperation und Konsens in der Raumplanung, in: Ruch, A./Hertig, G./Nef, U. (Hrsg.), Das Recht in Raum und Zeit, Festschrift für Martin Lendi, Zürich 1998, S. 425-444.
[25] RUCH, A.: Informalisierung und Deregulierung nach schweizerischem Verfassungsrecht, in: Schweizerisches Zentralblatt für Staats- und Verwaltungsrecht ZBl 103/2002, S. 505-528.
[26] SCHMIDT-ASSMANN, E./KREBS, W.: Rechtsfragen städtbaulicher Verträge, Vertragstypen und Vertragsrechtslehren, 2. Aufl. Köln 1992.
[27] SCHWEIZER, R.: Verträge und Absprachen zwischen der Verwaltung und Privaten in der Schweiz, Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer VVDStRL 52 1993, S. 314-322.
[28] SPANNOWSKY, W.: Vertragliche Regelungen als Instrumente zur Sicherung der nachhaltigen städtebaulichen Entwicklung, in: Die Öffentliche Verwaltung DÖV 53 2000, S. 569-579 (Deutschland).
[29] STÜER, B.: Möglichkeiten vertraglichen Handelns im Bauplanungsrecht, in: Ziekow J. (Hrsg.), Bauplanungsrecht vor neuen Herausforderungen, Speyer 1999, S. 45-72.
[30] ZIAMOS G., Städtbaurecht im Vergleich. Eine Untersuchung zur Steuerung des privaten Wohnungsbaus durch das Städtebaurecht in Deutschland, England und Frankreich, Frankfurt a.M. 1998.

🏆 *reviewed paper*

Netzwerk Raumplanung

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1 ABSTRACT

Das „Netzwerk Raumplanung“ ist eine Kommunikations-, Informations- und Kooperationsplattform für Raumplanerinnen und Raumplaner. Das Ziel dieser Website ist, den Dialog zwischen Theorie und Praxis sowie zwischen Raumplanerinnen, Raumplanern und Fachgebieten zu fördern. Dazu steht es Absolventinnen, Absolventen, Lehrenden und Studierenden der Studienrichtung Raumplanung sowie Planungspraktikern und Auftraggebern kostenlos zu Verfügung.

Im „Netzwerk Raumplanung“ ist gemeinsame Weiterentwicklung das Ziel. Der Kontakt zu Kolleginnen und Kollegen, Kooperation bei gleichzeitiger Konkurrenz und zukunftsorientierter Diskurs geben dazu in den vier Schwerpunktbereichen „Community“, „Best Practice“, „Linkdatenbank“, „Veranstaltungsdatenbank“ Gelegenheit.

Der Bereich „Community“ beheimatet Tools, die es registrierten Planerinnen und Planern ermöglichen, sich zu präsentieren, zu kommunizieren und ihr individuelles Netzwerk an Kontakten zu erweitern und zu pflegen. Gezielt kann nach Projektpartnerinnen, Projektpartnern, Jahrgangskolleginnen, Jahrgangskollegen, Expertinnen oder Experten zu bestimmten Themenbereichen gesucht werden. „Best Practice“ stellt eine Referenzsammlung von Projekten aus dem Fachgebiet der Raumplanung dar. Gute Beispiele zeigen, was gute Planung leistet. Registrierte User haben hier die Möglichkeit, ihre eigenen Projekte den passenden Kategorien hinzuzufügen und zu verwalten. Die Attraktivität des Angebots wird schließlich durch die „Linkdatenbank“ mit mehreren hundert Einträgen und durch die planungsspezifische „Veranstaltungsdatenbank“ abgerundet.

2 VERÄNDERUNG FINDET STADT

Neben naturräumlich-ökologischen Gegebenheiten ist räumliche Planung vor allem eng mit gesellschaftlichen, wirtschaftlichen und politisch-administrativen Rahmenbedingungen und Entwicklungen verbunden. Eine Änderung dieser Rahmenbedingungen [32] bringt zwangsläufig auch eine Änderung der Bedingungen der Raumplanung mit sich. Neue Medien, besonders das Internet und Formen der Visualisierung von Planungen nehmen bei der Kommunikation und Partizipation von Bürgern einen großen Stellenwert ein. Für Raumplanerinnen und Raumplaner bedeutet das, dass sie sich vermehrt mit medialer Aufbereitung beschäftigen und Kenntnisse im Umgang mit neuen Medien aneignen müssen.

Verbesserte Kommunikation ist jedoch nicht nur an der Schnittstelle zwischen „Planungswelt“ und „Alltagswelt“ (SCHÖNWANDT, 2002) erforderlich, sondern auch innerhalb der Fachöffentlichkeit und über die einzelnen Disziplinen hinaus. Für SCHINDEGGER etwa zählt „die in Österreich kaum stattfindende reflektierende Diskussion (innerhalb) des Fachgebietes Raumplanung … zu den größten Defiziten dieser Disziplin“ (SCHINDEGGER, 1999, S. 8).

Es gilt also einen Weg zu finden, Raumplanung besser zu kommunizieren, auf die Stärken und Erfolge hinzuweisen und gemeinsam an Lösungen zu arbeiten. Denn Raumplanung braucht für seine Wirksamkeit nicht nur „gute Arbeit“ bei der Erstellung des fachlich-technischen Kerns, sondern auch „gute Vermittlung“. Raumplanung braucht den Dialog mit den Betroffenen, professionelle Öffentlichkeitsarbeit und Berichterstattung, Verständigung mit Bürgerinnen und Bürgern und Aufklärung über die Wirksamkeit von erfolgreichen planerischen Maßnahmen. Die Österreichische Raumordnungskonferenz (ÖROK) schreibt dazu beispielsweise im Österreichisches Raumentwicklungskonzept 2001, dass seitens der Raumplanung verstärkt mediale Kanäle zu nutzen wären und die Zusammenarbeit mit den Medien forciert werden sollte.

[32] etwa durch Globalisierung, demographischen Wandel, Tendenzen zur Freizeitgesellschaft und zur Individualisierung der Gesellschaft, Verwaltungsmodernisierung, sektoralen Wandel hin zu einer Informations- oder Wissensgesellschaft etc.

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Dabei ist an die Einrichtung von Presseinformationsstellen, an den Ausbau von Beratungsstellen etc. zu denken (vgl. ÖROK, 2002, S. 155).

3 RAUMPLANUNG ZWISCHEN ZWEI WELTEN

Unter Punkt 2 war von „Planungswelt" und „Alltagswelt" die Rede. Um diese zwei Ebenen (Öffentlichkeit, Fachwelt) wo vermehrt Kommunikation erforderlich ist, zu verdeutlichen, scheint ein kurzer Exkurs in das „Grundschema Planung" von SCHÖNWANDT (1999, S. 25 – 35; 2000, S. 3 – 31) zweckmäßig. In seiner nachstehend kurz beschriebenen Planungstheorie der „dritten Generation" leitet SCHÖNWANDT aus dem Funktionskreis von UEXKÜLL (1928/1973, S. 158) ein „Grundschema für die Planung" ab (siehe Abb. 1).

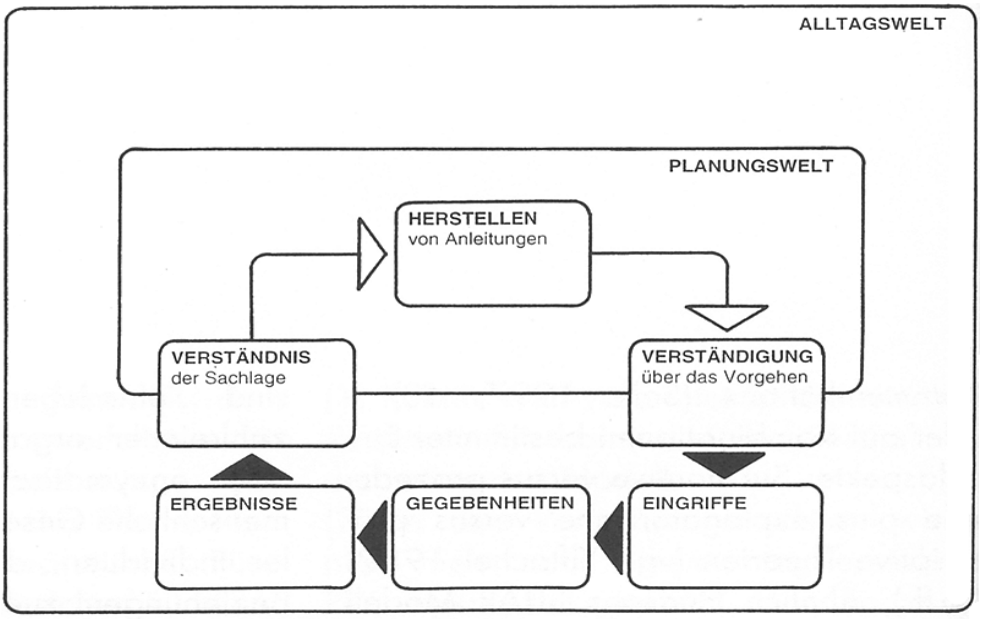


Abb. 1: Grundschema Planung [Quelle: SCHÖNWANDT, 1999, S. 28]

In diesem Planungsmodell ist von zwei „Welten" die Rede, wobei die „Planungswelt" in die „Alltagswelt" eingebettet ist. Die „Planungswelt" ist jener Bereich, in dem die Pläne bzw. Anleitungen erarbeitet werden. Es sind in der Regel mehrere Akteure (der „Planungswelt") beteiligt, die in bestimmten Organisationen und Kooperationsformen agieren. Die „Alltagswelt" bildet den Hintergrund für die Arbeiten der „Planungswelt" und beinhaltet alles, was die „Planungswelt" umgibt. „Planende Akteure, die in der Regel in bestimmten Organisationen agieren, bilden mit ihrer jeweiligen Gedankenwelt (Methoden, Begriffe, Theorien, Weltsichten etc.) eine „Planungswelt", die im Kontext einer „Alltagswelt" arbeitet, in der eine bestimmte Agenda von Themen von den Akteuren einer Arena behandelt wird. Beide „Welten stehen auf bestimmte Art und Weise in ständigem Austausch" (SCHÖNWANDT, 1999, S. 33).

Das Planungsmodell von SCHÖNWANDT beschreibt darüber hinaus Planung als offenen Zyklus durch diese beiden „Welten": „Ein bestimmtes „Verständnis einer Sachlage" ist die wesentliche Grundlage für die „Herstellung von Anleitungen". Diese Anleitungen wiederum sind die Basis für die „Verständigung über das Vorgehen". Das Resultat dieser Verständigung führt zu den jeweiligen „Eingriffen", die in bestimmte „Gegebenheiten" eingreifen und bestimmte „Ergebnisse" bewirken. Die Interpretation dieser Ergebnisse führt dann zu einem neuen „Verständnis der Sachlage" und so weiter" (SCHÖNWANDT, 1999, S. 30).

Kommunikation ist immer dann verstärkt erforderlich, wenn es um „Verständigung" und „Verständnis" geht – also an den Schnittstellen zwischen den beiden „Welten" – und innerhalb der „Planungswelt" zwischen den Fachgebieten, die am Planungsprozess beteiligt sind. Zwischen „Alltagswelt" und „Planungswelt" geht es vor allem um Information, um ein Problembewusstsein zu schaffen, Konflikte zu vermeiden, die „Wissenden" zu beteiligen und die enormen Potentiale der interessierten Bevölkerung zu nutzen.

Innerhalb der „Planungswelt" geht es um die Kommunikation in der Fachwelt – um einen zukunftsorientierten kritisch-fachlichen Diskurs, um Sinnfragen und Ziele, Austausch von Erfahrungen (Best-Practice), etc.

Zur Forcierung der Kommunikation auf der fachlichen Ebene scheinen vor allem drei Aspekte von besonderer Bedeutung: Erstens die Diskussion und Weiterentwicklung des theoretischen Grundgerüstes („Theoriekrise"), zweitens die Diskussion und Verbreitung von gelungenen Beispielen von zukunftsweisenden Projekten („Best Practice"), drittens die Kommunikation zwischen den Fachbereichen der Raumplanung.

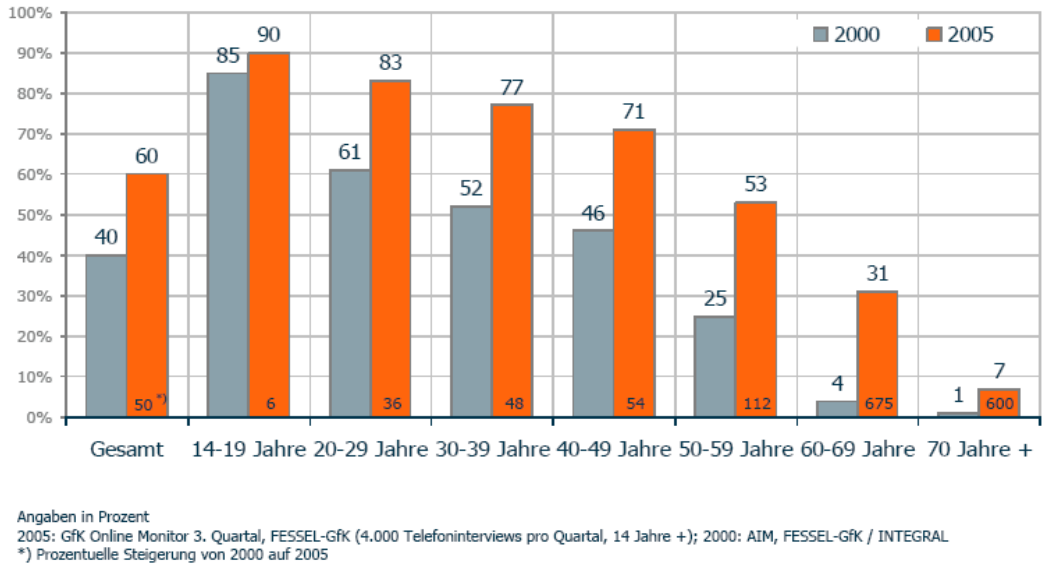
4 DAS INTERNET ALS PLATTFORM DER KOMMUNIKATION

„Die neuen Informations- und Kommunikationsmedien bieten die Chance, Informationen zur Raumentwicklung und –planung allgemein zugänglich zu machen, Meinungen zu erkunden und Debatten zur Raumplanung in virtuellen Netzen zu führen. Dieses Potential der neuen Technologien wird bislang nur wenig genutzt." (KUNZMANN, 2001, S. 72 f.)

Wenngleich Bürgerbeteiligung und Kommunikation im Fachgebiet bereits etabliert sind und vielfach angewendet werden und selbst die Nutzung neuer Medien dabei nichts Neues mehr ist (vgl. Beispiele in LINZER et.al., 1994), stellt die Verwendung von neuen Medien dabei immer noch eine gewisse Herausforderung dar. Schließlich verändert sich die Hard- und Software derart rasch, dass sich das Spektrum an Möglichkeiten permanent erweitert und letztlich werden die gefundenen technischen und fachlichen Lösungen an der Qualität der Planung, der Entscheidungsfindung im Beteiligungsprozess, der Öffentlichkeitsarbeit und vor allem an der tatsächlich erzielten Gestalt des gemeinsamen Lebensraumes gemessen (vgl. VOIGT et.al., 1998, S. 10).

So hat sich das Internet in den letzten Jahren von einem Informations- zum Kommunikationsmedium entwickelt. O'REILLY prägte beispielsweise den Begriff „Web 2.0". Er sprach bei der von ihm veranstalteten „Web 2.0 Conference" im Oktober 2004 vom Internet als Plattform, in welcher die Kommunikation der Nutzerinnen und Nutzer untereinander im Vordergrund steht. Im Gegensatz zum Internet der ersten Generation ist das Web 2.0 geprägt von OpenSource, Interaktion, Social Networks, Collaboration, Desktop Replacement, Personal Publishing etc. (vgl. O'REILLY, 2006). Diese Entwicklung stellt einerseits eine Herausforderung an die technischen Komponenten dar, andererseits bietet es in Bezug auf die Abwicklung von Planungsprozessen und zur Diskussion von planungsrelevanten Fragestellungen enormes Potential.

Gleichzeitig steigt auch die Zahl der Internet-User. Wie der „GfK OnlineMonitor 2005" über den Internetmarkt in Österreich zeigt, nutzen bereits 60% aller Österreicherinnen und Österreicher das Internet. „In der Bevölkerungsgruppe der 14 bis 59 Jährigen ist das Internet mit mehr als zwei Drittel Nutzerinnen und Nutzern bereits als Massenmedium zu bezeichnen und die Generation der unter 20 Jährigen, die das Medium zu 90% nutzt, wächst mit dem Internet auf" (Abb. 2) (GFK, 2006).



Angaben in Prozent
2005: GfK Online Monitor 3. Quartal, FESSEL-GfK (4.000 Telefoninterviews pro Quartal, 14 Jahre +); 2000: AIM, FESSEL-GfK / INTEGRAL
*) Prozentuelle Steigerung von 2000 auf 2005

Abb. 2: Internet-Nutzung gesamt nach Alter 2000 und 2005 [Quelle: GFK, www.gfk.at, März 2007. Basis: Österreicher ab 14 Jahre (6,796.000 Personen)]

5 EINE PLATTFORM FÜR DIE RAUMPLANUNG – „NETZWERK RAUMPLANUNG"

In den Punkten 2, 3, 4 wurden der theoretische Hintergrund und die Motivationsgründe ausgeführt. Unter Anbetracht dieser Erkenntnisse wurde am Fachbereich für Örtliche Raumplanung der Technischen Universität Wien die Idee geboren, eine Plattform der Kommunikation, Information und Kooperation für Planerinnen und Planer aller Fachgebiete zu schaffen – das „Netzwerk Raumplanung". Das Konzept und die Umsetzung erfolgte von Juni 2005 – Mai 2006 im Zuge einer Diplomarbeit („Raumplanung neu kommunizieren – Raumplanung unter den Aspeten der Informationsgesellschaft und Netzwerkbildung"; TSCHIRK, 2006). Der Betrieb wird derzeit vom Fachbereich für Örtliche Raumplanung im Department für Raumentwicklung, Infrastruktur und Umweltplanung an der TU Wien der Technischen Universität Wien in Partnerschaft mit der Bundesfachgruppe Raumplanung, Landschaftsplanung und Geographie finanziert.

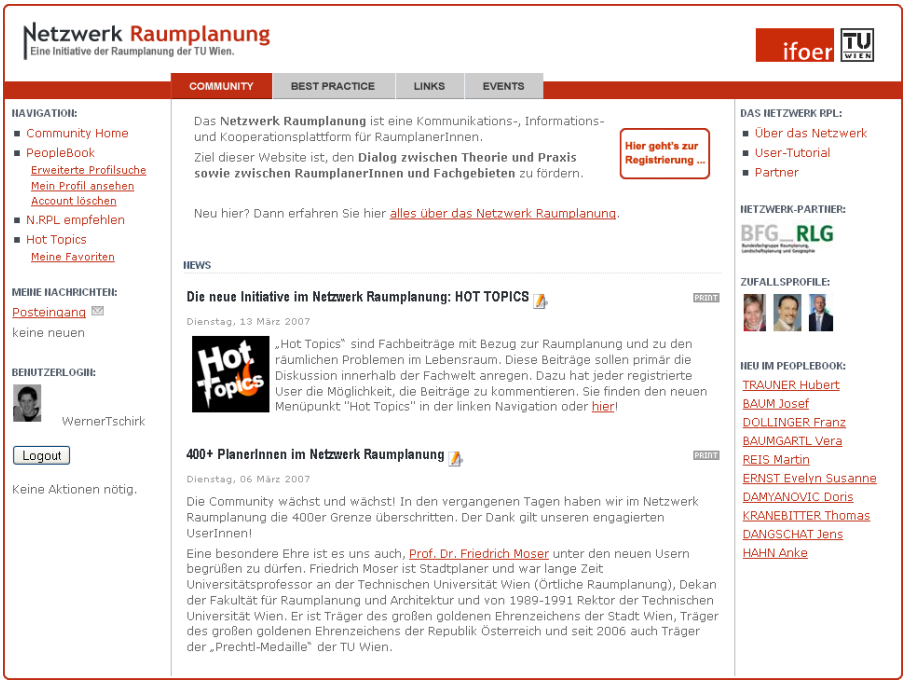


Abb. 3: Startseite Netzwerk Raumplanung [Quelle: Netzwerk Raumplanung, März 2007]

5.1 Ziele und Grundsätze

Das primäre Ziel dieser Website ist, den Dialog zwischen den Planungsfachgebieten sowie zwischen Theorie und Praxis zu fördern und eine Kommunikations-, Informations- und Kooperationsplattform für Planerinnen und Planer aller Fachgebiete zu sein. Das „Netzwerk Raumplanung" soll zum Erfahrungsaustausch anregen was wiederum der Weiterentwicklung der Raumplanung dient. Die kritische Reflexion der raumrelevanten Geschehnisse soll schließlich zu einer nachhaltigen, sozial gerechten und umwelt- und ressourcenschonenden Entwicklung beitragen.

Das Netzwerk Raumplanung soll jedem, der in Theorie oder Praxis mit Planung zu tun hat, nach Möglichkeit frei zur Verfügung stehen. Die Teilnahme am Projekt „Netzwerk Raumplanung" sowie die Registrierung im Planerinnen- und Planerverzeichnis sind nicht durch die einstige oder jetzige Zugehörigkeit zu einer Institution verbunden. Als Grundlage für die Beteiligung sind vielmehr das gemeinsame Interessensgebiet und die Kompetenz, die jeder einzelne persönlich einzubringen hat, ausschlaggebend. Dazu muss auch im Sinne einer Qualitätssicherung gewährleistet sein, dass Interessensgebiete, Kompetenz- und Tätigkeitsbereiche in den Benutzerprofilen angegeben werden.

Zielgruppe ist die Fachöffentlichkeit im deutschsprachigen Raum. Das Netzwerk Raumplanung sieht sich als Sprachrohr zwischen Expertinnen und Experten und nicht zwischen Expertinnen und Experten sowie Laien, wenngleich auch Beiträge aus nichtfachlicher Sicht wünschenswert und erstrebenswert sind.

5.2 Technische Umsetzung

Die technische Umsetzung erfolgte mithilfe des Open Source Content Management Systems (CMS) „Joomla!“. „Joomla!“ ermöglicht auf einfache Art und Weise, Inhalte zu organisieren und zu gestalten. Aufgrund der leichten Bedienbarkeit, der Flexibilität in der Anwendung, des großen Erweiterungspotenzials und der Systemstabilität, die sich im produktiven Umfeld bereits vielfach bewährt hat, wurde „Joomla!“ als geeignet angesehen und ausgewählt.

Benutzerfreundlichkeit, schnelle Erfassbarkeit und logische Strukturierung sind die zentralen Punkte, welche die Website aufzuweisen soll. Navigationselemente befinden sich schwerpunktmäßig im linken und oberen Bereich der Website, da dies aufgrund der menschlichen Wahrnehmung zu einer schnelleren Informationsaufnahme führt. Das linke Blickfeld des Menschen landet in der rechten Hirnhälfte, die für das räumliche Vorstellungsvermögen zuständig ist. Das rechte Blickfeld wird in der linken Hirnhälfte verarbeitet, die für Text, Sprache und die Decodierung von Information zuständig ist (vgl. LETTAU, HAHN, 2004, S. 202 f.). Bei der Anordnung der Navigationselemente wurde versucht, diese Erkenntnis bestmöglich zu berücksichtigen (siehe Abb. 4).

Die Hauptnavigation, die auf jeder Seite der Anwendung zur Verfügung steht, befindet sich im Kopf- und Fußbereich. Die thematische Navigation ist dynamisch und ändert sich je nach Schwerpunktbereich. Sie zeigt dem User die Navigationsmöglichkeiten der Seite an, auf der er sich gerade befindet. Zusatzinformationen wie z.B. die neu registrierten Planerinnen und Planer im PeopleBook oder der Link zum User-Tutorial stehen in der rechten Spalte. Diese werden je nach Bedarf dynamisch in die Anwendung integriert. Befindet sich der User beispielsweise in der Best Practice Datenbank, steht ihm in der rechten Spalte z.B. eine Suchfunktion zur Verfügung, die ihm das Durchsuchen der Datenbank erlaubt.

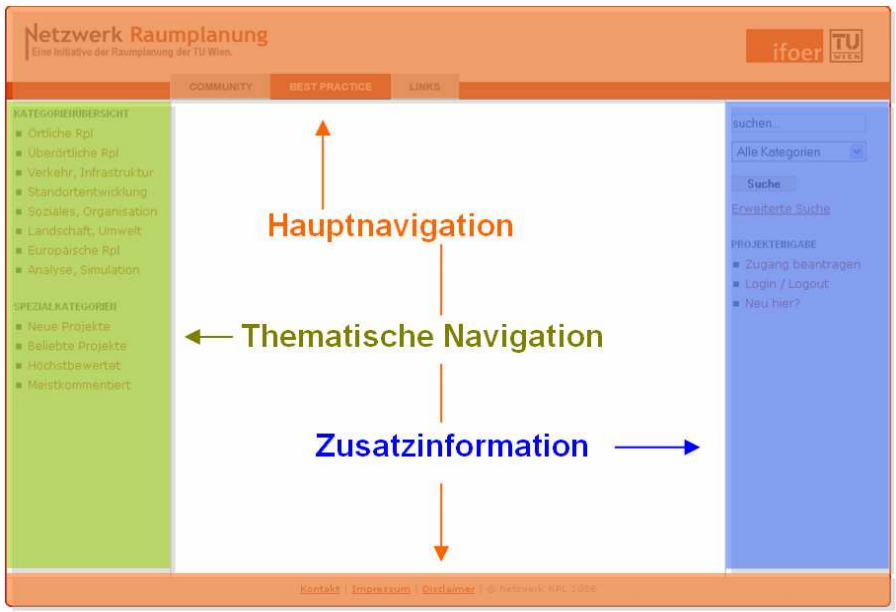


Abb. 4: Navigation [Quelle: Netzwerk Raumplanung, März 2007]

5.3 Inhalte

Das Netzwerk Raumplanung besteht derzeit aus vier Schwerpunktbereichen – der „Community“, der „Best Practice Datenbank“, dem „Linkverzeichnis“ und der „Eventdatenbank“.

Der Bereich „Community“ (siehe Abb. 5, S. 6) beheimatet Tools, die es registrierten Usern ermöglichen, sich zu präsentieren und ihr individuelles Netzwerk an Kontakten zu erweitern und zu pflegen. Gezielt kann nach Projektpartnerinnen, Projektpartnern, Jahrgangskolleginnen, Jahrgangskollegen, Expertinnen oder Experten zu bestimmten Themenbereichen gesucht werden. Ähnlich wie in Business-Clubs können auch Personen aus dem Netzwerk kontaktiert und zu den persönlichen Kontakten hinzugefügt werden. So erweitern sich mit jedem Mitglied das Netzwerk an Planerinnen und Planern und natürlich auch die persönlichen Netzwerke der User. Denn oft ist die Welt „klein“ und zufällig ist die gesuchte Expertin eine Jahrgangskollegin eines Bekannten. Das macht natürlich die

Kontaktaufnahme um einiges einfacher. Und genau deswegen sind im „Netzwerk Raumplanung“ auch die Kontakte der Kontakte sichtbar (siehe Abb. 5). Oder anders ausgedrückt: Der User sieht, über wie viele „Ecken“ er mit jeder beliebigen Person im Netzwerk in Verbindung steht. Seit Mitte März 2007 gibt es auch die Intitiative „Hot Topics“ im „Community“-Bereich. „Hot Topics“ sind Fachbeiträge mit Bezug zur Raumplanung und zu den räumlichen Problemen im Lebensraum. Diese Beiträge sollen primär die Diskussion innerhalb der Fachwelt anregen. Dazu hat jeder registrierte User die Möglichkeit, die Beiträge zu kommentieren.

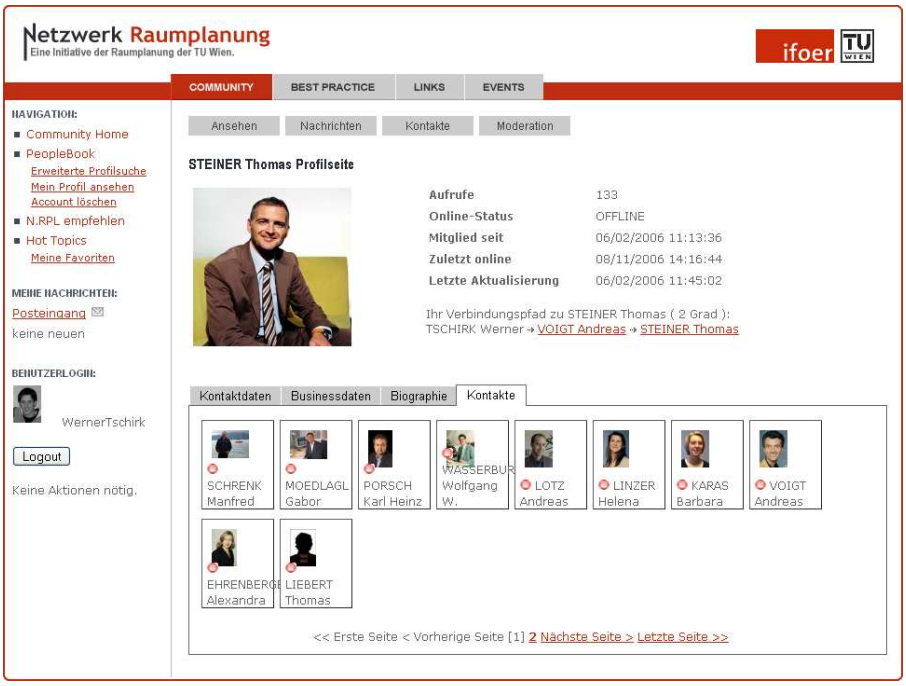


Abb. 5: Eintrag im „PeopleBook“ [Quelle: Netzwerk Raumplanung, März 2007]

Der Bereich „Best Practice“ (siehe Abb. 6, S. 7) stellt eine Sammlung von guten Planungsbeispielen dar. Es können sowohl Projekte gesucht als auch eingegeben werden. Registrierte Planerinnen und Planer haben dabei die Möglichkeit, die eigenen Projekte den passenden Kategorien hinzuzufügen und zu verwalten. Das hat zwei Vorteile: Zum einen entsteht eine Referenzsammlung an Projekten aus dem Fachgebiet der Raumplanung, die der Öffentlichkeit leicht zugänglich ist. Gute Beispiele zeigen, was gute Planung leistet. Zum anderen entsteht eine individuelle Referenzsammlung des Users, denn es lassen sich auch gezielt alle Einträge des „Besitzers“ anzeigen. Um eine Qualitätssicherung der eingegeben Projekte zu gewährleisten, muss jedes Projekt vor Veröffentlichung von einem Administrator freigegeben werden. Darüber hinaus gibt es die Möglichkeit, die Projekte zu bewerten, zu kommentieren oder weiter zu empfehlen. Zukünftig ist die Ausschreibung eines „Best Practice Preises“ geplant.

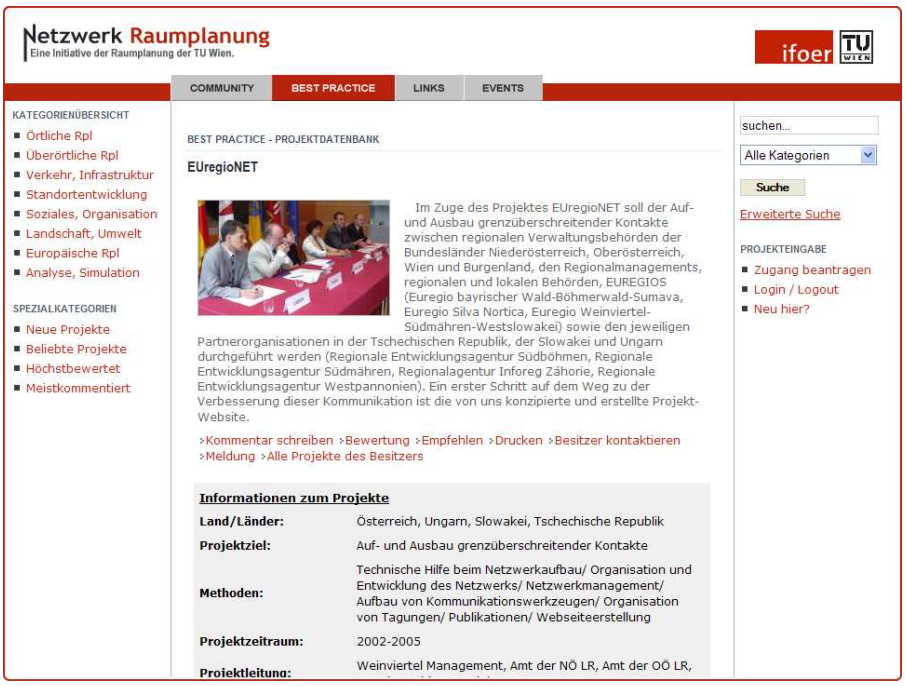


Abb. 6: Eintrag in „Best Practice Datenbank“ [Quelle: Netzwerk Raumplanung, März 2007]

Das „Linkverzeichnis“ (siehe Abb. 7) umfasst eine Sammlung von planungsspezifischen Webseiten. Das Besondere daran: neben den Links finden sich zu jeder Website eine Kurzbeschreibung sowie Kontaktinformationen. Eine integrierte Suchmaschine und die Zuordnung der Einträge zu Kategorien garantieren ein rasches Auffinden. User haben auch hier die Möglichkeit, Links dem Verzeichnis hinzuzufügen.

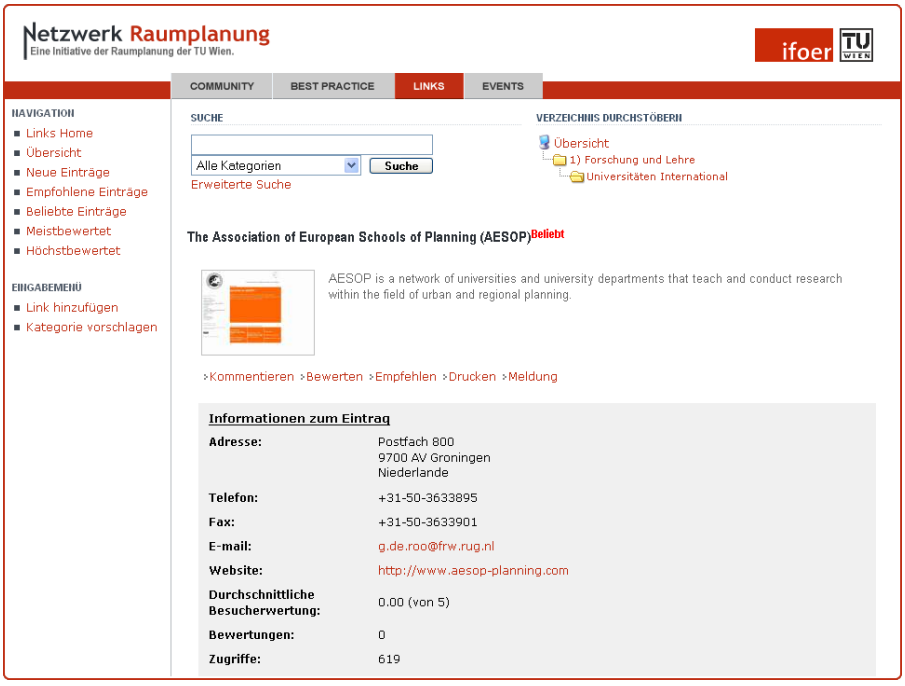


Abb. 7: Eintrag im „Linkverzeichnis“ [Quelle: Netzwerk Raumplanung, März 2007]

Die „Veranstaltungsdatenbank“ (siehe Abb. 8, S. 8) beinhaltet Informationen zu raumplanungsspezifischen Veranstaltungen. Es gibt dabei die Möglichkeit, zwischen Kalenderansicht oder Listenansicht und mehreren Kategorien zu wählen. Natürlich kann jede User eine neue Veranstaltung eintragen.

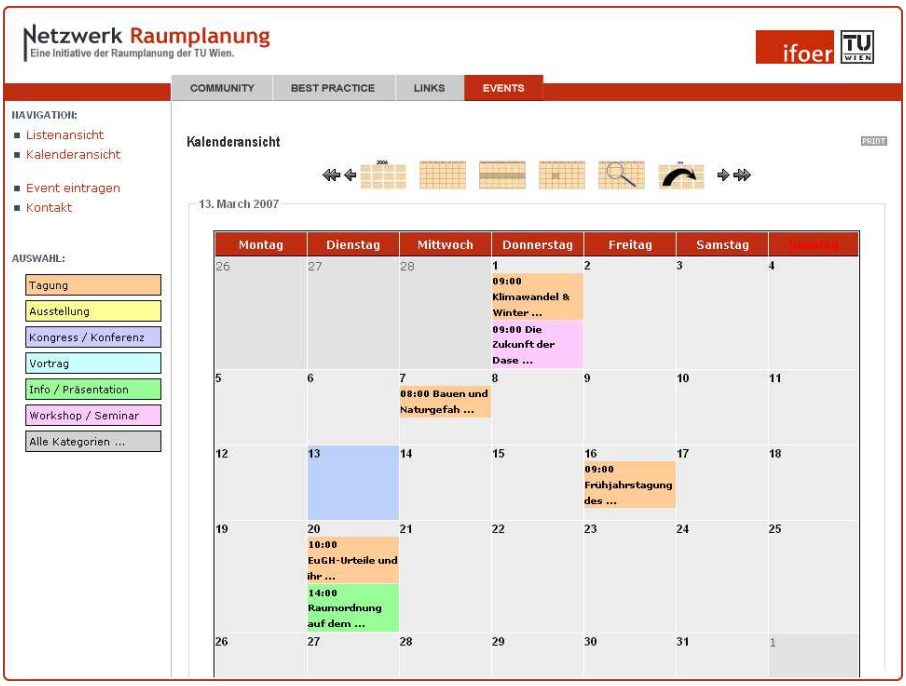


Abb. 8: Veranstaltungsdatenbank „Events“ [Quelle: Netzwerk Raumplanung, März 2007]

5.4 Kenndaten mit Stand März 2007

Das „Netzwerk Raumplanung” (http://www.netzwerk-raumplanung.at) ist seit Mai 2006 online. Seitdem haben sich mehr als 420 Planerinnen und Planer (großteils Absolventinnen und Absolventen der Studienrichtung Raumplanung und Raumordnung der TU Wien; Tendenz steigend) registriert und umfassende personenbezogene Daten inkl. Foto ins Planerinnen- und Planervereichnis „PeopleBook” eingetragen. Das „Netzwerk Raumplanung“ verzeichnet monatlich über 18.000 Page Impressions bei ca. 1600 Besuchern (exkl. Administratoren) – Tendenz steigend.

Medieninhaber ist der Fachbereich Örtliche Raumplanung im Department für Raumentwicklung, Infrastruktur und Umweltplanung, Technische Universität Wien.

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6 LITERATURVERZEICHNIS

GFK (2006): GfK Online Monitor 2004ff, http://www.gfk.at, März 2007.

KUNZMANN, K. R. (2001): Raumplanung: ein Tiger ohne Zähne? – Impulsstatement Podium 4: Raumplanung – ohne öffentliches Interesse?, in ARL Forschungs- und Sitzungsberichte Bd. 218, Beitrag beim Zukunftsforum RaumPlanung: Gemeinsamer Kongress 2001 von ARL und BBR, ARL, Hannover, 2002.

LETTAU, C.; HAHN, R. (2004): Das Webpflichtenheft, 2., überarb. u. erw. Aufl., Bonn, mitp.

LINZER, H.; VOIGT, A.; WALCHHOFER, H. P. (1994): Medial gestützte Methoden der Bürgerbeteiligung; in: Forschungsbericht, 180/93, Institut für Örtliche Raumplanung (IFÖR), Technischen Universität Wien.

O'REILLY, T. (2006): What is the Web 2.0? - Design Patterns and Business Models for the Next Generation of Software, http://www.oreilly.de/artikel/web20.html, Juli 2006.

ÖROK (2002): Österreichische Raumordnungskonferenz, Österreichisches Raumentwicklungskonzept 2001, Schriftenreihe Nr. 163, Wien.

SCHINDEGGER, F. (1999): Raum, Planung, Politik – ein Handbuch zur Raumplanung in Österreich, Hrsg. vom Österreichischen Institut für Raumplanung (ÖIR), Wien [u.a.], Böhlau.

SCHÖNWANDT, W. (1999): Grundriss einer Planungstheorie der „dritten Generation“, in: DISP 136/137, ETH Zürich, S. 25 – 35.

SCHÖNWANDT, W. (2000): Grundriss einer Planungstheorie der „dritten Generation“, in: IFOER E268-3, VOIGT, A.; WALCHHOFER H. P. [Hrsg.], Wien, S. 3 – 31.
SCHÖNWANDT, W. (2002): Planung in der Krise?, Theoretische Orientierungen für Architektur, Stadt- und Raumplanung, Stuttgart, Kohlhammer.
TSCHIRK, W. (2006): Raumplanung neu kommunizieren – Raumplanung unter den Aspekten der Informationsgesellschaft und Netzwerkbildung; Diplomarbeit am Fachbereich Örtliche Raumplanung, TU Wien.
UEXKÜLL, J. VON (1928/1973): Theoretische Biologie, Frankfurt am Main, Suhrkamp, 1. Auflage 1928.
VOIGT, A. ET.AL. (1998): „CACD“ – Computer Aided City Development, Pilotprojekt „die Digitale Stadt“, Forschung, Institut für Örtliche Raumplanung (IFÖR), Technische Universität Wien, 30.05.1998

🏆 *reviewed paper*

Die computergestützte Kommunikation zwischen Planungsabteilungen auf der Basis objektorientierter Analyse

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1 EINLEITUNG

Im Rahmen der Wissens- und Informationsgesellschaft steht die Raumplanung vor neuen Herausforderungen. Die Koordination von Planungsskizzen und die Organisationsstruktur der planenden Verwaltungen beziehen sich auf die Qualität und Leistungsfähigkeit von Planungsprozessen. Ein Projekt für die Stadtentwicklung wird durch die Zusammenarbeit von verschiedenen Abteilungen arbeitsteilig ausgeführt, die aber immer aufgrund schwacher Koordination der laufenden Prozesse verzögert sind. Eine der Ursachen hierfür ist die mangelnde Kommunikation, also der Austausch gegenseitig benötigter Daten, Informationen und Meinungen zwischen den Abteilungen, weil die offizielle Organisationsstruktur hierarchisch gegliedert ist und die Richtung des Informationsflusses in der Regel vertikal und nicht vernetzt stattfindet. Zur Durchführung des Projekts sind jedoch auch die vernetzten Zusammenhänge nötig.

Mit dem Aufkommen der Computertechnik wuchs das Bedürfnis, die neuen Möglichkeiten der Datenverarbeitung zur Aufbereitung von Informationen für die Planungsführung zu nutzen. Am Beispiel Taiwans ist die Regierung dabei, Informationssysteme für die Raumplanung zu erstellen, um den Planungsprozess aktiv zu unterstützen. Bislang werden die Systeme meist für die Bürger verwendet, um raumbezogene Informationen anzufragen. Auch gibt es in jeder Fachabteilung eigene computergestützte Assistenzsysteme, dennoch lässt der Mangel an Zusammenhängen zwischen den Abteilungen Planer die Lage des wechselvollen Planungsablaufs nicht umgehend begreifen.

2 ENTWICKLUNG DES ASSISTENZSYSTEMS FÜR EINE GRUPPE IN DER RAUMPLANUNG

Das Management von Planungsprozessen für die Raumplanung wird als effiziente, fuhrende Methode für die Projektentwicklung und -kontrolle verwendet. Im Ablauf des Managements ergeben sich Schwierigkeiten aus den vielfältigen, raumbezogenen Planungsdaten, die die Raumplaner erfassen müssen, damit sie die schwach strukturierten Probleme vom Planungsprojekt leichter handhaben können.

Planung und Management werden auf dem Problemlösungsprozess aufgebaut, der mit der Problemdefinition und -beschreibung beginnt und vielfältige Analyseformen beinhalt, z. B. durch Simulation und Modellierung. Viele wissenschaftlichen Beiträge untersuchten die Regeln der raumbezogenen Probleme und beschäftigten sich zugleich mit der Entwicklung von computergestützten Systemen wie etwa den Geographischen Informationssystemen (GIS) sowie den Informations- und Kommunikationssystemen (IuK-System) für die Raumplanung durch eine - nach entsprechender Situation erstellten - Modellierung. Dabei wurde versucht, die raumbezogenen Phänomene zu erklären und Probleme zu lösen. Viele der für komplexere räumliche Zusammenhänge entwickelten Assistenzsysteme weisen Mängel in der Nutzung im Wesentlichen dadurch auf, dass sie wenig auf Planungsprozesse ausgerichtet sind und in ihrer Funktionalität zu stark auf eng begrenzte Fragestellungen fokussieren.

2.1 2Computersysteme als zweckdienliche Instrumente zum Management und zur Entscheidung

Früher erfolgten die Planungen im Wesentlichen mit vielen menschlichen Bemühungen zur Datenverarbeitung und -analyse der Erhebungen, manuell bearbeitet auf großformatigen Karten und ebenso großformatigen Schreibtischen. In den 1960er Jahren wurde die Idee eines umfassenden "Management Informationssystems" (MIS) mit der Entwicklung der Datenbanktechnik, die die Fähigkeiten eines Systems zur Sammlung, Organisierung, Speicherung sowie Abrufen der Daten verstärkt, geboren.

Im Rahmen der Raumplanung hängt die Qualität der Planung und der Entscheidung immer davon ab, ob die Planer die Informationen in Erwägung ziehen können, deren Formen mit anderen Informationstypen verknüpfen dürfen. Als Überbegriff wurde das MIS hierfür im Bereich der analytischen Informationssysteme verwendet, z. B. Im Sinne von Entscheidungsunterstützungssystemen (Decision Support Systems, DSS). Ein DSS liefert aber keine Komplettlösung auf Knopfdruck, sondern kann zur Unterstützung von Planungs- und Entscheidungsprozessen genutzt werden, indem es die für eine Entscheidung wichtigen Informationen auf Anforderung schnell und übersichtlich bereitstellt und Alternativlösungen aufzeigt.

Das Konzept des DSS wurde also für die Raumplanung weitgehend angenommen, da die richtige Analyse von Informationen und Daten die Perspektive einer Planung sichert und als Basis für strategische Entscheidungen dient. Harris und Batty (1993) haben ihr Konzept wie folgt dargelegt:

- Eine Entscheidung basiert auf dem Einverständniss der Planung und wird in Normen und Anweisungen umgesetzt, die den Managementsprozess bestimmen.
- Bei den Planung- als auch den Managementhandlungen wird das aktuelle Wissen des Zustandes des sozialen oder physischen Systems gefordert.
- Solches aktuelle Wissen gründet sich direkt auf die aktuellen Daten, die im Informationssystem organisiert werden.
- Als Basis allgemeiner Planungsumgebung ist das sich gegenseitig beeinflussende und überlappende Assistenzsystem, in dem die Daten, Informationen und das Wissen strukturiert werden.

Die neuartige Computertechnik besitzt ein großes Potential zur Unterstützung der Beseitigung von Ungewissheit im Planungsablauf. Was von Batty (1995) dazu gezeigt wurde, war eine neue Logik des Computereinsatzes im offenen und flexiblen Framework des Planning Support Systems, inklusive der vielseitigen Kombination computergestützter Informationssysteme und Analysemoduln. Bei der Entwicklung und Anwendung der Informationssysteme sowie der Moduln in Form eines DSS werden die Informationen miteinander verbunden und gefiltert. Somit wird der Planungsprozess informativ und nützlich. Ein DSS kann als ein Interface zwischen Informationssystemen und Planungsprozessen betrachtet werden (vgl. Batty 1992).

2.2 2Computergestützte Assistenzsysteme als Medium für die Organisationseinheit

Malczewski und Ogryczak (1996) haben bei der Analyse der mehrkriteriellen Lokalisierungsprobleme darauf hingewiesen, dass Daten und analytische Komponenten mit Hilfe des Konzepts wechselwirkender Entscheidungsunterstützung, das den Feedback-Tausch von Informationen zwischen einem Entscheidungsträger und einem computergestützen System enthält, effektiv integriert werden können. Bei Verhandlungen und Entscheidungsprozessen existieren immer die unstrukturierten oder schwach strukturierten Probleme. Die schwach strukturierten Probleme, deren Elemente teils gut formuliert werden können und teils nicht erfassbar sind (Armstrong, 1994), brauchen jedoch noch die richtige Entscheidung von der Planungsgruppe, und deshalb müssen die gemeinsamen Informationen zwischen den Mitgliedern im Planungsablauf ungehindert ausgetauscht werden können. Die Planer können nämlich häufig tiefere Einsichten für das Informationsmanagement besitzen, und die Entscheidungsträger können auch den Planungsprozess genau kontrollieren.

Zudem sind die Methoden als Workgroup Computing entwickelt und als solche nur durch Zusammenarbeiten zu bedienen. Nach Streich (2005) soll das Konzept für folgende Aufgaben zur Unterstutzung der verteilten Arbeiten kommen:

- Koordination von Arbeitsschritten,
- Treffen von Gruppenentscheidungen,
- Kommunikation zwischen den Beteiligten sowie
- gemeinsamen Bearbeiten von Objekten. (vgl. Streich 2005, S. 196)

Darüber hinaus, mit wachsendem Einsatz des Internets, sind die computergestützten kooperativen Arbeit und Beteiligung die für die Raumplanung neuen verwendeten Techniken, was die Zusammenarbeit von den an verschieden Ortern liegenden Personen ermöglicht (vgl. Launiri 2001). Die "Group Decision Support Systems (GDSS)" wurden also auch in der Forschung und Entwicklung für Planungsprozesse eingesetzt. Die verbundenen Forschungen untersuchen nötige Elemente der Groupware und verknüpfen diese mit anderer Software. Somit konnten die bei Planungsprozessen beteiligenden Akteure, einschließlich Beamten, Planern, Experten und der allgemeinen Öffentlichkeit, über nützliche, wissenschaftlich vernünftige Informationen verfügen (vgl. Blaschke, 2004; Geertman, 2002; Steinmann, Krek, & Blaschke, 2005).

Shiffer (1992) hat ein Kooperationssystem für die Planung bearbeitet und darin die Wichtigkeit der Gruppenwahrnehmung hervorgehoben. Gruppenwahrnehmung ist eine Voraussetzung, um gemeinsame Arbeit zu koordinieren, und wird durch zwischenmenschliche Kommunikation, die als

Informationsaustausch bezeichnet werden kann, gefördert. Bei der Bearbeitung gemeinsamer Aufgaben spielt die Gruppenwahrnehmung eine zentrale Rolle für das Funktionieren der Zusammenarbeit. Angesichts des Mangels an Fähigkeit herkömmlicher Informationsysteme zur Unterstüzung der Zusammenarbeit, sind folgende Gesichtspunkte in Betracht zu ziehen:

- Data-Sharing Mechanismus,
- gemeinsamer Arbeitsraum für die Planungsgruppe, und
- passendes Interface zwischen Gruppen und Informationen (vgl. Armstrong, 1994; Jones, 1998; Launiri, 2001).

2.3 2Objektorientierte Analyse als Basis des Systementwurfs für ein Planning Support System (PSS)

Ausserdem deutet der Umriss über die Stadtentwicklung darauf hin, dass ein Satz Beziehungen zwischen Aktivitäten in der Stadtentwicklung schnelle beschrieben wird. Ein PSS soll auf der Basis von Elementen, die besonders notwendig in entsprechendem Planungsprozess sind, aufgebaut werden, und die entwickelten Komponenten vom PSS können dabei eventuell andere Modellierungen und Aufgaben zum Planungsaufbau sowie -durchführung unterstützen. Hopkins (1999) hat deshalb mit dem Konzept der Objektorientierung das PSS für die Stadtentwicklung in seine Bestandteile zerlegt, und dessen grundlegende Struktur zu konstruieren versucht. Er stellte fest, dass ein PSS auf Basis von

- einem gemeinsamen Satz von Objekten, die im Prozess der Stadtentwicklung inhärent sind, sowie
- Planungsebenen und -instrumenten, die diese gemeinsamen Objekte miteinander teilen,

gegründet werden soll. Insofern die Komponenten vom PSS in dieser offenen objekorientierten Struktur integrieret werden, kann PSS volle entsprechende Planungsaufgaben effizient unterstützen.

Was im Rahmen dieser verbundenen Forschungen parallel unerlässlich ist, ist die zeitliche Dynamik in der Stadtentwicklung. Es deutet darauf hin, dass beim Planungs- und Entscheidungsprozess der zeitliche Faktor in die Computergestützen Assistenzsysteme eingebettet werden soll. Das heißt, die Komponenten vom PSS müssen dementsprechend auf irgendeinen Stufen entfernt oder hinzugefügt werden können. Aufgrund der Objektorientierung wurden städtische Phänomene untersucht, Verhalten von jedem Element in die berechenbaren Regeln zu übersetzen. Mehr und mehr wird die Vision eines digitalen städtischen Phänomen umgesetzt, in dem viele Entwicklungslagen und -tendenzen vor seinem tatsächlichen Einsatz in Form von simulierbaren Rechnermodellen zur Verfügung stehen.

Die Stadtmodelle, die von Simulationen der Stadtsysteme als Kollektive von zahlreichen in der Stadt handelnden Elementen erfolgen, haben an zentraler Stelle zu belegen begonnen. Es wird vor allem von Techniken wie Zellularautomat (CA) und Multiagentensystem (MAS) beeinflusst (Benenson & Torrens, 2004). Um Anwender beim Aufbau neuer Modelle im PSS zu helfen, wandte Yeh und Qiao (2005) ebenso das Konzept der Objektorientierung zur Wiederverwendung der vorher bestehenden Modellquellen an. Als Bausteine können die Komponenten der Modelle aus sogenannten Modellbibliotheken benutzt werden.

Ein effizienter Planungsprozess zur Stadtentwicklung im Bereich des PSS setzt voraus, dass die Planungsgruppe auf flexible Architekturen vom PSS zurückgreifen können. Damit können die Funktionen des PSS im Bedarf leichter ergänzt werden. Soll die Aufgabe der Projektplanung auf mehrere Personen verteilt werden, so setzt dies eine Dekomposition des Gesamtplanungsproblems in Teilplanungsprobleme voraus. Hingegen wird in der Regel nicht nur ein einzelnes computergestütztes System in der Planungsgruppe operiert, und das heißt, dass die Fähigkeit der Assistenzsysteme zur gegenseitigen Unterstützung als Leistungsfähigkeit eines Verfahrens im Planungsablauf bezeichnet wird. Es stellt sich hierbei das Problem der Koordination der Teilpläne bzw. der Koordination der für sie verantwortlichen Planer oder Planungsabteilungen. Viele dieser Koordinationensmängel sind auf inhaltliche und begriffliche Mängel zurückzuführen.

3 GRUNDGEDANKEN EINES FLEXIBLEN ASSISTENZSYSTEMS

Um den inneren Konflikt zu reduzieren, muss die Rolle des PSS nicht nur als Instrument zur raumbezogenen Problemlösung verstärkt werden, sondern auch zur Verbesserung der inneren Kommunikation. Mit den häufigen Zustandsänderung im Planungsablauf müssen zukünftige PSS also auf flexibler Struktur aufgebaut werden, so dass die vorher unerwarteten notwendigen Elementen darin eingebettet werden können. Durch

den Einsatz der Konzept der Objektorientierten Technologie in diesem Bereich wird die Elastizität des Entwurfes vom PSS gesteigert. Mit der Objektorientierten Analyse vom Planungsprozess innerhalb des vorliegenden Artikels werden Objektbasierte Paradigmen zur Beschreibung der Objekte im Planungsprozess und zur Formalisierung deren statischer und dynamischer Zusammenhänge entwickelt.

3.1 Behinderung der Kommunikation durch hierarchische Organisationsstruktur

Schnelle Planungsprozesse steigern die Effizienz, indem sie arbeitsteilige Prozesse besser und schneller koordinieren. Die Anforderungen, die an die Geschwindigkeit und Flexibilität der räumlichen Planungsabläufe gestellt werden müssen, hängen deshalb davon ab, wie komplex und dynamisch das Kommunikationsumfeld einer Planungsgruppe ist. Hier wird die Kommunikation zwischen den Abteilungen einer Planerstellung und -bearbeitung herausgearbeitet. In Abbildung 1 wird die hierarchisch gegliederte offizielle Organisationsstruktur gezeigt.

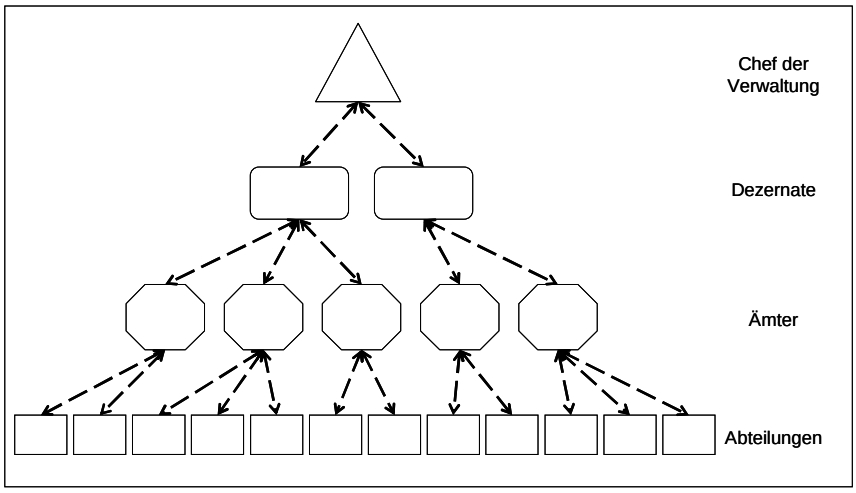

Abb. 1: Organisationsstruktur einer Stadtverwaltung

In der Regel wurde räumlicher Planentwurf auf dieser pyramidal hierarchischen Organisationsstruktur durch die folgenden Schritte bestimmt:

- Vorplanung: Betrachtung der erwarteten Funktion (oder Ziel) des Raums zur Entwicklungsmethode.
- Planerarbeitung: Konzeption der Raumstruktur auf der Basis der behandelnden Funktion.
- Plankonstruktion: Einsetzung der Aktivitäten, die genannten Funktion erreichen zu können.
- Ausführungsanordnung: Auswählen des Prozesses im Planablauf, woran die Aktivitäten entlang geführt werden.
- Planumsetzung: Zuordnung verbundener Aufgaben in entsprechenden Abteilungen gemäss der Funktion.

In diesem Fall wird die Planungsmethode immer auf Basis einer "Top-Down"-Prozessbehandlung durchgesetzt, und die Raumplanungen werden grundsätzlich auf Basis der Angebotsorientierung durchgeführt. Die Regierung oder Entscheidungsträger beschließen selbst die Planungsrichtung und erstellen hierfür die zugehörigen Pläne. Somit wird am Anfang der Großteil des räumlichen Planes behandelt. Obwohl die Teilpläne bzw. Vorgehensweisen gleichzeitig genau definiert werden, ist es doch unvermeidlich, dass Planer die Wichtigkeit jedes einzelnen raumbezogenen Ereignisses oder Elements, das mit den Aktionsprojekten vernetzt, nicht leicht erfassen können und sogar vernachlässigen. Der abteilungsübergreifende Informationsfluss, der Grundvoraussetzung für die Verbesserung der Wissensbasis und der kommenden Entscheidung ist, wird jedoch in diser Organisation behindert. Die Gründe dafür liegen in den Verwaltungsvorgängen und im Kooperationsverhalten.

Im Bereich räumlicher Planung geht es, bei der räumlichen Handlungsdimension etwa, um Fragen des Bearbeitungsmaßstabs, des Flächenumgriffs einer Planung oder um räumliche Wechselwirkungen verschiedener Nutzungskategorien (vgl. Streich 2005, S. 34). Dafür werden umfangreiche Daten und Informationen benötigt, die erst eine optimale Zuordnung der unterschiedlichen Nutzungen ermöglicht. Aufgrund der anhaltenden wechselhaften Raumentwicklung hat sich die räumliche Planungsform auch

kooperativer verändern müssen. Es sollte nicht nur eine Angebotsorientierung stattfinden, sondern gerade auch Ermöglichungen zur Informations- und Meinungsaustausch der verbundenen Abteilungen (=Kommunikation) als sinnstiftendes Element im Planungsablauf hergestellt werden.

Die Zusammenarbeit in der Planungssystematik soll jedoch besser ausgebaut, optimiert und vernetzt werden. Ziel ist es, einen vorhandenen Planungszustand frühzeitig zu erkennen und entsprechende Unterstützung anbieten zu können; außerdem Erwerb des entsprechenden Fachwissens über den Plannungsgegenstand in der Planungsgruppe. Jedes Projekt verbindet aber nicht nur direkt die Abteilungen miteinander, sondern auch die verbundenen oberen Verwaltungen bis hin zu den Entscheidungsträgern selbst, z. B. Bürgermeister. Was in Abbildung 2 dargestellt wird, sind die Verbindungen mit den allen Komponenten in der Organisation.

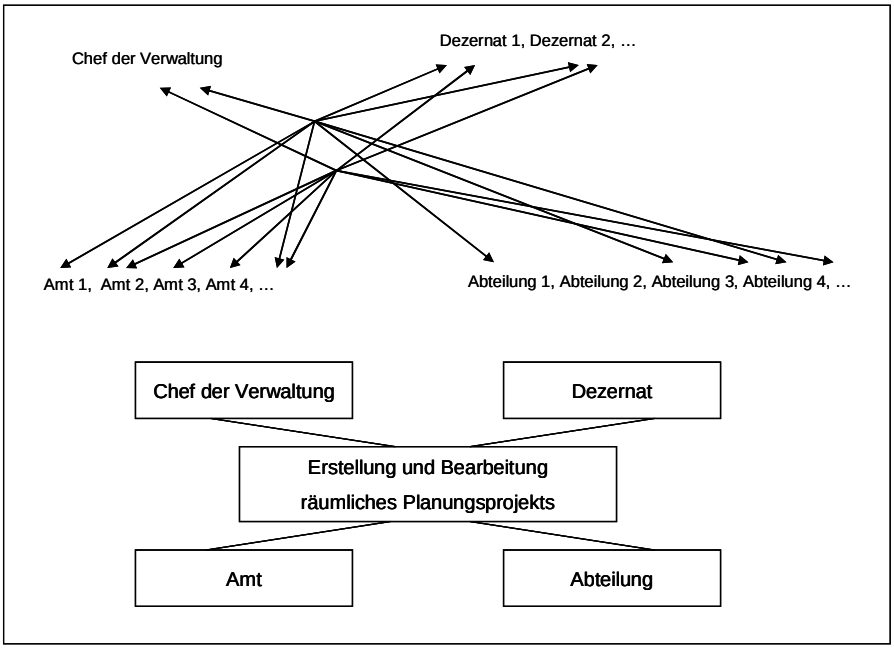

Abb.2: Verbindungen mit den allen Komponenten in der Organisation

Mit der zunehmenden Spezialisierung und Differenzierung der Fachplanungen ergibt sich daneben der Koordinationsbedarf zwischen den Fachbehörden. Darüber hinaus agiert Raumplanung, und das erst recht heute, im Spannungsfeld zahlreicher Interessen - vor dem Hintergrund von Privatisierung und Globalisierung und insbesondere mit der Transformation in die Wissensgesellschaft haben sich jedoch die Rahmenbedingungen entscheidend verändert. Welche Rollen dabei seitens der Raumplanung eingenommen werden und welche Instrumente zur erfolgreichen Übereinstimmung und Umsetzung von Raumentwicklungsinteressen notwendig sind, müssen Planungsträger und -gruppen, also mehrere, Kentnisse schneller besitzen.

Der Zugang zu den relevanten räumlichen Bedingungen und ihren Bezugen aus unterschiedlichsten Informationen werden deshalb erfordert. Raumplanung muss danach koordinierend einwirken, so dass einerseits prioritäre Maßnahmen möglich werden und anderseits endogene negative Beeinflussungen verringert werden können. Die darauf basierende Entwicklung von Planungsprozessen und deren Koordination mit Planungsbetroffenen stellt das wichtigste Tätigkeitsfeld der räumlichen Datenverarbeitung, bzw. des planungsbezogenen Assistenzsystems dar. Deswegen kommt die Anforderung vor, dass ein computergestüztes System eingerichtet wird, mit dem die Mitarbeiter allerzeiten eine Menge Daten oder Informationen bearbeiten, die über die für das durchgeführte Planungsprojekt relevanten Daten und Informationen verfügen.

3.2 Flexibles Daten- und Informationsmanagement im Planungsprozess

Planung ist eine Auseinandersetzung mit der Zukunft, für deren Bewältigung oder Sicherung viele Probleme gelöst werden müssen. Die Planungsaufgaben werden immer im Form von Informationserhebung, raumbezogener Problemanalyse, Vorhersage zukünftiger Wirkungsabschätzungen sowie dem Vergleich und der Bewertung von Alternativen festgelegt.

Arbeiten verschiedene Planungsabteilungen gemeinsam an einem Projekt, ist die rollen- und aufgabenabhängige Weiterleitung von Dokumenten in einzelnen Arbeitspaketen unerlässlich. Integrierte Daten- und Informtaionsmanagement-Funktionen ermöglichen es dem Anwender, verschiedene Arten von Arbeitspaketen durch einen Prozess gesteuert zu verteilen. Die Aufgaben über das für die Raumplanung relevante Daten- und Informationsmanagement im Planungsprozess werden erhalten. Es stellt sich die Frage, inwieweit die neuen Kommunikationstechnologien zu besseren Informationen der Planungsgruppe, Bürger oder sonstiger Akteuere genutzt werden?

In diesem Beitrag geht es um den Begriff des "offenen Frameworks" für die Kommunikation und deren Daten- und Informationsmanagement. Die neuen Herausforderungen in Kombination mit den Möglichkeiten der flexiblen Unterstützung für Kommunikationen zwischen Planungsabteilungen erfordern neue Arbeitsmethoden und Organisationsstrukturen, die ein neues Verwaltungsdenken voraussetzen. Eine verbesserte Flexibilität führt zu:

- schnelleren Reaktionen auf Raumveränderungen,
- direkter Kontrolle über Prozesse für Datenbearbeitung und Management,
- schnellerer Vernetzung von Planungsprozessen bei Planungspartnern und Entscheidungsträgern,
- Möglichkeit schnellerer raumrelevanter Entscheidungen.

Hier wird in abstrakter Form gezeigt, wie die Flexibilität im Planungsprozess, wobei alle im Projekt eng zusammenarbeitenden Personen verbunden sind, konzipiert werden kann.

3.3 Flexible Beschreibung der Planungsstruktur

Herkömmliche Denkenweisen des raumbezogenen Planungsablaufs, die die befestigten voraussichtlichen Optionen und Ziele haben, unterstützen vor allem gut- oder wohlstrukturierte Planungsprobleme. Als wohlstrukturiert wird ein Planungsproblem bezeichnet, wenn das Entscheidungsfeld nach Art und Umfang scharf definiert ist. Dies bedeutet, dass Art und Anzahl der Variablen und die Beziehungen zwischen ihnen bekannt sein müssen, so dass die Menge der Lösungen vollständig definiert ist.

Den Erstellungen für die Raumplanung ist allen gemeinsam, dass sie Teile des Planungszustandes beschreiben. Daraus kann abgeleitet werden, dass es in nur einfachstmöglichen Projekten möglich ist, eine ganzheitliche Planungsdurchführung zu gestalten. Damit große Projekte auf verschiedene Planungsgruppen oder -akteure aufgeteilt werden können, ist es von Vorteil, wenn alle Mitglieder mit dem selben Planungsziel planen. Die Aktionen können daher in mehrere kleinere Aktionen aufgeteilt werden, die sich auch mehrfach zusammen oder hintereinander durchführen lassen. Genauso könnten Daten und Informationen zergliedert werden, um mit kleineren Datenmengen auf einmal zu arbeiten und unnötige Daten und Informationen für eine Aktion zu vermeiden.

Der Planungsprozess sollte sich wiederholen lassen, dessen Charakter von der Dynamik und Interaktion zu erhalten. Integration der verschiedenen Aspekte der Raumentwicklung, bezogen auf den Planungsablauf, ist eines der wichtigsten Anliegen einer raumbezogenen Planung. Daher wird das Augenmerk besonders auf die wechselseitigen Beziehungen und Abhängigkeiten zwischen den verschiedenen Komponenten im Raum gerichtet. Objektorientierte Beschreibung der Planungssystematik soll modulares Denken und Einsicht in die Grundkonzepte der Projektsplanung und Planungsauswertung vermitteln. Auf Basis der Objektorientierung wird eine Bewegungsstruktur gezeigt. Die Objekte, die hier dynamisch importiert und ausgewechselt werden, werden mit der Ansammlung von vorherigen Planungsdatensatzen festgelegt oder als neue Planungsobjekte bezeichnet. Zum Zweck dieser Modellierung des Planungsablaufs konnten sowohl Projekte, als auch Planungsträger, Angestellte, Mitarbeiter, Abteilungen und Dokumente usw. als Objekte betrachtet werden.

3.3.1 Anwendung eines flexiblen computergestützten Systems

Die aus der Entwicklung der Wissens- und Informationsgesellschaft resultierenden Anforderungen an den Computereinsatz bestimmen den Themenbereich der EDV-Systementwicklung. Erklärte Arbeit aller Planungsprozesse ist es, nur notwendige, richtige und konsistente Informationen zu erstellen, weshalb die folgende Leistung von der verbundenen Datensammlung und -integration abhängen wird. Ein wesentlicher

Ausgangspunkt für diese Anwendung eines flexiblen computergestützten Systems ist vor allem der Aufbau der Vernetzung von raumbezogenen Daten unterschiedlicher getrennter Abteilungen.

Mit Raumplanung ist gemeint, dass die raumbezogenen Projekte erfüllt werden, Probleme oder Konflikte bewusst wahrzunehmen, zu bearbeiten und auf eine bestmögliche Lösung hinzuwirken. Die üblichen raumbezogenen Probleme, mit denen die Planungsgruppe konfrontiert werden, haben in der Regel mit größeren Daten- und Informationsmengen zu tun. Die Aufgaben der Daten und Informationsverarbeitung sind aus den Anforderungen an ein Projektmanagement abzuleiten. Es geht dabei um die Gestaltung und Steuerung von Managementtechnologie im Planungsablauf. Diesem Management obliegt es, allen Stellen in einer Planungsorganisation die benötigen Daten und Informationen mit den Mitteln der modernen Technik aktuell und in effektiver Weise zur Verfügung zu stellen. Die technologischen Ziele hierfür sind:

- effetive Verwaltung der Daten,
- schnelle und übersichtliche Verfügbarkeit der Daten,
- angemessene Archivierung der Daten und
- Übertragung, Speicherung und Verarbeitung großer Datenmengen.

Aufgrund der technischen Entwicklung wird vorausgesehen, dass diese Planungsprozesse zukünftig nahezu vollständig elektronisch durchgeführt werden können. Eine flexible Planungsstruktur muss daher auch mit einem flexiblen computergestützten System effizient untermauert werden. Entwicklungen in der Kommunikations- und Informationstechnik sind ein wesentlicher Faktor bei den Veränderungen von Planungsstrukturen. Für einen erfolgreichen Technikeinsatz bedarf es einer hohen Integration von Organisations- und Informationsmanagement, damit die neuen technischen Möglichkeiten auch zur Optimierung vom Planungsablauf beitragen.

Flexible computergestützte Systeme bieten den Planungsgruppen die Möglichkeit an, der Begriff "Kommunikation" in der Datenverarbeitung zu verwenden. Flexibilität in dem computergestützten System, d. h. Fähigkeit des gemeinsamen Austausches von Informationen, kann beim Systementwurf für folgende Arten organisieren und pflegen:

- **Rechte und Pflichten von Daten- und Informationensverarbeitung zuteilen**: Damit werden Aufträge geeignet übernommen.
- **Netzwerk aufbauen**: Gemeint ist hier sowohl das Datenverarbeitungs-Netzwerk, als auch das Netzwerk von verbundenen Projekten sowie Beziehungen personaler Verantwortung.
- **Berichtswesen:** Die zur Planung und Steuerung erforderlichen Informationen werden im Berichtswesen zusammengestellt. Aufgabe des Berichtswesens ist es, die Ergebnisse der Projektarbeit zu dokumentieren und zu kommunizieren.
- **Dezentralisierung der Arbeit:** Die Beteiligten arbeiten in unterschiedlichen Planungsphasen. Der Durchlauf von Planungsakten kann jedoch Monate und Jahre dauern, und sie beanspruchen eine Menge Mitarbeiter, die nicht immer zu demselben Zeitpunkt an demselben Ort sind.

Die Vorteile liegen auf der Hand: Schaffung und Anpassung von Organisationsstruktur durch effiziente interne Vernetzung, und schneller Informationsaustausch durch gemeinsame Schnittstelle. In der nächsten Stufe kann die Planungsgruppe nach den Daten und Informationen mit der Verwaltung elektronisch in Kontakt treten. Durch den Einsatz von flexiblem computerstütztem System soll die Effizienz in den Planungsabteilungen gesteigert werden, indem die Planungsprozesse beschleunigt, Aufwände reduziert und somit Kosten eingespart werden. Dazu wird im folgenden Abschnitt näher spezifiziert, wie ein Entwurfprozess beschreibbar ist.

4 OBJEKTORIENTIERTE ANALYSE IM PLANUNGSPROZESS

Nach der allgemeinen Organisationsstruktur der Stadtverwaltung kann sich die Planungssystematik für die Gesamtentwicklungsplanung, die in Abbildung 4 gezeigt wird, folgendermaßen gliedern: Hauptprojekte, Subprojekte und Pflichtabteilungen. Jedes Subprojekt benötigt unterschiedliche Abteilungen zur Zusammenarbeit.

Für jedes Projekt erarbeiten Wissenschaftler und Planer eine angemessene Planungsmethode und beschäftigen sich mit der Modellierung, um die zukünftigen Entwicklungszustände zu simulieren. Die

Entwicklung des Projektunterstützenden Assistenzsystems wird dabei in der Regel den erwarteten Funktionen (oder planerischen Ergebnissen) gemäss durchgeführt.

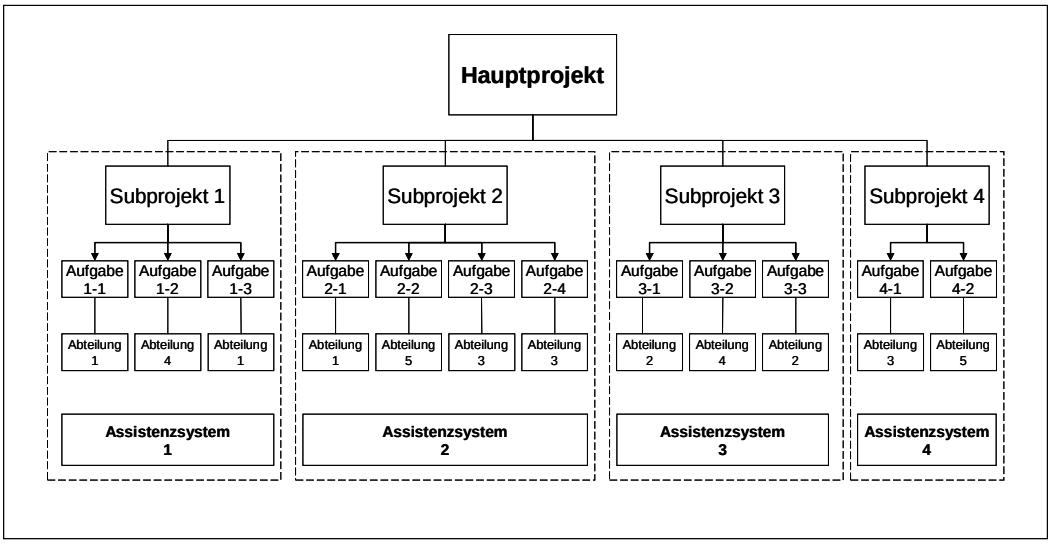

Abb. 4: Herkömmliche Aufgabenzuordnung einer Gesamtentwicklungsplanung

Der Einsatz der Objektorientierung bedeutet, ausgehend von der Problemstellung den Problembereich als eine Menge kommunizierender und interagierender Objekte zu beschreiben. Jede Datei, jedes Mitglied und sogar ganze Organisation können entsprechend ihrer Aufgabenzuordnung und Kompetenz in der Gruppe definiert werden. Auf Basis des objektorientierten Konzepts kann zuerst jede Abteilung als ein Objekt behandelt werden, in der die Systematik erneut beschrieben wird, wie in Abbildung 5 gezeigt wird.

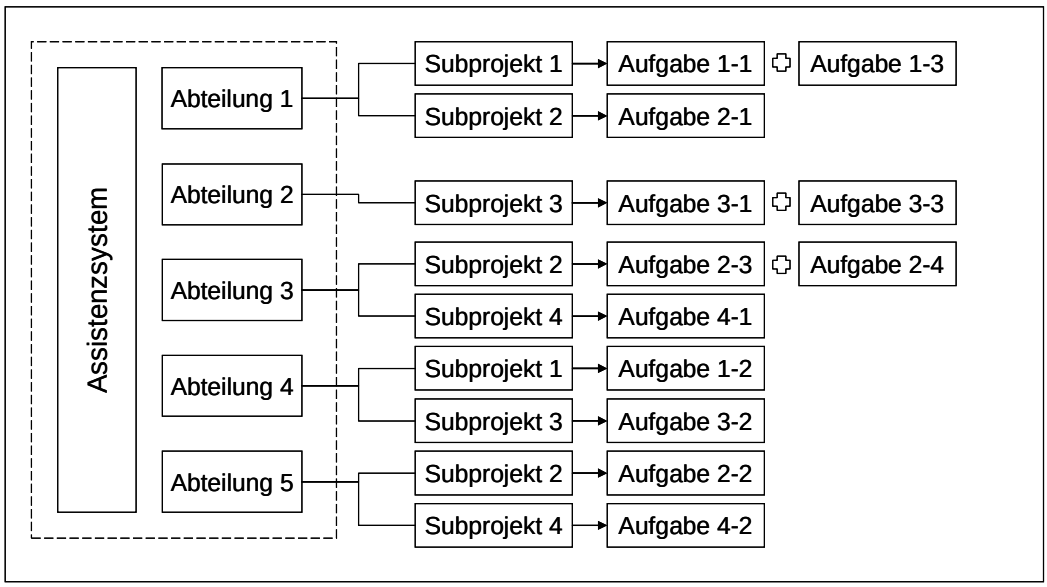

Abb. 5: Das Konzept objektorientierter Analyse für eine Gesamtentwicklungsplanung

Die Unterschiede zwischen den beiden Konzepten sind:

- In Abbildung 4 ordnet jedes Projekt die Aufgaben eindeutig zu. Falls aber irgendeine Abteilung die gemeinsamen Daten verändert, werden die anderen Abteilungen ebenfalls davon beeinflusst. Für den notwendigen Daten- und Informationsfluss muss also ein geeignetes Assistenzsystem erstellt werden, um entsprechende Analysen durchzuführen. Die Schwierigkeit ist es jedoch, dass - außer im entsprechenden Projekt - die Daten und Informationen schwer von anderen Abteilungen gemeinsam genutzt werden, und andererseits ist es unvermeidlich, noch ein neues System für zusätzliche Projekte aufzubauen.
- Abbildung 5 zeigt das Objekt (als Abteilung) mit einer davon unterschiedlichen Logik zur Aufgabenlösung. Entsteht ein neues Projekt, darf jede Abteilung nach den zugeordneten Aufgaben

das weitere "Verhalten" selbst bestimmen, und andere Abteilungen brauchen die laufenden Aktivitäten nicht zu verändern. Das System ist auf diesem Framework deshalb erweiterbar.

5 FAZIT

Es ist jedoch unmöglich, ein Entscheidungsunterstützungssystem aufgrund der Komplexität und der unerwarteten Einflüsse im Planungsablauf aufzubauen. Die Leistungsfähigkeit muss von Planungssystemen daran gemessen werden, inwieweit sie in einem dynamischen und komplexen Umfeld ihre Hauptfunktionen der Koordination und der Leistungssteigerung erfüllen (vgl. Franz 1993, S. 37). Die schnelle Evolution der Computertechnologie erhöht die Transparenz von raumbezogenen Problemen, damit mehrere Daten repräsentiert und verwendet werden können. Aber das konfrontiert Planer zugleich mit der Schwierigkeit der Erfassung vielfältiger Daten von jeder Abteilung, so dass sie noch Hilfswerkzeuge zur Bildung ordentlicher Kommunikation benötigen.

Die Objektorientierung kann als ein Denken, eine Philosophie, ein Verhaltensmuster und sogar eine Lebensweise sein. Deren Ziel in diesem Bereich ist, wenn die Planer die wechselhaften Planungszustände begegnen, können sie die komplizierten oder schwach strukturierten Probleme mit „ursprünglicher“ Denkweise umreißen und auslösen. Damit wird der Entwurf der Assistenzsysteme bezüglich ihrer Tauglichkeit für Plaungsprozesse tiefer untersucht.

6 LITERATUR

Armstrong, M. P.: Requirements for the development of GIS-based group decision-support systems; Journal of the American Society for Information Science, 45(9), 669-677, 1994

Batty, M.: Planning support systems and the new logic of computation; Regional Development Dialogue, 16(1), 1-17, 1995

Benenson, I., & Torrens, PM.: Geosimulation: object-based modeling of urban phenomena; Computers, Environment and Urban Systems, 28, 1-8, 2004

Blaschke, T.: Participatory GIS for spatial decision support systems critically revisited. In: Egenhofer, M., Freksa, C., Miller, H. (Ed.), GIScience 2004 (S. 257-261) Adelphi, MD, 2004

Franz, T.: Die Gestaltung von Managementsystemen zur Beschleunigung von Planungsprozessen. Doktordissertation, Institut für Betriebswirtschaft, Hochschule St. Gallen, 1993

Geertman, S.: Participatory planning and GIS: a PSS to bridge the gap; Environment and Planning B: Planning and Design, 29, 21-35, 2002

Harris, B., & Batty, M.: Locational models, geographic information and planning support systems; Journal of Planning Education and Research, 12, 184-198, 1993

Hopkins, L. D.: Structure of a planning support system for urban development; Environment and Planning B: Planning and Design, 26, 333-343, 1999

Jones, R. M.: An analysis of computer-supported co-operative work systems to support decision-making in regional planning; Computer, Environment and Urban Systems, 22(4), 335-350, 1998

Laurini, R. (Ed.): Groupware in urban planning; Information Systems for Urban Planning (S. 219-244). New York: Taylor & Francis, 2001

Malczewski, J. & Ogryczak, W.: The multiple criteria location problem: 2. Preference-based techniques and interactive decision support; Enviroment and Planning A, 28, 69-98, 1996

Shiffer, M. J.: Towards a collaborative planning system; Environment and Planning B: Planning and Design, 19, 709-722, 1992

Steinmann, R., Krek, A., & Blaschke, T.: Can online map-based applications improve citizen participation? In: M. Bohlen et al. (Eds.), LNAI 3416 (S. 22-35), Springer, 2005

Streich, B. (Eds.): Stadtplanung in der Wissensgesellschaft. Wiesbaden: VS Press, 2005. http://www.urban-is.de/Default-engl.htm (English version-excerpts)

Yeh, A. G. O. & Qiao, J. J.: ModelObjects - A model management component for the development of planning support systems; Computers, Environment and Urban Systems, 29(2), 133-157, 2005

🏆 *reviewed paper*

Qualitative Bilder von Stadt und Region: Geographische Informationssysteme in der Architektenausbildung

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1 ABSTRACT / ZUSAMMENFASSUNG

Der technische Fortschritt der Geografischen Informationssysteme (GIS) sowie die zunehmende Qualität und Verbreitung von Geodaten ermöglichen, einhergehend mit der Entwicklung neuer (technischer und methodischer) Analyseverfahren, immer präzisere Aussagen zur Stadt-, Regional- und Raumentwicklung. Innerhalb der Planer- und insbesondere der Architektenausbildung wird der systematische Umgang mit Geodaten und -informationssystemen bisher dennoch oft vernachlässigt bzw. ausgeblendet. Dabei bieten die mit GIS erzeugten räumlichen Informationen eine sehr viel verlässlichere Basis für viele räumliche Entscheidungen in Analyse, Entwurf und Konzeption der verschiedenen Maßstabsebenen. Quantitative und qualitative Raumeigenschaften lassen sich überdies mit GIS im Vergleich zu „herkömmlichen“ Methoden sehr viel aussagekräftiger und (allgemein-)verständlicher visualisieren.

Der Lehrstuhl für Stadtquartiersplanung am Institut für Orts-, Regional- und Landesplanung an der Universität Karlsruhe erprobt die Integration von GIS als Werkzeugkomponente in seinem Lehrkonzept und im Aufbau eines entsprechenden Forschungsbetriebes. Die Fähigkeiten des GIS-Konzeptes sollen gezielt in den Maßstäben zwischen Regionalplanung und Architektur und deren Schnittstellen eingesetzt werden, um eine bislang ineffiziente Lücke im Ausbildungssystem zu schließen.

Seit 2005 werden unterschiedliche Herangehensweisen und Vermittlungsansätze erprobt, um die für die Architektenausbildung relevanten Inhalte und Abläufe zu definieren, Lehrmethoden und Lernverhalten und die entsprechenden Geschwindigkeiten einschätzen zu können und letztlich grundsätzliche Ableitungen für ein Gesamtkonzept zur Einbindung von GIS in die Architektenausbildung zu ziehen. Die eingesetzten Methoden werden dabei kontinuierlich überprüft und modifiziert. Der Beitrag skizziert und begleitet die verschiedenen Ansätze mit Blick auf Rahmenbedingungen und Ziele, schildert deren Vor- und Nachteile, stellt ausgewählte Beispiele vor, zieht Schlüsse hinsichtlich eines effizienten Didaktik- und Erprobungskonzeptes und verdeutlicht die praktischen Anwendungsbereiche und -möglichkeiten, die sich Architekten und Planern durch eine einschlägige Ausbildung bieten können.

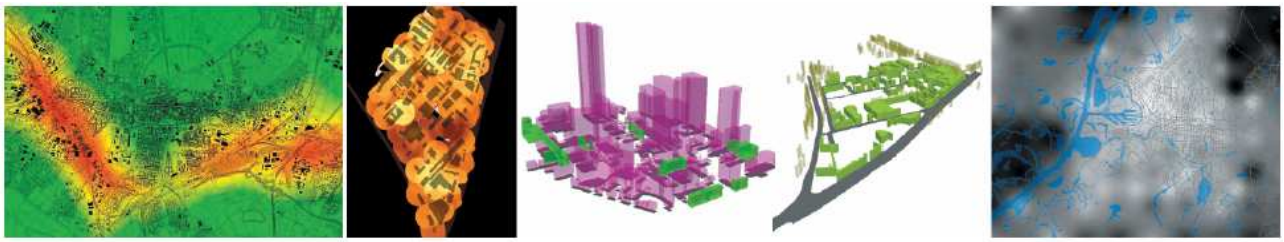

Abb. 1: Überblick „GIS als Werkzeug für Architekten“ (Quelle: eigene Darstellungen, Studentenarbeiten)

2 AUSGANGSLAGE

2.1 „GIS für Architekten“?!?

Geographische Informationssysteme sind seit jeher bei Geographen und Geodäten angesiedelt und fest in deren Arbeitsfeldern und Ausbildungssystem verankert. Seit einiger Zeit bekommen Geoinformationen auch bei Dienstleistern, Ökonomen und (Geo-)Informatikern besonderes Gewicht. Die drastisch ansteigende Nutzung von Onlinediensten wie etwa Map24, GoogleMaps oder Google Earth, zeigt die wachsende Bedeutung von raumbezogenen Informationen auch für Nichtfachleute. An Raumplanungs- und anderen Planungs-, insbesondere Architekturfakultäten hingegen beginnt GIS sich erstaunlicherweise erst allmählich in der Lehre zu etablieren: Im Normalfall haben Architekturstudenten wie -absolventen eher noch nie etwas von „GIS“ gehört. Doch gerade für diese, bisher eher „klassische CAD-Nutzer“, ergeben sich durch den Einsatz von GIS nützliche Optionen:

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- *GIS als Standardtool* Architekten kommen bereits in ihren „herkömmlichen“ Tätigkeitsfeldern mit GIS in Berührung, denn in den öffentlichen Verwaltungen als Auftrag- und häufig auch Arbeitgeber ist der GIS-Einsatz mitt<lerweile nahezu Standard. Kartenwerke, Plandaten und zusätzliche raumbezogene Fachinformationen werden zunehmend von den zuständigen Behörden und Fachplanungsbüros digital und georeferenziert im GIS erarbeitet, eingepflegt und verwaltet. Dem Architekten als räumlichem Experten, Planungs- und Ansprechpartner werden dadurch die für seine Arbeit benötigten umfassenden Informationen zweckmäßig und effizient GIS-basiert bereitgestellt.
- *GIS als räumliches Werkzeug* GISe bieten für räumliche Aufgaben eine umfassende Werkzeugpalette wie keine andere Anwendung. Ihre Stärke liegt in erster Linie in der Verknüpfung von Geometrien mit beliebig erweiterbaren Sachdaten als quantitative oder qualitative Objektattribute: statistische, wirtschaftliche, morphologische, materielle, zeitliche oder prozesshafte Eigenschaften, die mit Hilfe von Verwaltungs-, Analyse-, Berechnungs- und Visualisierungstools verarbeitet werden können. Typische Arbeitsprozesse lassen sich sehr effizient gestalten und wichtige konzeptionelle Entscheidungen fundiert begründen. Für Architekten besonders interessant wird der Einsatz von GIS auf Gebäudeebene, da sich Eigenschaften und funktionale Zusammenhänge von Nachbarschaften, Quartieren oder Städten nachvollziehbar darstellen lassen.
- *Wandel der Tätigkeitsfelder* Architekten und Stadtplaner beschäftigen sich heute sehr viel intensiver mit Transformationsprozessen: dem quantitativen und qualitativen Umbau von Raum- und Systembeständen. Die Arbeit erfolgt kontextbezogen: Eine erfolgreiche Umsetzungsstrategie setzt daher umfangreiche Kenntnisse von Umgebung, raumrelevanten Systemen und Zusammenhängen voraus, die GIS auf effiziente Weise bereitstellen kann.
- *Beruflicher Strukturwandel* Zahlreiche Architekten und Planer arbeiten im Asset- oder Facility Management, in der Standortplanung, Projektentwicklung oder in verschiedenen Bereichen der Immobilienwirtschaft und Infrastrukturversorgung. Bei zentralen Aufgaben wie Vorhaltung und Verwaltung von Anlagen- oder Gebäudebeständen, Prozesssteuerung oder Controlling unterstützen geographische Informationssysteme eine effiziente Organisation und einen sicheren Ablauf.

So verstanden bedeutet GIS-Ausbildung effizientes Anwendungswissen und damit fachlichen Vorsprung: eine besondere und auf dem Arbeitsmarkt ausdrücklich nachgefragte Qualifikation für Absolventen.

2.2 **Rahmenbedingungen Universität Karlsruhe**

Die Fakultät für Architektur an der Universität Karlsruhe bildet derzeit Diplom-Ingenieure der Architektur aus. Die Institute „Orts-, Regional- und Landesplanung“ (ORL), und „Garten und Landschaft“ decken dabei die großräumigeren Lehrinhalte als integrativen Bestandteil ab. Im Hauptstudium besteht die Möglichkeit, einen Schwerpunkt zu wählen, u. a. „Stadtplanung“ oder „Rechneranwendung in der Architektur“.

Mit dem ifib, Institut für industrielle Bauproduktion, Prof. Niklaus Kohler, existiert in Karlsruhe gleichermaßen eine „Urzelle“ der Beschäftigung mit GIS in Forschungsarbeiten zu Lebenszyklusanalysen von Gebäudebeständen. Über gemeinsam von ifib und dem Lehrstuhl für Stadtquartiersplanung betreute Diplomarbeiten ergeben sich erste Schnittstellen. Die intensive planungspraktische Erfahrung der Autoren mit GIS in der Bearbeitung des Masterplans Emscher-Zukunft tut ihr übriges: 2005 wird zur Erprobung und Etablierung von GIS in der Architektenausbildung eine Arbeitsgruppe GIS eingerichtet, bestehend aus Prof. Markus Neppl, den beiden Autoren sowie Martin Behnisch und Pablo Viejo-Garcia vom ifib.

Dabei erscheint der Lehrstuhl Stadtquartiersplanung und Entwerfen als Schnittstelle zwischen kleinräumigen architektonischen Eingriffen auf Stadtquartiersebene und großräumigen Funktionszusammenhängen besonders geeignet als zweckmäßiger Erprobungsort für die GIS-Lehre und für Testläufe auf den verschiedenen Maßstabsebenen. Zum Wintersemester 2008/2009 steht überdies mit der Umsetzung der Studienreform die Einführung der Bachelor-/Masterstudiengänge an: Der Umgang und Einsatz von GIS soll bereits dort eine aktive und selbstverständliche Rolle einnehmen.

2.3 **Ziele und Fragen**

Übergeordnetes Ziel der Aktivitäten der GIS-Arbeitsgruppe ist der Gewinn von Erkenntnissen für die systematische Einbindung von Geographischen Informationssystemen in die Architektenausbildung an der Universität Karlsruhe, für die Gestaltung einer effektiven Lehre, für die Integration der Inhalte in die

bisherige Ausbildung und für die dauerhafte Etablierung von GIS in Lehre und Forschung der Architekturfakultät, insbesondere im Hinblick auf den Bachelor-/Masterstudiengang.

Vorrangig ist jedoch zunächst die Zielkonzeption der Lehrveranstaltungen selbst: Die Studierenden (Vorkenntnisse in der Nutzung von GIS bestehen nicht!) sollen zu einem architektonischen oder planerischen Thema eine realitätsnahe fachliche Aufgabe lösen und dadurch nach und nach alle für Architekten relevanten Aspekte des GIS kennen und nutzen lernen.

Dabei sollen aber nicht nur Software-Kenntnisse im Umgang mit ArcGIS, sondern gleichzeitig und insbesondere auch Vorgehens- bzw. Denkweisen und fachlich relevante Inhalte vermittelt werden. Entsprechend besteht die Zielkonzeption der Grundlagenvermittlung aus dem Komponenten-Dreiklang „Software", „Fachwissen" und „Methode, Struktur und Verständnis".

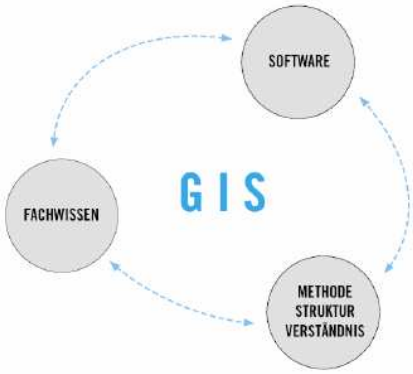

Abb. 2: Komponenten-Dreiklang der Grundlagenvermittlung (Quelle: eigene Darstellung)

Die Komponente *„Software"* beschreibt die „technische" Seite des Seminars: Überblick über GIS- Software, Einsatzmöglichkeiten, Aufbau, Zusammenhang, Benutzeroberfläche und Grundeinstellungen des Programms ArcGIS 8, später 9.1, seine Bestandteile und deren Zusammenwirken, die Funktionalitäten und Werkzeuge.

Die Komponente *„Fachwissen"* beinhaltet den Umgang mit konkreten, insbesondere städtebaulichen Planungsinhalten, wie Gesetzestexten und Verordnungen, Bauleitplänen oder städtebaulichen Bezugs- und Kenngrößen, die in der späteren Arbeit eine Rolle spielen.

Die Komponente *„Methode, Struktur, Verständnis"* umfasst die „Anleitung zum systematischen Denken und Handeln": die Vermittlung von realisierbarer Arbeitsstruktur und -methodik, von zielgerichtetem Arbeiten in Analyse, Konzept, Visualisierung und Layout im Hinblick auf definierte Adressaten im jeweiligen Zusammenhang. Gleichzeitig ist es Ziel, bei aller technischer Machbarkeit und Mächtigkeit des GIS ein Gefühl, ein Gespür für den Sinn des jeweiligen Vorgehens und die Verwertbarkeit der Ergebnisse zu vermitteln: durch Anwendung, Übung und Routine.

Gleichzeitig werden aber auch Fragen aufgeworfen:

„Soll jeder Architekt richtig gut (oder jeder gleich gut) GIS können"? Nicht jeder benötigt wohl dieselben Kenntnisse im Umgang mit der Software. Es gibt dabei unterschiedliche Nutzungsgrade und -intensitäten, die je nach fachlichem Schwerpunkt Voraussetzungen für eine Anwendung von GIS nach sich ziehen. „Welche typischen und abgrenzbaren Anwendungs- und damit ‚Wissenseinheiten' gibt es?" Aus den identifizierten „Anwendungsschwellen" könnte ein maßgeschneidertes Baukastensystem für eine an konkrete Anforderungen und unterschiedliche Zeitpunkte im Studium angepasste GIS-Ausbildung abgeleitet werden. Die Klärung dieser Fragestellungen durch den Einsatz in der Lehrpraxis wird letztlich auch zum Ziel des gesamten Projektes.

2.4 **Ansatz, Herangehensweise, Stand der Dinge**

Im Frühjahr 2005 startet die „Arbeitsgruppe GIS" den Testbetrieb: Innerhalb von dreieinhalb Jahren, bis zum Sommersemester 2008, sollen zunächst unterschiedliche Vermittlungsmethoden in GIS-Seminaren mit verschiedenen Anforderungs- und Intensitätsgrade getestet werden.

Es sollen insbesondere folgende Fragestellungen geklärt werden:

- Aus welchem Kontext heraus gehen die Teilnehmer an GIS heran? Warum wählen sie GIS?

- An welchem Zeitpunkt im Studium befinden sich die Teilnehmer?
- Welche Lehrinhalte sind in der begrenzten Zeit eines Semesters zu vermitteln?
- Welcher Umfang an neuem, GIS-basiertem Inhalt ist in der begrenzten Zeit eines Semesters mit angemessenem Aufwand für die Studierenden zu leisten?
- Welche Lerneffekte haben unterschiedliche Vermittlungskonzepte? Welche Resonanz rufen sie hervor? Wo liegen Vorteile, wo Nachteile?
- Welche Schwierigkeiten treten auf? Gibt es regelmäßig wiederkehrende Probleme oder eher Probleme beim einzelnen? Gibt es Problemfelder in bestimmten Bereichen (Hardware, Software, Verständnis, Daten, Struktur, Zeit, …)?
- Was ist für Architekten oder Stadtplaner inhaltlich relevant? Welche Aufgabenstellungen, welche Methoden, welche Inputs werden schwerpunktmäßig angenommen, welche nicht?
- Lassen sich sinnvolle „Vermittlungsblöcke“ im Sinne der oben genannten „Anwendungsschwellen“ identifizieren?

Die Grundlagenseminare finden als Wahlfach mit zwei Semesterwochenstunden im Hauptstudium statt und sind auch in den Vertiefungsrichtungen „Stadtplanung“ oder „Rechneranwendung in der Architektur“ anrechnungsfähig. Im Sommersemester 2007 finden mittlerweile das fünfte Grundlagenseminar, das zweite Kompaktseminar, der zweite Fortgeschrittenenkurs, der erste GIS-basierte Städtebauentwurf und die zweite Diplomarbeit auf Basis von GIS statt, so dass erste verwertbare Erfahrungen und Erkenntnisse vorliegen.

Jedes Grundlagenseminar soll ein eigenständiges und auf Basis der Erkenntnisse des Vorgängerseminars modifiziertes Lehrprofil aufweisen. Die Unterschiede sollen dabei möglichst jeweils die Dimensionen

- Inhalt (unterschiedliche Aufgabenstellungen)
- Betrachtungsweise (übergeordnet oder konkret)
- Maßstabsebene (Betrachtungs- oder „Zoomrichtung“: groß nach klein oder klein nach groß)
- Datenlage (Bestandskarten vs. eigene Digitalisierungen)
- Vermittlungsabfolge (erst theoretische Einführungen oder erst praktische Anwendung bzw. „zuerst lang und breit erklären“ oder „direkt ins kalte Wasser“…)
- GIS-Schwerpunkt (welche Komponenten stehen im Vordergrund?) und
- Bearbeitungsmodus (Einzel- oder Gruppenarbeit, eingeforderte Leistungen)

betreffen. Im folgenden werden die unterschiedlichen Lehrprofile anhand von Beispielen vorgestellt und erläutert. Zur Überprüfung und Bewertung der Veranstaltungen durch die Studierenden und zur qualitativen Selbstkontrolle wurde für jedes Seminar eine Evaluierung durchgeführt.

3 „GIS ALS WERKZEUG FÜR ARCHITEKTEN“ - DIE SEMINARE

3.1 Herangehensweise 1 - „Von außen nach innen“

Das Thema des ersten Seminars lautet „Stadtpunkte - eine Standortkritik“. Die Aufgabe besteht in der kritischen Analyse von Stadträumen in Karlsruhe. Die Auswahl der zu analysierende Orte deckt verschiedene Standorte ab und verfolgt das Ziel, ein Gefühl für die Bandbreite an städtischen Situationen und die Einbindung in ihren geschichtlichen, stadträumlichen und funktionalen Kontext zu bekommen. Alle „Stadtpunkte“ befinden sich überdies an Orten des Übergangs bzw. Bruchs: zwischen verschiedenen Stadtstrukturen, Nutzungen, Grenzen, Milieus und Bedeutungen.

Während des „Hineinzoomens bis zum Stadtpunkt“ sollen übergeordnete Zusammenhänge für den konkreten Ort erkannt und dargestellt werden. Entsprechend dieser Aufgabe wird zunächst das Arbeiten mit vorhandenen Vektor- und Rasterdaten vermittelt. Die GIS-Datenbestände sind leider sehr überschaubar und umfassen in erster Linie generalisierte großräumige Informationen. Brauchbare städtische Daten auf Gebäudeebene sind nur für kleine Bereiche (200m x 200m) um die Stadtpunkte herum zu bekommen, dafür aber ein Kernstadtausschnitt des Stadtplans als Rasterkarte und einige Orthofotos für denselben Bereich.

Diese Not wird im Seminar zur Tugend: Die Studierenden lernen im zweiten Schritt Zeichen- und Attributierwerkzeuge im Editormodus und digitalisieren den Kernstadtbereich selbst. 18 Studierende erhalten je eine „Kachel“, die sie nachzeichnen und gemäß „kleinem Nutzungsartenkatalog“ attributieren. Es zeigt sich bald, dass die Arbeit zwar etwas mühsam und zeitaufwendig ist, sich dadurch aber schnell Routine in Anwendung und Verständnis der Softwarefunktionen einstellt.

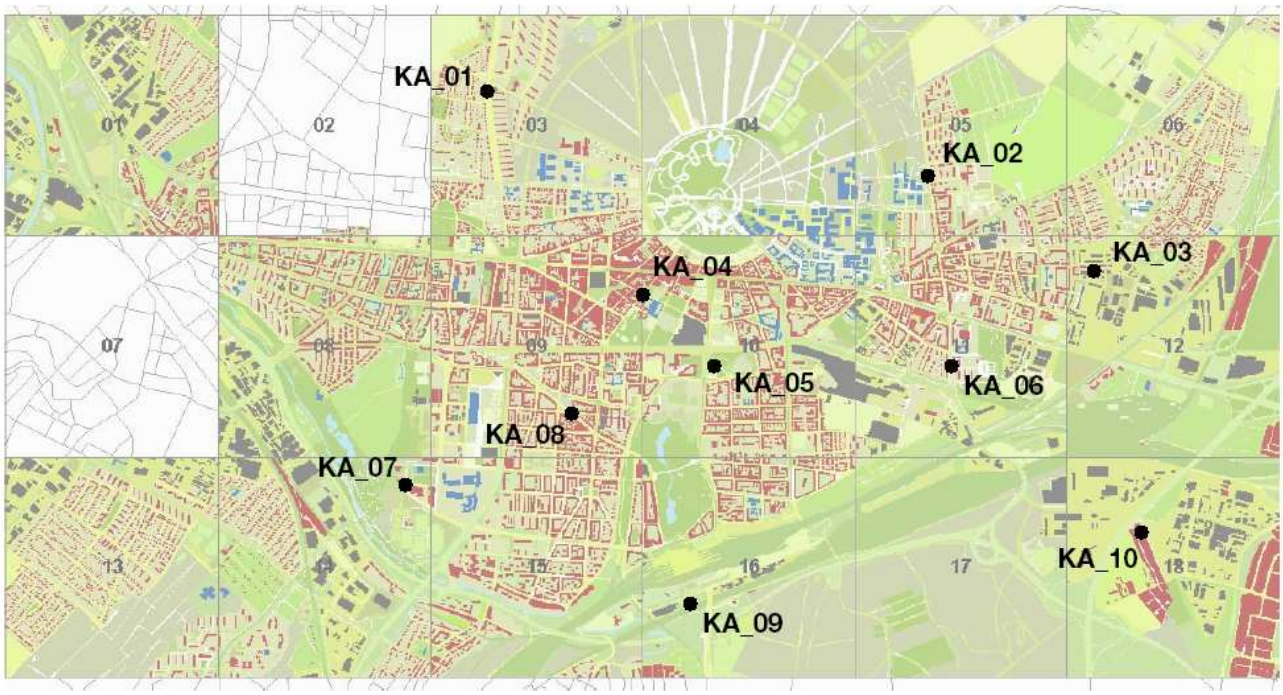

Abb. 3: Karlsruher Kernstadt self-made: Die Studierenden digitalisieren und attributieren die Kernstadt in Eigenarbeit. Analysiert werden im zweiten Schritt die städtischen Situationen und Merkmale der einzelnen „Stadtpunkte“ (Quelle: eigene Darstellung)

Die Aufgabe reicht vom regionalen Maßstab über den gesamtstädtischen bis zur Quartiersebene. Dabei sollen folgende Fragestellungen Berücksichtigung finden: Wo befindet sich der Ort, welche Lage und Funktion hat er innerhalb von Gesamtstadt und Quartier? Wie sieht er aus? Wie wird er genutzt? Wofür wurde er konzipiert? Funktioniert er? Gibt es spezielle Themen? Was kann die Perspektive dieses Ortes sein? Besonderes Augenmerk soll auf die Qualitäten (oder auch Probleme) gerichtet werden, die durch die besondere Lage des Ortes begründet sind. Ziel ist eine fundierte Aussage zum gewählten Ort, die durch Analysekarten und Bilder untermauert wird. Stellvertretend werden zwei Arbeiten vorgestellt:

Der südliche Bahnhofsvorplatz wird in einen globalen (hoch frequentierter Fernbusbahnhof) und lokalen Zusammenhang gestellt. Seine Lage und Funktion im städtischen und Quartiersgefüge wird für mehrere Aspekte analysiert, interpretiert und grafisch aufbereitet. Ergebnis und Kernbotschaft der Arbeit ist die Erkenntnis einer räumlich und funktional undefinierten Grenze zwischen Stadt und Peripherie.

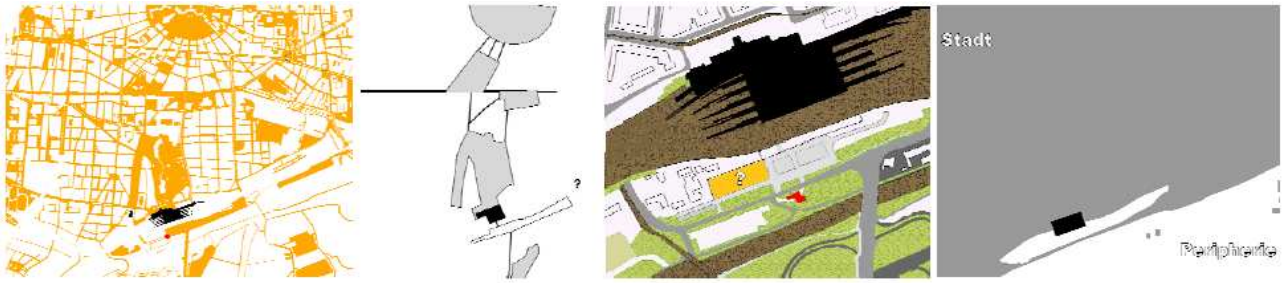

Abb. 4: Analyse Bahnhofssüdseite (Quelle: Studentenarbeit Timo Wirth)

Die Aufgabe im Gewerbegebiet Lohnlissen-Killisfeld ist anders gelagert: Die auffällige Vielfältigkeit des auf den ersten Blick sehr uniformen Gebietes führt zur Suche nach Regeln: Weisen andere Orte mit gleichen Bedingungen ähnliche Charakteristika auf? Bahninfrastruktur, überörtliche Strassen, „alte“ Industrieanlagen und die Randlage zu älteren Mischbebauungen als Kriterien ergeben in ihrer Überlagerung eine überraschende Antwort, die mit bebilderten Charakterisierungen der vergleichbaren Ergebnisgebiete veranschaulicht wird.

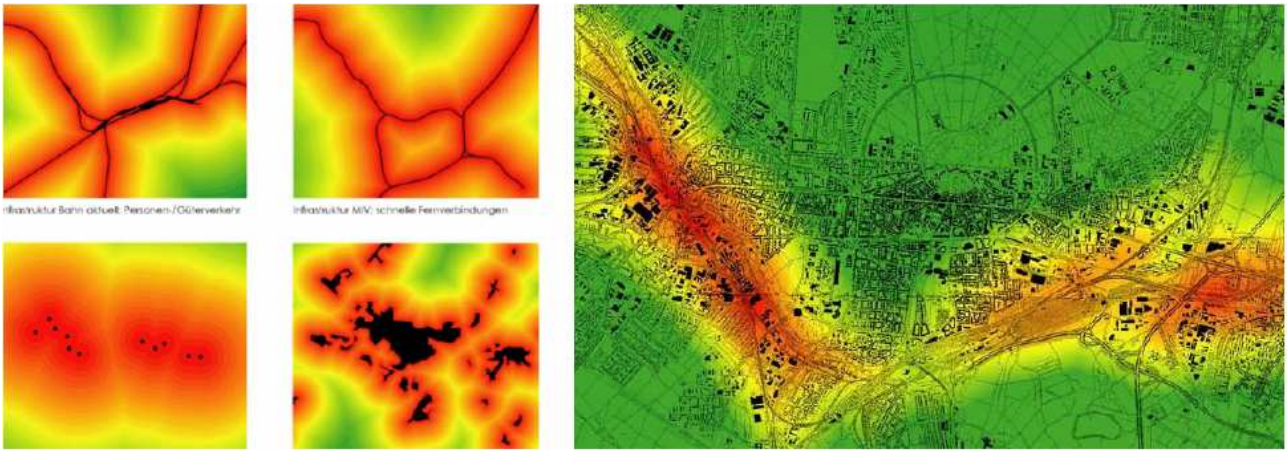

Abb. 5: Suche von anderen Orten mit „ähnlichen Charakteristika“: (Quelle: Studentenarbeit Dirk Siebels)

Die Aufgabe kommt bei den Studierenden an, die Ergebnisse sind nach anfänglichen Mühen mit dem Aufbau der Software recht ordentlich. Der Einsatz wirklich interessanter GIS-Funktionalitäten kommt allerdings bei den meisten zu kurz. Schließlich lässt sich folgende Randbemerkung festhalten: Als erstes durchgeführtes Seminar dient „Stadtpunkte“ auch einer ersten und grundsätzlichen Positionierung und Standortbestimmung zum Umgang mit GIS in der Lehre. Als solches müssen die Ergebnisse der Abschlussarbeiten auch gesehen werden: Nicht nur die Studierenden haben ihre Probleme mit der neuen Materie - auch die Dozenten fangen erst mit der didaktisch Aufbereitung der Inhalte an. Viele der aufgetretenen Schwierigkeiten sind offensichtlich „Kinderkrankheiten“, die sich anfangs nicht vermeiden lassen bzw. sogar für die Erarbeitung eines funktionierenden Lehrkonzepts notwendig sind.

3.2 **Herangehensweise 2 - „Von innen nach außen“**

Im folgenden Semester bestimmt eine unerwartete Anfrage das Seminar: Gewerbetreibende der Gablonzer Straße in Karlsruhe haben sich zum „Gewerbegebiet IN-WEST“ zusammengeschlossen und bitten den Lehrstuhl um konkrete inhaltliche Unterstützung in Fragestellungen zu Stadtraum, Freiflächenkonzept und Parkierungsmaßnahmen. Dieser Umstand ermöglicht es, das Seminar aus einem umgekehrten Blickwinkel zu sehen: ausgehend vom konkreten Objekt hin zu dessen Einbindung in Umfeld, Stadt und Region.

Die Aufgabe „gablonz$_{MAX}$“ besteht entsprechend aus drei Teilen: einem lokalen, der das Gebiet selbst unter die Lupe nimmt und „unter Laborbedingungen“ konzeptionelle Maximalvorschläge macht, einem quartiersbezogenen, der die Einbindung des Plangebietes in die Umgebung untersucht, und einem überörtlichen, der den Standort mit seiner regionalen Lagegunst in Beziehung setzt. „MAX“ bedeutet dabei die testweise Ermittlung von maximal möglichen Handlungsoptionen in städtebaulichen, freiräumlichen und verkehrlichen Handlungsfeldern.

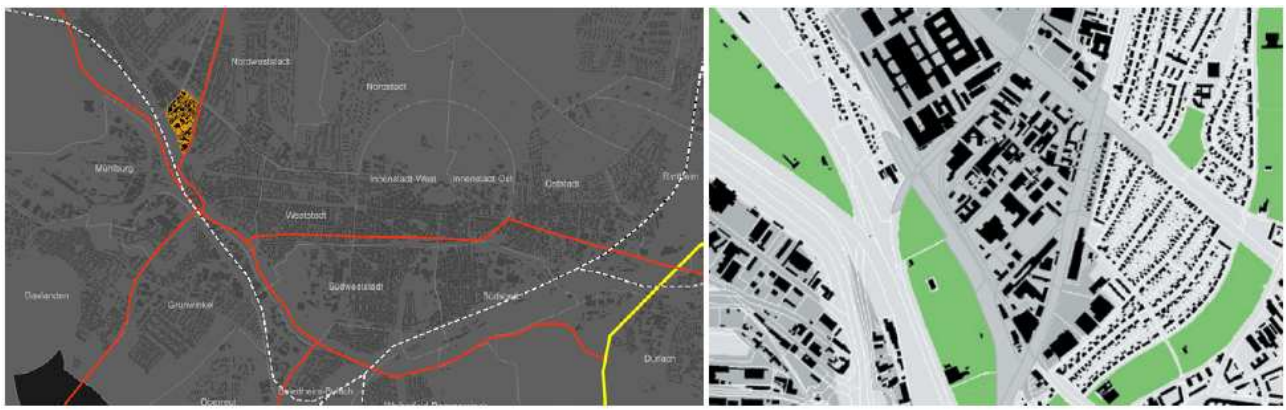

Abb. 6: Lage und Struktur „InWest“ Karlsruhe, Gablonzer Straße (Quelle: Studentenarbeiten Patrick Schirmer, Fabian Müller)

Die Aufgabe Städtebau$_{MAX}$ versucht über Dichteanalysen die Ist-Situation mit den rechtlichen Vorgaben zu vergleichen und untergenutzte Potenziale zu ermitteln, die unter Laborbedingungen maximal ausgenutzt werden sollen. Freiraum$_{MAX}$ schlägt über eine Analyse von Beschäftigtenzahlen, Oberflächen,

Baumstandorten und Lärmquellen ein Freiraumsystem mit Pocketparks und deren Verknüpfung im Gebiet und in die Umgebung vor.

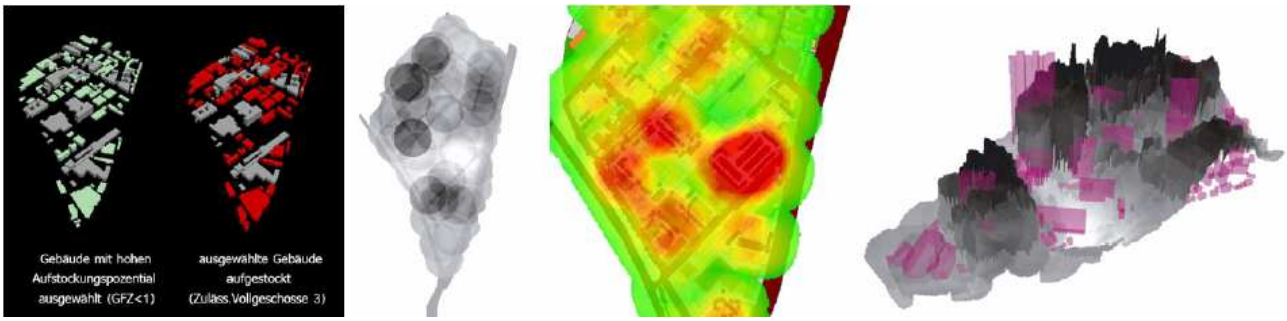

Abb. 7: Gewerbegebiet InWest, Analysebeispiele StädtebauMAX und FreiraumMAX (Quelle: Studentenarbeiten Samuel Fuggenthaler, Christian Keim, Martin Reinig)

VerkehrMAX untersucht Raum-Zeit-Entfernungen zu wichtigen regionalen oder städtischen Punkten als Standortfaktor und Qualität des Gewerbegebietes IN-WEST. Im zweiten Schritt sollen Standorte für Quartiersparkhäuser auf dafür geeigneten Flächen und in Relation zu den Beschäftigtenzahlen der Betriebe ermittelt werden.

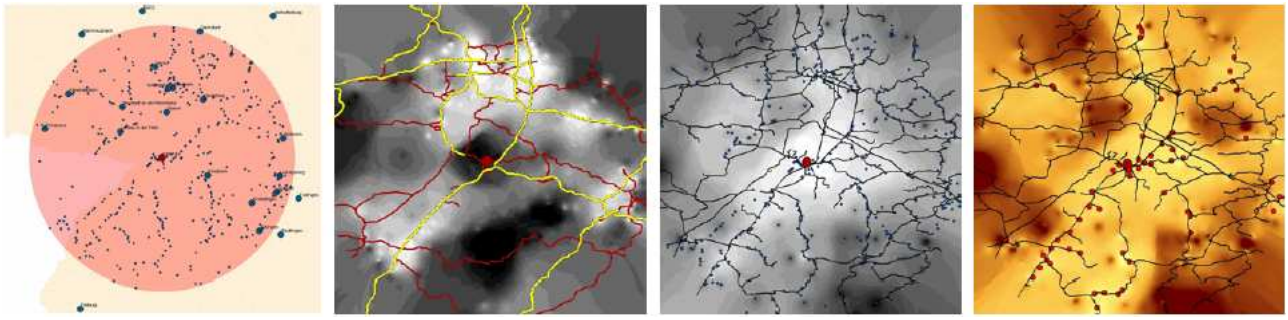

Abb. 8: Gewerbegebiet InWest, Analysebeispiele VerkehrMAX der regionalen Erreichbarkeiten mit Kfz/Bahn (Quelle: Studentenarbeit Jessica Hofmann/Kerstin Schulz)

Zunächst scheint die Methode von innen nach außen besser zu funktionieren als umgekehrt. Offensichtlich können die Studierenden mit einem konkreten Quartier als Betrachtungsgegenstand und einer definierten Fragestellung vor Augen mehr anfangen als mit einer generellen und inhaltlich selbständig zu füllenden Standortkritik. Sie beginnen wiederum mit Bestandsdaten, diesmal ist die Datenlage zufrieden stellend: Durch das Engagement der Anlieger kann auf Katasterdaten, Luftbilder und zusätzliche Informationen zurückgegriffen werden, zusätzlich existieren die von den Vorgängern digitalisierten Kartendaten. Durch die Art der Aufgabenstellung fehlt allerdings weitgehend die Notwendigkeit, selber zu zeichnen und zu attributieren, was entsprechend kurz kommt. Dafür werden die analytischen Softwaremethoden intensiver getestet, was sich auch an den Ergebnissen zeigt: analytisch präzise und anregend, aber bei den konzeptionellen Folgerungen und Aussagen eher dünn, so dass die Ergebnisse insgesamt wenig verwertbaren Rückfluss für die ursprünglichen Anfragen erzeugen.

„gablonzMAX“ wurde gleichzeitig als zweiwöchiges Kompaktseminar für indonesische Austauschstudenten durchgeführt. Die Kürze der zur Verfügung stehenden Zeit und die Lernbereitschaft der Teilnehmer erzeugte eine hohe Intensität und beachtliche Ergebnisse, die für das Konzept „Kompaktseminar“ einen guten Eindruck hinterlassen.

3.3 **Herangehensweise 3: „Die virtuelle Stadt“**

„Städtebaulabor: Experiment - Konzept - Analyse“ verfolgt einen experimentellen Ansatz im virtuellen Raum. Das Vermittlungskonzept geht dabei im Verhältnis zu den Vorgängerseminaren einen umgekehrten Weg: Die Studierenden zeichnen und attributieren bereits in der ersten Veranstaltung selbst, auf das Laden und Visualisieren von Bestandsdaten wird verzichtet. Zunächst werden einzelne Gebäude erstellt und mit einem spezifischen und realistischen Datensatz zu geschossweisen Nutzungen, Gebäudetyp, -beschaffenheit, -alter, -belegung, Einwohnerstruktur usw. versehen. Die Studierenden lernen die Funktionsweise und den Aufbau der Software auf diese Weise bereits „nebenbei“, während der Erarbeitung der Inhalte.

Im nächsten Schritt dient eine Normparzelle von 80 x 100 Metern als Testfeld für die Erstellung von Gebietstypen gemäß Baunutzungsverordnung, mit den entsprechenden räumlichen Ausprägungen nach Art und Maß der baulichen Nutzung sowie den sonstigen quantitativen und qualitativen Merkmalen. Der entstandene umfangreiche Variantenkatalog wird allen Bearbeitern zur Verfügung gestellt, um daraus 10x6 Felder große sinnvolle Quartiere zusammenzusetzen.

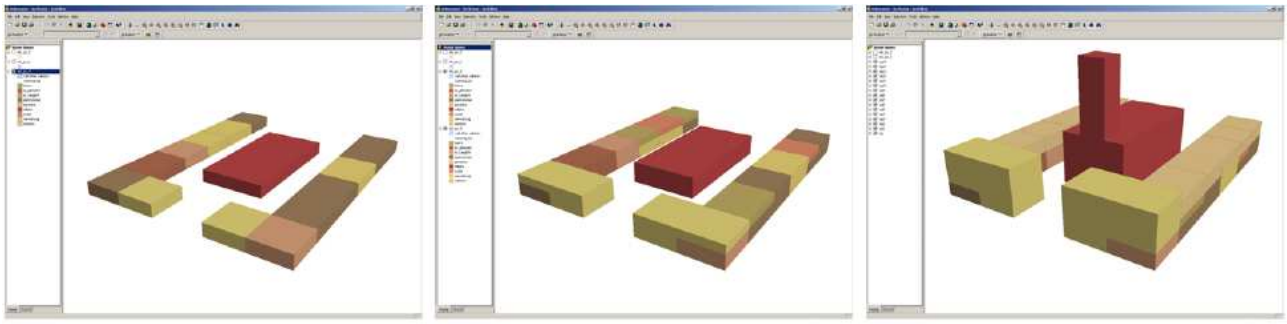

Abb. 9: beispielhafter Aufbau und Attributierung eines Baugebietstyps (Quelle: eigene Darstellung)

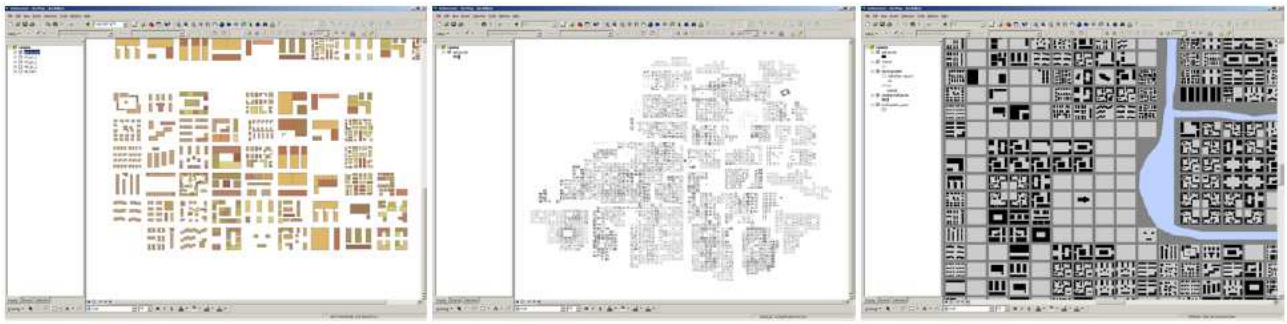

Abb. 10: Gebietstypenkatalog, Gesamtstadt und Viertel im Zentrum (Quelle: eigene Darstellung)

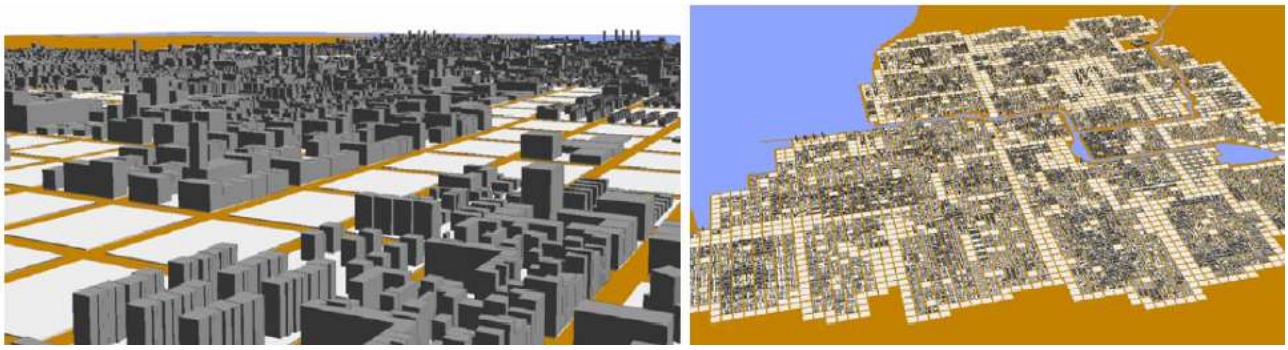

Abb. 11: „Schrägluftbilder“ aus der virtuellen Großstadt: Lage und Höhenverteilung (Quelle: eigene Darstellung)

Diese Quartiere werden durch Multiplikation, Anordnung und Individualisierung zu einer großen digitalen Stadt von etwa 300.000 Einwohnern zusammengestellt: mit Zentren, Quartieren, Sonderzonen, städtischen Funktionen, Einwohnern, Arbeitsplätzen, Parkplätzen usw. Die Stadt wird nun mittels räumlicher Abfragen und Rasteranalysen gründlich erforscht: Wie verteilen sich welche Nutzungen, Einwohner, Arbeitsplätze, gibt es homogene oder heterogene Zonen, existieren Schwerpunkte oder Auffälligkeiten? Mit Hilfe der Analysen werden die entsprechenden GIS-Tools eingesetzt und vermittelt, die letztlich in der Abschlussaufgabe selbständig angewandt werden sollen.

In der Abschlussaufgabe nehmen die Studierenden reale Rollen in der virtuellen Stadt ein und bearbeiten dementsprechende Aufgaben: als Stadtplaner (Identifizierung von Sanierungsgebieten, Energiekonzepte, Sozialanalyse), Stadtforscher (Analyse der Stadtstruktur und Stadtmorphologie), Makler (Wohnungssuche für bestimmte Zielgruppen), Immobilienwirtschaftler (Preisniveau und Mietspiegel), Verkehrsplaner (Aufbau ÖPNV-Netz, Untersuchung der Straßenhierarchien) oder Freiraumplaner (Grünkonzepte für die Anlieger). Dem Einfallsreichtum sind dabei keine Grenzen gesetzt. Der Schwerpunkt der Arbeiten liegt dabei auf der Erarbeitung einer in sich stimmigen Methodik und einer verständlichen Präsentationsform.

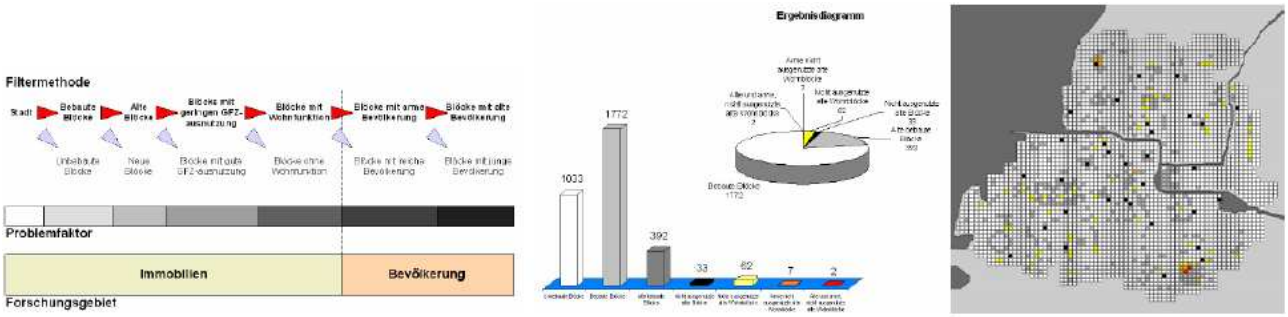

Abb. 12: Bsp. Identifizierung von Sanierungsgebieten, Methode und Ergebnis (Quelle: Studentenarbeit Gabor Kovacs)

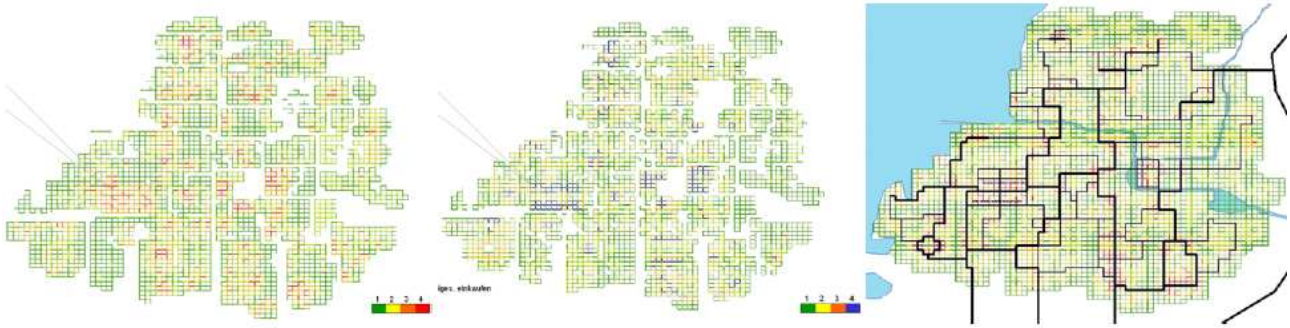

Abb. 13: Bsp. Analyse und Definition von Straßenkategorien entsprechend der funktionalen und qualitativen Anliegereigenschaften (Quelle: Studentenarbeit Jessica Hofmann/Simone Schmid)

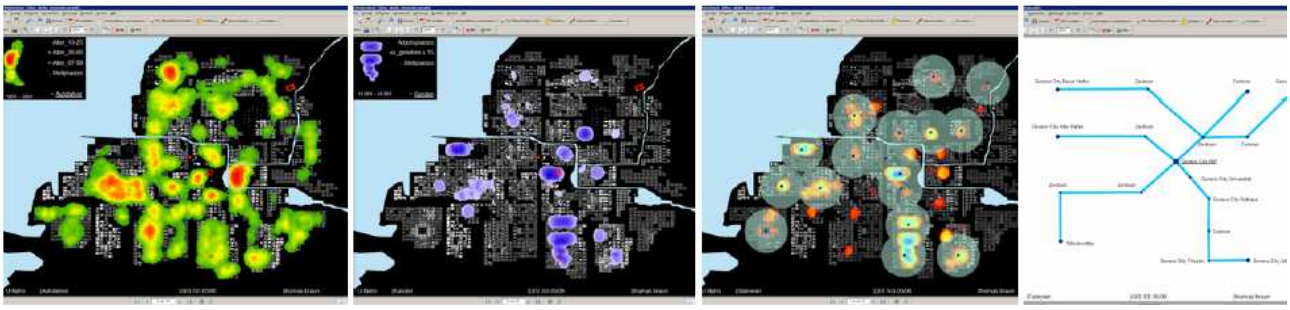

Abb. 14: Bsp. Analyse der Gesamtstadt und Erarbeitung eines U-Bahn-Konzeptes entsprechend der Verteilung von Einwohnern, Arbeitsplätzen, Einkaufszentren, Sondernutzungen (Quelle: Studentenarbeit Thomas Braun)

Ablauf und Ergebnisse des dritten Ansatzes präsentierten sich auf deutlich höherem Niveau als in den ersten Durchläufen und für Teilnehmer und Dozenten sehr befriedigend. Die guten Erfahrungen führten zu einer zweiten, überarbeiteten Auflage desselben Ansatzes. Zur Anwendung kam dabei ein erweiterter Attributkatalog. Die Baugebietstypen waren diesmal aus realen Stadtgebieten abzuleiten und entsprechend zu attributieren (Wohnumgebung der Studierenden, GoogleEarth, Internet). Diese kleine Anpassung half den Teilnehmern des zweiten Durchlaufs deutlich, gleichzeitig wurden auch die Gebietsqualitäten realistischer. Auch setzte diesmal eine Gruppe von Freiwilligen die virtuelle Stadt zusammen, wodurch diese die kaum mehr handhabbare Größe einer Megacity mit 3 Millionen Einwohnern annahm. Auch im zweiten Durchlauf war das Feedback durchweg positiv.

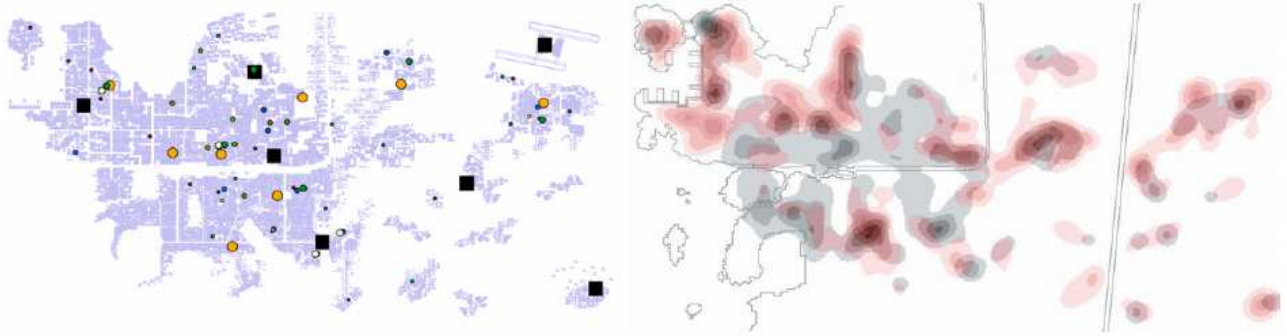

Abb. 15: Die Studierenden „komponieren“ und analysieren die zweite virtuelle Stadt als polyzentrale Megacity (Quelle: Studentenarbeiten Patrick Beuchert/Tim Bruckhoff, Christoph Garenfeld/David Sommer)

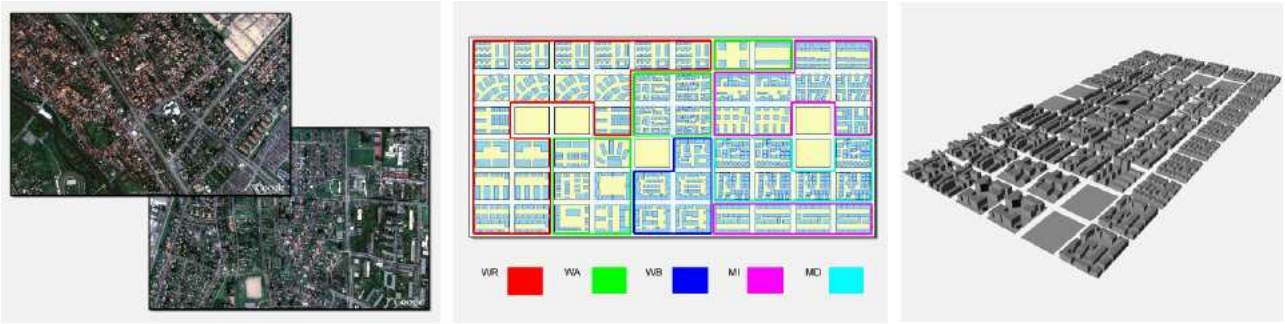

Abb. 16: Ableitung der Baugebietstypen aus realen Baugebieten (Quelle: Studentenarbeit Seok kyu Cho)

4 RESÜMMEE UND AUSBLICK

4.1 Zentrale Aspekte, Erfahrungen und Erkenntnisse

Es handelte sich bei den Teilnehmern ausschließlich um Studierende des späten Hauptstudiums, ohne jegliche GIS-Vorkenntnisse. Frauen und Männer waren dabei durchgängig zu etwa gleichen Teilen vertreten. Die Veranstaltungen fanden in Rechnerpools statt, die meist die Belegung eines Computers mit ein, seltener zwei Studierenden ermöglichten. Anders wäre entsprechender Unterricht auch nicht sinnvoll durchführbar.

Festzuhalten ist zunächst, dass die überwiegende Mehrzahl der Teilnehmer den Umgang mit GIS bzw. die Thematik nach Abschluss der Veranstaltung für sinnvoll erachtete und sich über Inhalte und Ablauf entsprechend positiv äußerte. Übliche Startschwierigkeiten gab es immer, bezogen sich aber meist auf Hard- und Software. Verständnisprobleme bei der zum Teil komplexen Materie kamen verhältnismäßig selten vor und divergierten stark mit der Wahl der Vermittlungsmethode. Es zeigt sich deutlich, dass die Teilnehmer sehr viel schneller Sicherheit und Routine in GIS-Aufbau und -Struktur erlangen, je früher im Seminarablauf sie selbständig Inhalte mit der Software erstellen. Im Sinne eines „learning by doing“ ist nach der bisher gemachten Erfahrung die Vermittlungsmethode des „Sprung ins kalte Wasser“ dem Start mit Bestandsdaten vorzuziehen: Alle sonst mühsam vorab zu lehrenden und zu lernenden Inhalte erklären sich im Verlauf der Veranstaltung „nebenbei“. Dringend empfohlen wird in diesem Zusammenhang auch die Bearbeitung der Aufgabenstellungen in Gruppen.

Die wichtigste Erkenntnis des Projektes ist allerdings, dass GIS dem Benutzer die eigentliche Arbeit nicht abnehmen kann. Die Software lässt lediglich logische und strukturierte Algorithmen ablaufen, deren Abfolge oder Zusammenhang der Nutzer dem System zunächst einmal mitteilen muss. Die Fähigkeit, richtige und gute Analysen mit GIS durchzuführen, muss beim Anwender verankert sein. Daher benötigt er ein tiefes Verständnis für den fachlichen Hintergrund, für die Methode und die dahinter steckenden technischen Abläufe, damit er das Ergebnis einschätzen und bewerten kann. Die Gefahr, ohne Sachverstand interessant anmutende, aber sinnfreie Karten herauszubekommen, ist bei GIS besonders hoch. Entsprechend wichtig ist der eingangs erwähnte Komponenten-Dreiklang der Grundlagenvermittlung. Die Studierenden lernen mit GIS gleichzeitig methodisches, strukturiertes Denken und disziplinierte Lösungswege.

Der Vollständigkeit halber: Ein eigentlich unnötiges Ärgernis ist nach wie vor die Beschaffung brauchbarer Daten zu Lehrzwecken. In dieser Hinsicht müsste von Seite der kommunalen Vermessungs- und Planungsämter eine Öffnung gewagt werden. Möglicherweise wäre auch die Einrichtung eines Lehr- und Forschungs-Rahmenvertrages mit den Landesvermessungsämtern eine interessante Variante.

4.2 Integration in Lehre und Forschung

Die gesammelten Erkenntnisse und Erfahrungen aus den Testläufen fließen in das Gesamtkonzept GIS im Bachelor-/Masterstudiengang Architektur ein, das derzeit erarbeitet wird. Grundsätzlich existieren dabei verschiedene Möglichkeiten der Integration von GIS in die Architektenausbildung: GIS als integrierter und selbstverständlicher Teil der Ausbildung *aller* Architekturstudenten oder eine „Vertiefung GIS“ mit fakultativen Wahlmöglichkeiten. Nach den bisher gemachten Erfahrungen scheint ersteres vernünftiger. Wie anfangs dargelegt, werden Architekten in absehbarer Zeit nicht um GIS-Basiskenntnisse herumkommen, wenn sie auf dem Stand der Technik bleiben wollen. Wichtig ist hierbei insbesondere festzustellen, welche Fertigkeiten für welche Nutzergruppe notwendig und sachdienlich sind. Daraus bestimmen sich dann auch

Zeitpunkt, Art und Verpflichtungsgrad ihrer Einbindung in die Lehre. Folgende Tabelle gliedert in dieser Hinsicht die Fertigkeiten in vier grundlegende Funktionsbereiche:

INHALT	WER?	WANN?	ART
Einlesen, Ansehen und Ausdrucken von Daten	alle Studierenden	erstes Semester	Pflicht
Durchführung Bestandsaufnahme, Datenverwaltung	alle Studierenden	Grundstudium	Pflicht, integriert in Lehrveranst.
Nutzung als Analysetool	Interessierte	Seminar Hauptstudium	Wahlfach
Nutzung als Entwurfswerkzeug	Vertiefer Rechneranwendung	Hauptstudium	Entwurf, Abschlussarbeit, „Kür“

Abb. 17: Anforderung an die Lehre: unterschiedliche Anwendungsgrade und Zielgruppen (Quelle: eigene Darstellung)

Übertragen in eine vorläufige Bachelor-/Master-Struktur könnte die Integration von GIS in die Architektenausbildung wie folgt aussehen:

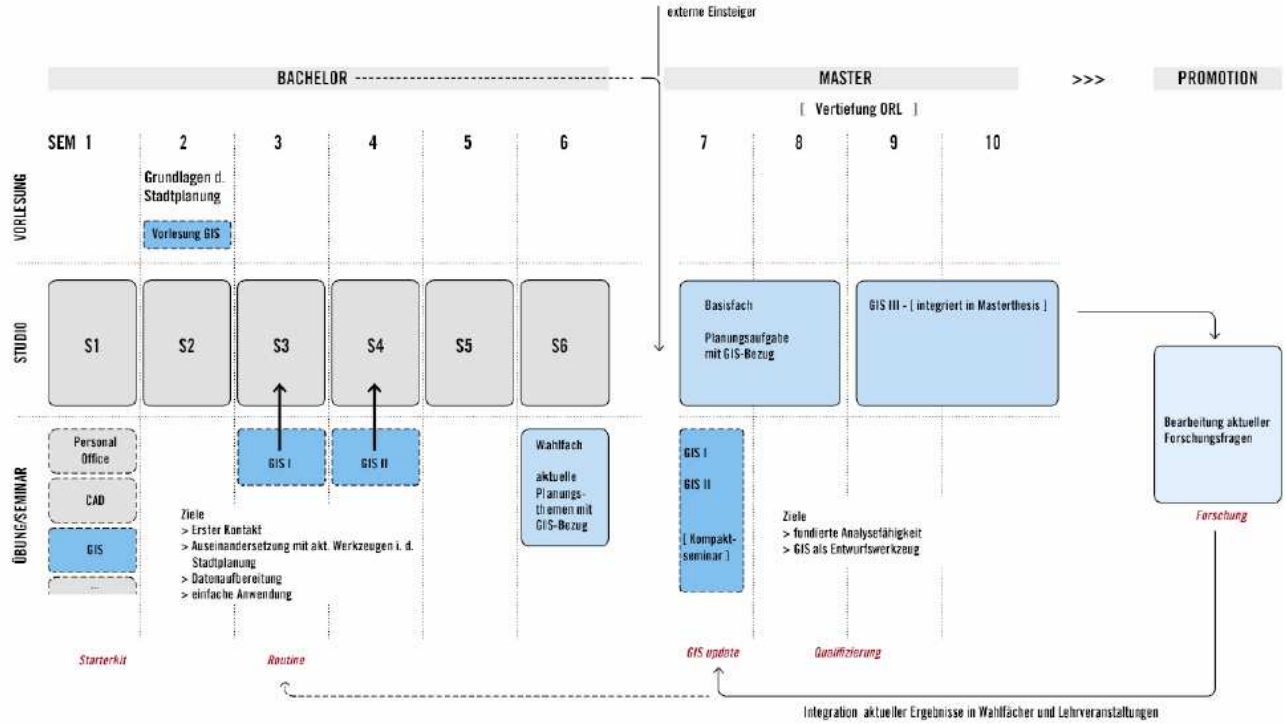

Abb. 18: möglicher Ansatz zur Integration von GIS in die Bachelor/Master-Struktur (Quelle: eigene Darstellung)

Zum Ende des Bachelor-Studiengangs verfügen alle Studierenden über ein GIS-Grundwissen für die wichtigsten wiederkehrenden Aufgaben. Im Masterstudiengang betrifft die GIS-Ausbildung in erster Linie die Vertiefer der Fachrichtung Orts-, Regional- und Landesplanung mit fachspezifischem GIS-Input.

4.3 **Kooperation als nächster Schritt**

Nach dem ersten Versuch der Durchführung eines Fortgeschrittenenseminars im Winter 2006/2007 entstehen derzeit Austausch- und Kooperationsprojekte zwischen Hochschule und Praxisanwendern in den Kommunen. GIS-Kooperationspartner sind derzeit die Städte Biberach a.d. Riß und Mannheim in Baden-Württemberg, weitere Partner folgen. Die mittels GIS erzeugten, „neuen“ und qualitativen Darstellungen städtebaulicher Informationen sollen in Verwaltung und Politik transferiert werden, um damit sowohl die Eigenschaften des Bestandes sichtbar zu machen, als auch Entwicklungen und Konsequenzen räumlichen Handelns verständlich zu machen und damit letztlich räumliche Entscheidungsprozesse zu unterstützen.

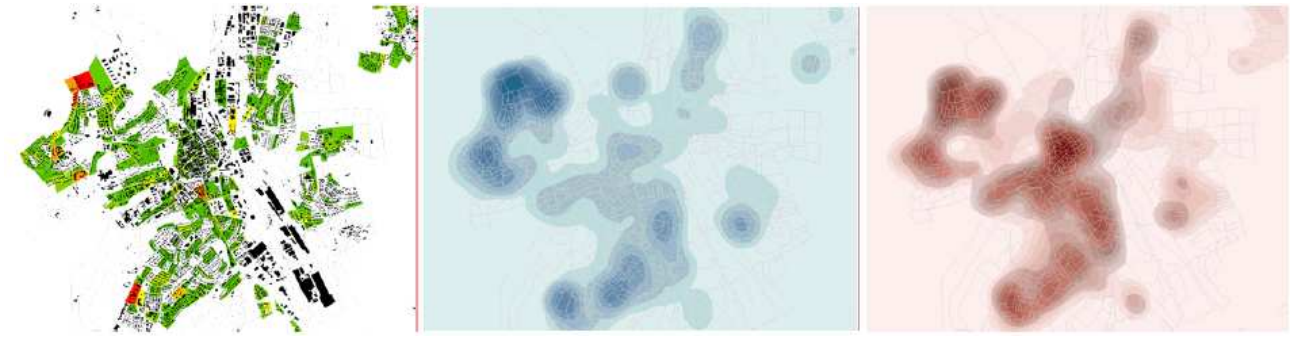

Abb. 19: „Raum Statistik Begreifen“: Indikatoren der Stadtentwicklung Biberach an der Riß (Quelle: eigene Darstellung, Geodaten: Biberach an der Riß)

Auf der Grundlage einer solchen Kooperation mit der Stadt Biberach an der Riss findet im Sommer 2007 ein zweites Fortgeschrittenenseminar statt. Dabei sollen die Stadt und ihre Quartiere bzw. deren morphologische Zusammenhänge lesbar gemacht und allgemeinverständlich aufbereitet werden, um ein anderes Bild von „Stadt“ zu erzeugen. Zeitreihen der räumlichen Statistiken oder auch Phasierungen von Indikatoren und Bestandsdaten lassen darüber hinaus räumliche Phänomene und Entwicklungslinien sichtbar werden. Ebenso soll versucht werden, verschiedene Entwicklungsszenarien anschaulich in die Zukunft zu projizieren.

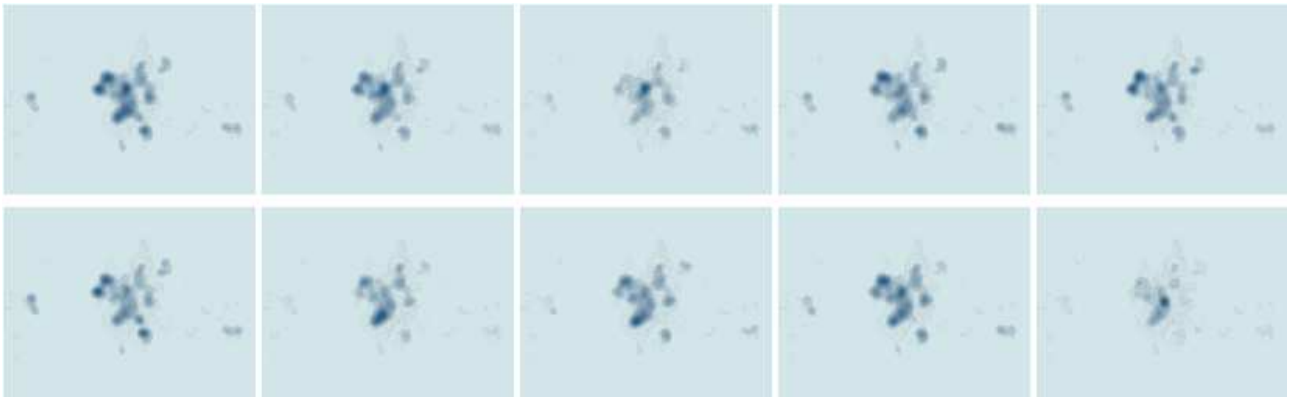

Abb. 20: „Raum Statistik Begreifen“: räumliche Einwohnerverteilung nach Altersklassen im Februar 2007 (Quelle: eigene Darstellung, Geodaten: Biberach an der Riß)

Allmählich vergrößern sich das Fundament der GIS-Nutzer und der GIS-Wissenspool an der Architekturfakultät der Universität Karlsruhe, was die Veranstaltung von weiterführenden Lehrveranstaltungen wie GIS-Entwurfsprojekten und -Diplomarbeiten erst möglich macht.

Mit der einsetzenden Etablierung von GIS-Themen in Forschungsfeldern der Architektur entsteht nach und nach ein „rundes“ GIS-Gesamtpaket, das dem räumlichen Mehrwert von GIS im Architekturbetrieb Rechnung trägt.

5 LITERATUR

Zur Thematik existieren nur sehr wenige Schriften, die sich meist primär mit fach- oder softwarespezifischen Inhalten beschäftigen. Literatur, geeignete Lehrbücher, Websites und Hinweise sind daher spezifisch bei den Autoren zu erfragen.

Public Private Partnership:
Fallstudie zur Verwaltungskonzentration der Kärntner Landesverwaltung, Klagenfurt

Karl FRIEDL

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1 PROBLEMSTELLUNG UND ZIELSETZUNG

1.1 New Public Management – Konzentration auf die Kernaufgabe der Verwaltung

Das Land Kärnten verfolgt seit Mitte 2000 ein umfassendes Konzept der Verwaltungsinnovation, in dem die Einführung von New Public Management einen zentralen Stellenwert einnimmt. New Public Management kann als Oberbegriff eines mittlerweile globalen Reformtrends öffentlicher Verwaltung bezeichnet werden.

Die generelle Zielsetzung und Vision, die in Kärnten verfolgt wird, ist die Schaffung der modernsten Verwaltung in Österreich.

Dies soll geschehen durch die Schaffung von Bürgerzentren, einer Standortkonzentration, kundenorientierte-, effiziente Abläufe eines klaren Leistungsangebotes einer dezentralen Führungs- und Organisationsstruktur sowie modernste IT-Unterstützung für Bürger und Mitarbeiter.

Ein wesentlicher Schritt im Rahmen dieses Projektes ist die Zusammenführung der Landesverwaltung nach sachlichen Kriterien zu Kompetenzzentren sowohl in räumlicher als auch in organisatorischer Sicht.

Eine erste Machbarkeitsstudie zu den 39 Bestandsstandorten kam schnell zum Ergebnis, dass entscheidende und wirkungsvolle Veränderungen nur mit einem neuen bürgernahen Dienstleistungszentrum gelöst werden können.

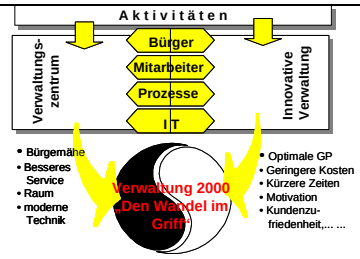

Abb. 1: Aktivitäten

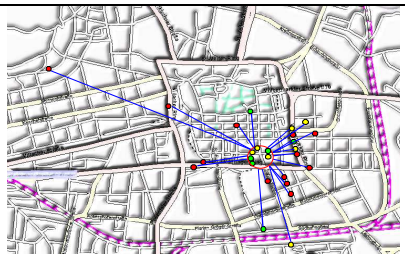
Abb. 2: Foto Klagenfurt KL 1-26

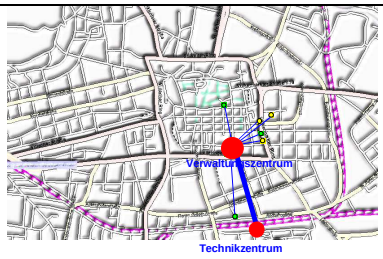

Abb. 3: Foto Klagenfurt, Verwaltungszentrum, Technikzentrum

1.2 Projektziele der Verwaltungskonzentration

Der Neubau des Verwaltungszentrums sowie des Technikzentrums zusammen mit dem Kompetenzzentrum für Gesundheit und Lebensmittelsicherheit, ist ein Vorzeigeprojekt und ein Meilenstein für Kärnten.

Unter dem Schlagwort „Kärnten gut verwalten" steht das Ziel, die Verwaltung für den Bürger zu vereinfachen und sehr sorgfältig mit den Steuergeldern umzugehen, im Mittelpunkt.

Das Projekt „Verwaltungszentrum" umfasst den Neu- und Zubau von Bürogebäuden, den Umbau und die Sanierung von bestehenden Büros (Hochhaus und Mittelbaukörper) und die Errichtung einer zweigeschossigen Tiefgarage.

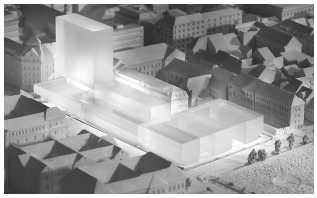
Abb. 4: Verwaltungszentrum

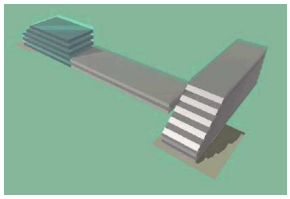
Abb. 5: Technik-/Laborzent.


Abb. 6:Regierungsgebäude


Abb. 7: Alte KELAG

Unter Federführung der Landesimmobiliengesellschaft und nach Plänen der Architekten Poos Isensee (Hannover), entsteht bis Ende 2007 das Bauwerk mit folgenden Zielen:

- Finanzielle Einsparungen für das Land Kärnten!

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Editors: Manfred SCHRENK, Vasily V. POPOVICH, Josef BENEDIKT

- 12 Mio. € Einsparungen über 20 Jahre
- Etablierung eines zeitgemäßen Bürgerservices ist erst durch die Konzentration möglich. Die Bürger werden in Zukunft nicht mehr mit 30 und mehr Standorten der Landesverwaltung konfrontiert werden
- Eine durchgreifende Verbesserung der Arbeitsplatzqualität gemäß den Arbeitnehmerschutzbestimmungen ist ohne Verwaltungskonzentration aufgrund der Nichteignung zahlreicher Gebäude für Büroräumlichkeiten nicht möglich.

Abbildung 8: Ansicht Süd

Abbidlung 9: Ansicht Nord

Der Wettbewerbsentwurf zum Technikzentrum sowie zum Kompetenzzentrum für Gesundheit und Lebensmittelsicherheit wird nach den Plänen der Villacher Architekten Fercher & Güldner realisiert.

2 PPP-MODELL ZUR STEIGERUNG DER FACILITÄREN QUALITÄT BEI GLEICHZEITIGER KOSTENREDUKTION

PPP bedeutet Kooperation von öffentlicher Hand und privater Wirtschaft bei der Planung, der Erstellung, der Finanzierung, dem Betreiben und der Verwertung von bislang staatlich erbrachten öffentlichen Leistungen (Lebenszyklusansatz). Im Rahmen von PPP tritt die öffentliche Hand im Wesentlichen als Nachfrager von Dienstleistungen auf; die von Privaten erbrachten Leistungen werden auf der Basis vertraglicher Vereinbarungen vergütet. PPP-Projekte sind charakterisiert durch eine langfristige vertragliche Zusammenarbeit zwischen öffentlicher Hand und Privatwirtschaft, verbunden mit einer Risikoverteilung orientiert an Wirtschaftlichkeitsgesichtspunkten.

Im Fall des Kärntner Projektes geht es im ersten Schritt um eine zu 100% im Eigentum des Landes stehende Gesellschaft, welche allerdings den selben privatwirtschaftlichen Zielen, wie klassisch PPP-Projekte verpflichtet ist.

Diese sind:

- Gemeinsame Aufgabenerfüllung
- Public: Bereitstellung hoheitlicher Aufgaben (Landesverwaltung)
- Privat (LIG): Bauherren- und Betreiberfunktion
- Bündelung strategischer Ziele der Bestandserhaltung und Werterhaltung
- Risikoteilung (LIG-seitig, insbesondere alle Immobilienrisiken)
- Privates Investment (Außerhalb des Landesbudgets)
- Langfristige vertragliche Beziehungen
- Betreiber- / Mietvertrag

Die LIG selbst versteht sich als privatwirtschaftlich geführtes Unternehmen, welches die volle Verantwortung übernimmt, kundennah agiert und wirtschaftliche Interessen in den Mittelpunkt stellt.

2.1 Projektinitiierungsphase

In der Initiierungsphase wurde der Projektrahmen und die Projektstrategie ausführlich definiert und damit die Grundlagen für das Investment, aber auch für den späteren Gebäudebetrieb festgelegt.

2.1.1 Facilitäre Konzeption von innen nach außen

In vielen Projekten werden „schöne Häuser“ errichtet, die flächen- und nutzungswirtschaftlich katastrophal sind. Kurz vor Besiedlung werden noch die Faciltiären Services zusammengestoppelt oder ein total-FM-Dienstleister mit der Betreuung beauftragt.

In diesem Fall wurde in enger Zusammenarbeit mit der Landesverwaltung ein Nutzerbedarfsprogramm erstellt, im Rahmen eines europaweit ausgeschriebenen Architekturwettbewerbs, zwei Architektenteams gefunden und in enger Zusammenarbeit zwischen den Verantwortlichen der Landesverwaltung und dem PPP-Geber, die Gebäudeentwicklung durchgeführt.

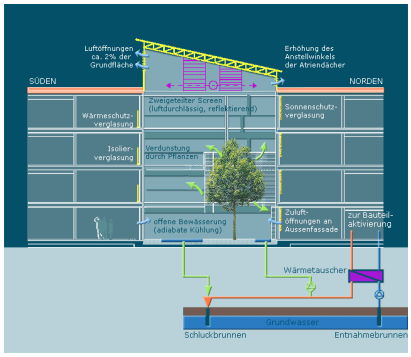

Abb. 10: Haustechnik Neubau

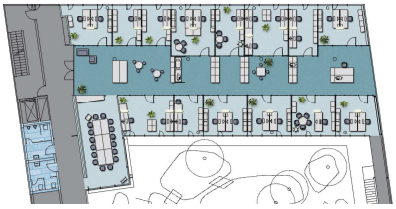

Abb. 11: Büroflächen 1

Abb. 12: Büroflächen 2

Abb.13: Büroflächen 3

Zur Optimierung des Veränderungsmanagements (hier wurden in der Analyse der Vergangenheit hohe Kosten festgestellt) wurden die Büroflächen reversibel gestaltet. Alle Ausbaugewerke wurden so abgestimmt, dass das Büro mit einer Bühnenfläche vergleichbar ist.

2.2 FM von Beginn an

In enger Zusammenarbeit zwischen Verantwortlichen der Landesverwaltung und der Landesimmobiliengesellschaft wurde schon bereits im Initiierungsprojekt eine Parallelität zwischen Facilitärer Konzeption und den Leistungen im Gebäudebetrieb geplant. So entsteht eine Immobilie abgestimmt auf eine optimierte Betriebsorganisation, die auf die Arbeitsprozesse und Kommunikationsflüsse der Landesverwaltung ausgerichtet ist.

2.3 Planungs- und Ausführungsphase

In der Planungs- und Ausführungsphase, in welcher sich das Projekt derzeit befindet, waren und sind die Partner gefordert, klare Regeln für die Entwicklung, wie auch dem Betriebsprozess als Grundlage der Kostenkalkulation festzulegen.

2.3.1 Organisation und Aufgabenverteilung

Eine eigens dafür eingerichtete Arbeitsgruppe beschäftigt sich deshalb mit einer detaillierten Definition der Aufgabenverteilung. Ziel ist es, eine Organisation zu schaffen, welche kerngeschäftsnahe Leistungen im Verantwortungsbereich der Kärntner Landesverwaltung und gebäudenahe im Verantwortungsbereich der Landesimmobiliengesellschaft definiert.

2.3.2 Kostentransparenz

Speziell bei den Kosten gilt der Grundsatz: Strenge Rechnung, gute Freunde.

Sowohl die direkt als auch die umlagefähigen Kosten bedürfen einer klaren Struktur und Kostenzuordnung zu den einzelnen Kostenstellen, um etwaiges Misstrauen schon an der Wurzel bekämpfen zu können.

Das Kostenrechnungssystem der öffentlichen Verwaltung ist naturgemäß auf das Kerngeschäft ausgerichtet. Für einen effizienten Gebäudebetrieb greift das zu kurz. Nach Analyse der Ist-Situation wurde eine an die GEFMA 200 angelehnte Kostenartenstruktur gemeinsam entwickelt, die neben der Transparenz auch die entsprechende Tiefe aufweist.

2.3.3 Nutzungsphase

In der Nutzungsphase, welche im Februar 2006 in Bauetappen begann, werden schrittweise die neuen partnerschaftlichen Regeln umgesetzt.

2.3.4 FM Manager als Manager eines Servicenetzwerks

Die Landesimmobiliengesellschaft ist überzeugt, dass Facility Management das Managen eines kundenorientierten Netzwerks aus Nutzern, Investoren, Eigentümern und Dienstleistungslieferanten ist.

Oft wird dieser Job einfach mit einem „Techniker“ besetzt. Der Manager muss das Kerngeschäft der öffentlichen Verwaltung verstehen, um dieser eine optimale Dienstleistung zur Verfügung stellen zu können.

Die Anforderungen an ihn sind sehr hoch gestellt, von einem modernen „Hausmeister“ sind sie weit entfernt.

Folgende Aufgaben- und Stellenbeschreibungen für Planung, Organisation, Durchführung und Controlling sind in Diskussion:

- Vertretung gegenüber dem Eigentümer/Betreibergesellschaft, den internen und externen Kunden und den Servicelieferanten
- Führung des Gebäudebetriebs (inkl. Mitarbeiterführung Eigen- und Fremdpersonal)
- Netzwerk-/Partnermanagement der Servicelieferanten
- Qualitätsmanagement der erbrachten Leistungen (Beschwerden und Verbesserungen)
- Internes Marketing/Sicherstellung der Kundenzufriedenheit (inkl. Festlegen und Adaption des Produkt- und Dienstleistungsspektrum)
- Aktualisierung der unterstützenden Werkzeuge (Helpdesk, CAIFM, Intranet)
- Abstimmung und Entscheidungen hinsichtlich wesentlicher Einkaufsaktivitäten
- Unterstützung bei organisatorischen Querschnittsfunktionen wie Flächen- und Umzugsmanagement und Inventarverwaltung
- Wahrung der Eigentümeraufgaben, sowie der rechtlichen Aspekte des Gebäudebetriebs
- Dokumentation
- Kaufmännische Aufgaben der Hausverwaltung

2.3.5 Pattformen und Werkzeuge für Akzeptanz und Effizienz

Durchgängige Akzeptanzsicherung von der Planung bis zur Nutzung:
Bereits in der Initiierungsphase des Projektes konnten sich Mitarbeiter und Bürger auf einer projektbezogenen Internetplattform mit den Möglichkeiten der neuen Gebäude auseinandersetzen. Die Akzeptanz war und ist enorm. In der Nutzungsphase wird diese Internetplattform als Serviceplattform des PPP-Gebers und damit als direkte Kommunikationsmöglichkeit zu den Nutzern weiterbetrieben werden.

Abb. 16: Informationsplattform; Architektur

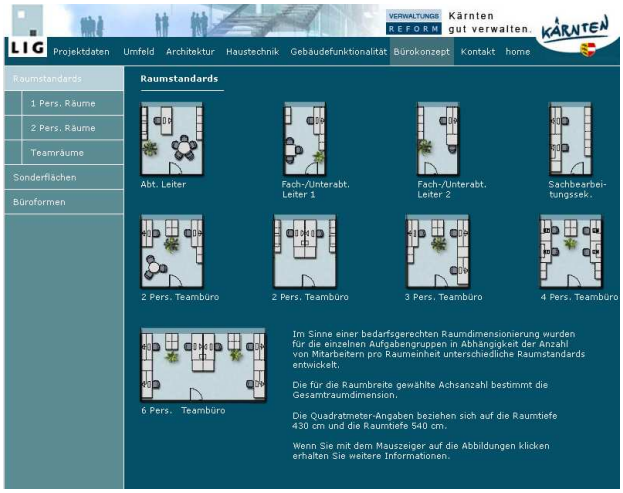

Abb. 17: Informationsplattform, Bürokonzept

2.3.6 CAIFM für alle – ein intranetbasierendes System:

Ein State-of-the-Art – CAIFM System wurde bereits in der Planungsphase angeschafft, um die relevanten Daten zeigerecht zu übernehmen. Neben den Basisfunktionalitäten wie z.B. Flächen- und Mobilienmanagement, werden Wartungs- und Instandhaltungsmanagement, Reinigungsmanagement, etc. eingesetzt. Die in dieser Phase geschaffenen Informationen gehen somit nicht verloren.

Die LIG stellt damit eine EDV-Plattform für das Objekt Informationssystem zur Verfügung, welche von der Landesverwaltung über eine direkte Datenleitung für die von ihr verantworteten Aufgaben benutzt werden kann.

Das Informationssystem steht online für die Landesverwaltung zur Bearbeitung ihrer eigenen Aufgaben in Flächen- Mobilien- und Kostenmanagement zur Verfügung. Das Werkzeug stellt darüber hinaus die Basis für die von der Landesimmobiliengesellschaft zukünftig geplanten, integrierten Gebäudedienstleistungen „Mehrwertdienstleistungen“ dar.

3 SELBSTVERSTÄNDNIS UND KUNDENBETREUUNGSPRINZIP DES PPP-GEBERS (LANDESIMMOBILIENGESELLSCHAFT)

3.1 Aufgaben und Zielsetzung

Mit der Gründung der Landesimmobiliengesellschaft (LIG) verfolgte das Land Kärnten das Ziel Landesvermögen bestmöglich zu bewirtschaften und mehr Produktivität zu erreichen ohne Personal abzubauen.

Im Vordergrund stehen die Ziele „Konzentration auf Fachaufgaben“ der Landesverwaltungsorganisation und „Optimierung der Flächennutzung“.

Die bei der Verwaltung und Unterhaltung von Dienstgebäuden bestehende Rationalisierungsreserven müssen ausgeschöpft werden. Dazu bedarf es einer stärkeren Bündelung der betreffenden Funktionen und einer veränderten Organisation.

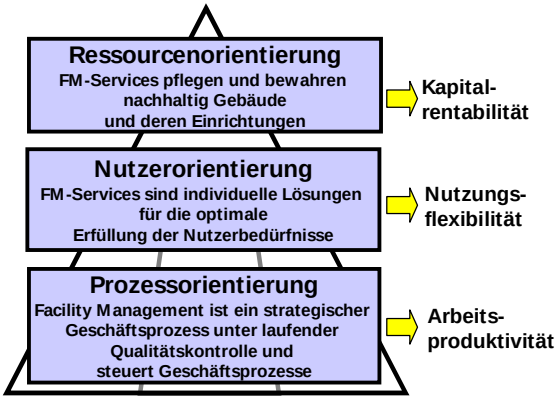

Abb. 18: Selbstverständnis der LIG

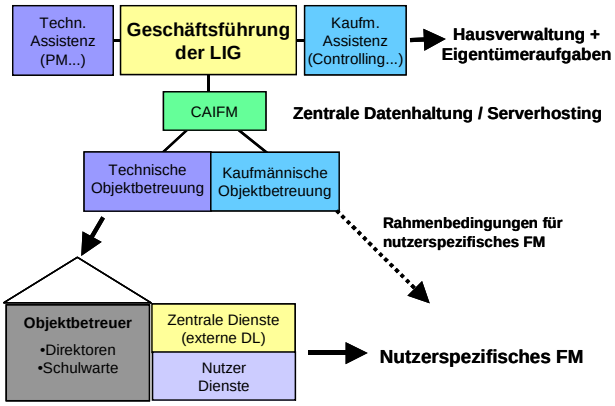

Abb. 19: Das Kundenbetreuungsprinzip der LIG

4 SCHLUSSFOLGERUNGEN UND AUSBLICK

Zur Umsetzung der organisatorischen Ziele der Kärntner Landesregierung (New Public Management) war eine umfassende Reorganisation der Verwaltung und damit verbunden, eine Realisierung einer Standortkonzentration in zwei Dienstleistungszentren erforderlich.

Im Rahmen des laufenden Haushaltes wäre das Land Kärnten nicht in der Lage gewesen, eine so zukunftsorientierte Investition durchzuführen. Die Ausgliederung in ein privatwirtschaftlich agierendes Dienstleistungsunternehmen der Landesimmobiliengesellschaft, ermöglichte die Realisierung, welche neben der inhaltlichen Optimierung einen Barwertvorteil im Lebenszyklus von € 12 Millionen ermöglicht.

Das inhaltlich an der Definition von PPP-Modellen orientierte Vorgehen, schafft den Vorteil einer Professionalisierung der Immobilienwirtschaft des Landes und der Möglichkeit nach privatwirtschaftlichen Regeln zu budgetieren und zu handeln.

🏆 *reviewed paper*

Das Business-Improvement-District-Modell als Integrationsrahmen für Public-Private-Partnership und Bürgerbeteiligung in der Stadtentwicklung?

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1 EINLEITUNG

Die zukünftige Organisation urbaner Entwicklung wandelt sich in Richtung eines verstärkten Zusammenwirkens von öffentlicher Hand und Gesellschaft (vgl. Bogason 2000; Einig et al. 2005; Röber 2006; Helbrecht 1994; Jekel 1998). Im Besonderen ist dies auf der kommunalen Ebene wahrnehmbar, die als unterste Einheit des politischen Systems die unmittelbare Schnittstelle zwischen Staat, Bürgerinnen und Bürgern darstellt. In der städtischen Planung findet die Veränderung der Rollenverteilungen zwischen öffentlicher Hand und nicht-staatlichen Akteuren Ausdruck in verschiedenen bilateralen Kooperationsformen: einerseits zwischen öffentlicher Hand und Privatwirtschaft im Rahmen von Public-Private-Partnerships (PPP), deren übergeordnetes Ziel die Sicherung der Finanzierungmöglichkeiten für Projekte gemeinsamen Interesses darstellt, sowie andererseits zwischen Staat sowie Bürgerinnen und Bürgern im Rahmen von Partizipationsverfahren, denen das demokratische Prinzip der aktiven Mitgestaltung sowie das Ziel der Stärkung des Sozialkapitals zugrunde liegt. Ein prominentes Beispiel für die bilaterale Zusammenarbeit von Staat und Privatwirtschaft stellt das Modell der Business-Improvement-Districts dar. Ursprünglich in Kanada in den 1970er Jahren erstmals angewandt, existieren mittlerweile 1.700 BIDs weltweit (Stand 2006; Friesecke 2006: 1/18), in acht Nationen (vgl. Hoyt 2006: 228). Auch in Österreich werden Umsetzungsmöglichkeiten diskutiert (siehe dazu ERFA-Tagung für Stadtmarketing und Citymanagement 2006; Lobendanz et al. 2007). Bisher beschränkt sich die Verbreitung jedoch weitgehend auf eine kopienhafte Übernahme des Konzeptes, das vorrangig auf die direkte und indirekte Förderung wirtschaftlicher Interessen ausgerichtet ist.

In der wissenschaftlichen Debatte wie auch in der Praxis finden sich gegenwärtig kaum Ansätze, die einen Rahmen für eine übergreifende Kooperation der drei zentralen Akteursgruppen der Stadtentwicklung (öffentliche Hand, Privatwirtschaft, Bürger, Bürgerinnen) zu schaffen versuchen und auf eine konsensuale räumliche Entwicklung ausgerichtet sind. Der vorliegende Artikel stellt das Modell der Business-Improvement-Districts (BIDs) als einen möglichen Integrationsrahmen für eine trilaterale Zusammenarbeit im österreichischen Raum zur Diskussion. Dabei soll eine Neuausrichtung des Modells andiskutiert werden, die nicht nur ökonomischen Aspekten Rechnung tragen, sondern ein besonderes Augenmerk auf die Integration der bürgerschaftlichen Bedürfnisse legen soll.

2 FRAGESTELLUNGEN UND METHODIK

Der erste Abschnitt beleuchtet überblicksartig bestehende Instrumente und Organisationsformen städtischer Entwicklung abseits der öffentlichen Handhabe und leitet daraus Ansätze für Anforderungen an zukünftige Prozesse urbaner Entwicklung ab. In der Folge werden Stärken und Schwächen trilateraler Kooperationsformen diskutiert. Schließlich werden anhand einer umfassenden Literaturanalyse sowie gestützt auf Studien von Anwendungsfällen die Vorzüge und Schwächen des Business-Improvement-District-Modells in seiner ursprünglichen Form erörtert, und seine Potentiale in Hinblick auf eine mögliche Adaption an die Anforderungen trilateraler Partnerschaften, das heißt die zusätzliche Integration bürgerschaftlicher Akteure, diskutiert. Kernfragestellungen dabei sind:

- Welche Aspekte des BID-Modells bieten im Vergleich zu bestehenden Ansätzen neue Möglichkeiten für die Stadtentwicklung bzw. welche Risken sind damit verbunden? Welche Integrationsmöglichkeiten bestehen zu den aktuellen Ansätzen?
- Kann das BID-Modell einen Rahmen für eine Zusammenführung von Public-Private-Partnership und Bürgerbeteiligung darstellen?

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Das Ziel der Arbeit auf Basis dieser Analyse ist es, den Entwurf einer Organisationsform zu skizzieren, die einerseits geeignete Rahmenbedingungen für trilaterale Kooperationen schaffen soll und andrerseits beitragen kann, mögliche Probleme bestehender Strukturen zu bewältigen.

3 BESTEHENDE KOOPERATIONSFORMEN IN DER STADTENTWICKLUNG

Aktuell existieren in Österreich kaum institutionalisierte Organisationsformen für Aktivitäten städtischer Entwicklung, welche die öffentliche Hand, Wirtschaft und Bürgerinnen und Bürger als gleichgestellte Kooperationspartner zusammenführt. Unternimmt man eine Analyse bestehender Organisationsformen mit dem Ziel der (inner)städtischen Entwicklung, so lassen sich, neben den Instrumenten und Zuständigkeiten der öffentlichen Hand, im Wesentlichen folgende Ausprägungen klassifizieren:

(i) Instrumente, die auf eine Förderung des innerstädtischen Einzelhandels ausgerichtet sind und mit der Standortkonkurrenz zu den meist in den städtischen Randbereichen (‚Speckgürtel') angesiedelten großflächigen Einzelhandelsagglomerationen in Zusammenhang stehen,

(ii) Instrumente, die auf die Finanzierung von städtebaulichen Projekten abzielen,

(iii) Maßnahmen, die eine Gestaltung des öffentlichen Raumes in Zusammenarbeit mit den betroffenen Bürgern und Bürgerinnen zum Ziel haben.

Betrachtet man die im Rahmen dieser Instrumentarien in der Regel agierenden Personen, die Zielsetzungen sowie die Stärken und Schwächen solcher Projekte, so lassen sich - vereinfacht dargestellt - die die in Tabelle 1 angeführten Merkmale festhalten[33]. .

	Akteurinnen und Akteure	Ziele	Stärken/Schwächen
(i)	Privatwirtschaftlich organisiert (Einzelhändler, Eigentümer) Fallweise: Kooperationen mit öffentlicher Hand (Kommune) oder anderen Interessensvertretungen (z.B. Tourismusverband) Form: Interessengemeinschaften Werbegemeinschaften, Stadtmarketing, Vereine, gemischtwirtschaftliche GmbHs,	Förderung des jeweiligen Einkaufsstandortes Steigerung der Attraktivität für Konsumenten Gestaltung öffentlichen Raums Verbesserung der Erreichbarkeit	+ Starke Interessensvertretung aus wirtschaftlicher Notwendigkeit heraus + Belebung meist innerstädtischer Lagen, die zur gesamtstädtischen Attraktivität v.a. nach Außen beitragen (Tourismus) - Kapitalmangel durch freiwillige Mitgliedschaft & geringe Beiträge - Vorhandensein von Trittbrettfahrern - Fehlen qualifizierter Beratung - geringer Einsatz engagierter Akteure und Akteurinnen über einen längeren Zeitraum/ ehrenamtliche Mitarbeiter - starke Kunden- und Außenorientierung, weniger auf lokale Bevölkerung ausgerichtet - Kompetenzen & Ressourcen entsprechen oft nicht den Zielen
(ii)	Kooperationen zwischen öffentlichen und privatwirtschaftlichen Akteurinnen und Akteuren (Investoren, Eigentümer,…) Form: Public-Private-Partnerships	Finanzierung eines meist baulichen Projektes gemeinsamen (öffentlichen) Interesses	+ Finanzierungsmöglichkeit für Projekte öffentlichen Interesses + Entlastung der kommunalen Finanzen - wenig bis kein Einbezug der lokalen Bevölkerung - „Privatisierung" des öffentlichen Raumes - „Wer bezahlt, hat das Sagen"
(iii)	Kooperationen zwischen der öffentlichen Hand und den Bürgern/der Zivilgesellschaft Form: Agenda 21, Grätzelmanagements etc.	Förderung zivilgesellschaftlicher Strukturen und einer Beteiligungskultur Gemeinsame Gestaltung des Lebens- und Wohnumfeldes	+ Stärkung des Engagements der lokalen Bevölkerung + Bedarfsorientierte Gestaltung des Raumes, Steigerung von Lebens- und Wohnqualität - Schwierigkeit, lokale Wirtschaft einzubeziehen - Finanzknappheit

Tabelle 1: Organisationsformen städtischer Entwicklung

Fasst man die angeführten Merkmale dieser vereinfachten Darstellung zusammen, so wird sichtbar, dass es sich jeweils um die spezifische Ausrichtung auf die Einzelinteressen der vertretenen Stakeholder bzw. Nutzerinnen und Nutzer handelt. Diese stehen jedoch untrennbar zueinander in Beziehung, zumal sie in der Regel auf ein und denselben Raumausschnitt treffen. Alle Ansätzen verfolgen dabei letztlich ein Ziel: die Gestaltung des eigenen Umfeldes, um die Attraktivität, die Lebens-/Wohnqualität bzw. die Konkurrenzfähigkeit des Standortes zu erhöhen. Die Knappheit der Ressource Raum und die Vielzahl ihrer Nutzungsansprüche an diese machen eine Koordination der jeweils individuellen Interessen und Bedürfnisse unumgänglich. Trotzdem werden diese Ansprüche oft isoliert voneinander umgesetzt. Während Stadtmarketingvereine, Werbegemeinschaften und Einzelhandelsinitiativen vor allem versuchen, den

[33] An dieser Stelle wird darauf hingewiesen, dass es sich um eine generalisierte Übersicht handelt, die hybride Organisationsformen, wie sie u.U. vereinzelt in der Praxis auftreten, nicht berücksichtigt.

Standort als Einkaufsstandort zu etablieren, sich an den Wünschen der potentiellem Kundschaft orientieren und entsprechende Werbemaßnahmen ergreifen, haben Organisationen wie etwa die Lokale Agenda 21 zum Ziel, auf die Bedürfnisse der betroffenen Wohnbevölkerung einzugehen und mit diesen gemeinsam die Qualität des Lebens- und Aktionsraumes zu erhöhen. Zwischen diesen Organisationsformen gibt es in der Praxis in den meisten Fällen wenig bis keinen Austausch. Initiativen, die sich an den Bedürfnissen der Bürgerinnen und Bürger orientieren, gelingt es häufig nur schwer, lokale Wirtschaftstreibende für eine Zusammenarbeit zu gewinnen. Aufgrund ihrer starken Ausrichtung auf Konsumentinnen, Konsumenten und Gewinnorientierung beziehen sie Perspektiven der Bürgerinnern und Bürger nicht oder nur wenig in ihre Planungen ein. Letztlich beeinflussen und gestalten diese Initiativen jedoch dasselbe Handlungsfeld. Dies lässt Forderungen nach neuen Formen der integrativen Zusammenarbeit und Koordination der Einzelinteressen im Hinblick auf eine Entwicklung, die sämtlichen Ansprüchen Rechnung tragen kann, als nahe liegend erscheinen..

4 TRILATERALE KOOPERATIONSFORMEN

Wie die vorangegangene Analyse gezeigt hat, beschränken sich Kooperationen in der Stadtentwicklung bisher meist auf bilaterale Abkommen, also auf das Zusammenwirken von zwei Interessensgruppen. In der Realität reichen diese Ansätze für eine gesamtheitliche Raumentwicklung jedoch oft nicht aus. Vor allem die Beteiligung von Bürgerinnen und Bürgern in Planungs- und Entwicklungsprozessen ist, wie etwa Selle (2007: 65) deutlich macht, oftmals auf eine Pro-Forma-Teilhabe reduziert. Für die Suche nach alternativen Formen und Programmen für Stadterneuerung gilt es daher, neue Horizonte für Kooperationen zu erschließen, die im Stande sind, auf breiter Ebene Ressourcen zu aktivieren und eine lokale Beteiligungskultur zu etablieren. Als trilaterale Kooperation soll daher in diesem Kontext das Zusammenwirken von Akteurinnen und Akteuren der öffentlichen Hand, der Wirtschaft sowie der Bürgerinnen und Bürgern innerhalb eines organisatorischen Rahmens mit dem Ziel der konsensualen räumlichen Entwicklung eines bestimmten Raumausschnittes verstanden werden.

4.1 Argumente für einen Einsatz trilateraler Kooperationsformen in der Stadtentwicklung

Verschiedene Tendenzen im Bereich der Organisation und Zielsetzung urbaner Entwicklung sprechen für einen Einsatz trilateraler Kooperationsformen. Dazu gehören unter anderem:

(i) Die Veränderungen des politisch-administrativen Systems in Richtung Governance, die eine Suche nach trilateralen Steuerungs- und Kooperationsformen als nahe liegend erscheinen lassen. Als zwei zentrale Merkmale von Governance hält Sinning (2006: 87) fest: Die Koproduktion öffentlicher Leistungen durch Staat/Kommunen, Wirtschaft und Bürgerschaft, also die partnerschaftliche Einbeziehung privater Beteiligter, sowie den strategischen Einsatz spezifischer Kooperationsformen. Dadurch wird eine Vielzahl von Ausprägungen der Zusammenarbeit ermöglicht.

(ii) Die erwartete Stärkung von bürgerschaftlichem Engagement und Sozialkapital, die auf einem anhaltenden Wandel der Rolle der Bürgerinnen und Bürger von passiven Empfängerinnen und Empfängern zu Mitgestalterinnen, Mitgestaltern, Koproduzentinnen und Koproduzenten aufbaut.

(iii) Der Erhalt der städtischen Funktionsvielfalt, die stark mit wirtschaftlichen und gesellschaftlichen Prozessen verknüpft ist. Der Erfolg von Stadterneuerung wird, vor dem Hintergrund der steigenden Standortkonkurrenz und dem damit verbundenen Wettbewerb um Einwohnerzahlen, Kaufkraft, Investitionen und Steuereinnahmen, langfristig vor allem davon abhängen, ob die Bedürfnisse von Wirtschaftstreibenden und Bürgerinnen und Bürgern gleichermaßen befriedigt werden können.

(iv) Die in der Stadtentwicklung vielfach diskutierte Privatisierung des öffentlichen Raumes (siehe dazu Hatz 2004, Symes & Steel 2003, Glasze 2001, Feldtkeller 1995), der in seiner Zugänglichkeit durch die Veränderung von Eigentumsverhältnissen von der öffentlichen Hand hin zu privaten Investorinnen und Investoren beschnitten wird. Diese entscheiden über die Nutzung und orientieren sich dabei an höheren Einkommensgruppen und Touristen, was sich etwa in Zugangsbeschränkungen für sozial schwächere, marginalisierte Gruppen ausdrücken und damit zu sozialpolitisch unerwünschten Folgewirkungen führen kann (vgl Hatz 2004: 77).

4.2 Anwendungsbeispiel trilateraler Kooperation: „3stadt2“

Ein Anwendungsbeispiel trilateraler Kooperation bietet das vom Bundesamt für Bauwesen und Raumordnung in Bonn im Herbst 2001 initiierte ExWoSt-Forschungsfeld „3stadt2 – Neue Kooperationsformen in der Stadtentwicklung“ [34].. Ziel der Arbeiten war es, „Kooperationen zwischen den drei zentralen Akteursgruppen – öffentliche Hand, private Investoren und Bürger – zu erproben und mit Blick auf ihre Leistungsfähigkeit, Erfolgsbedingungen und optimalen Organisationsmuster zu bewerten“ (Jakubowski & Pauly 2005: 619; vgl. auch Jakubowski & Hohn 2007: 49). Das Projekt sollte die Ansätze von Public-Private-Partnership und Bürgerbeteiligung, durch eine Verknüpfung klassischer Instrumente der Stadtentwicklung mit neuen kooperativen Instrumenten, zusammenführen.

Zusammenfassend können die Erkenntnisse des Forschungsfeldes zu tritaleralen Kooperationsformen wie folgt festgehalten werden:

(i) Trilaterale Verfahren ermöglichen eine Beschleunigung von Planungsprozessen durch die Fähigkeit, komplexe Aufgabenstellungen und Probleme aufgrund konsensual abgestimmter Zielvorstellungen zu lösen.

(ii) Diese Zeitersparnis führt in der Regel auch zu einer Reduktion der Kosten.

(iii) Trilaterale Verfahren erfordern ein strenges Prozess- und Schnittstellenmanagement.

(iv) Koordinations und Abstimmungskosten, die in der Anfangsphase eines kooperativen Prozesses anfallen können, in der Folge durch ein minimiertes Risiko relativiert werden.

Im Folgenden werden Argumente, welche für und wider den Einsatz trilateraler Kooperationsformen sprechen, überblicksartig zusammengefasst und decken sich in weiten Teilen mit den Erkenntnissen des Forschungsfeldes „3stadt2“.

4.3 Chancen und Risken trilateraler Kooperationsformen

Für den Einsatz trilateraler Organisationsformen spricht das Miteinbeziehen von Akteurinnen und Akteuren mit unterschiedlichen Interessensschwerpunkten in Entscheidungs- und Planungsprozesse. Dadurch wird ein Kompromiss zwischen bedarfsgerechter, städtebaulich hochwertiger und wirtschaftlich umsetzbarer Planung greifbar erreicht (vgl. Jakubowski & Pauly 2005: 624). Besser abgesicherte Planungslösungen werden unterstützt, potentielle Konfliktfelder in einer frühen Planungsphase aufgedeckt und vermindert. Die aktive Beteiligung der Stakeholder führt zu einer höheren Transparenz und Nachvollziehbarkeit von Planungsprozessen und damit in der Regel auch zu einer verbesserten Akzeptanz der Planung. Zudem bieten die entstehenden Mitgestaltungsmöglichkeiten mehr Motivation zu eigenverantwortlichem Handeln. Gleichzeitig kann eine Steigerung der Chancen auf hohe Qualität der Planung bzw. des Planungsergebnisses sowie auf die tatsächliche Umsetzung eines Projektes erwartet werden. Zudem kann eine trilaterale Zusammenarbeit zu einer Zeitersparnis und damit zu reduzierten Kosten beitragen (vgl. BBR 2005: 5f, Jakubowski & Pauly 2005: 622ff.). Zwar erfordern trilaterale Kooperationsprozesse verglichen mit traditionellen Instrumenten besonders in der Anfangsphase einen zeitlichen und finanziellen Mehraufwand, jedoch zeigte sich, dass nachfolgende Abstimmungsprozesse rascher erfolgen und damit auch eine Reduktion der Kosten eintritt.

Den genannten Vorzügen stehen aber auch verschiedeneRisken gegenüber. Eine besondere Herausforderung stellt die Schaffung einer realen Gleichwertigkeit der beteiligten Parteien dar. Es besteht die Gefahr, dass nicht zahlende Akteurinnen und Akteure nur schwer ihre Interessen einbringen können, da sie entweder nicht erreicht oder als nicht ernstzunehmende Verhandlungspartner angesehen werden (vgl. Baranek & Walk 2005: 75, siehe auch Sack 2003). Allzu oft unterliegen „schwache, wenig zahlungsfähige und kaum mit ‚bargaining-power’ ausgestattete Gruppen“ (Selle 2007: 66) den wirtschaftlichen Interessen in Prozessen der Quartiers- und Stadtentwicklung. Durch den erhöhten Koordinationsbedarf entsteht im Vergleich zu bilateralen Zusammenschlüssen zudem ein Mehraufwand an Zeit und Kosten, daher sollte das Verhältnis von Aufwand und Ergebnis rechtzeitig abgewogen werden. Mehrkosten können insbesondere für die öffentliche Hand anfallen, für Koordinationsarbeit oder für einen erhöhten Personalaufwand, was sich insofern als

[34] „3stadt2 –Neue Kooperationsformen in der Stadtentwicklung“ wurde in Zusammenarbeit des Bundesamtes für Bauwesen und Raumordnung (BBR) mit dem Bundesministerium für Verkehr, Bau- und Wohnungswesen im experimentellen Städtebau (ExWoSt) Deutschland durchgeführt (vgl. BBR 2005).

problematisch erweisen kann, als die kommunale Finanzknappheit eine wesentliche Triebfeder für die Suche nach alternativer Kooperationsformen ist.

5 DAS BUSINESS-IMPROVEMENT-DISTRICT MODELL

Die Idee der Business Improvement districts fand 1970 in Toronto, Kanada ihren Usprung, als Reaktion auf die in den 1960er Jahren einsetzenden Suburbanisierungstendenzen sowie die Unzulänglichkeit vorangegangene Konzepte zur Förderung des Einzelhandels aufgrund von mangelnder Beteiligung, freiwilligen Beiträgen und zunehmender Uneinigkeit unter den Händlern. Nach der Kürzung der staatlichen Subventionen für Städtebau in den 1970er Jahren wurden die Kommunen der USA dazu gezwungen, lokale Eigenverantwortung zu übernehmen und neue Finanzierungsmöglichkeiten für die Revitalisierung der Innenstädte zu finden (vgl. Helbrecht 1994: 2). Jüngere städtische Erneuerungsmaßnahmen sind daher oftmals von lokalen Unternehmen selbstfinanziert und als Public-Private-Partnerships organisiert. Dabei spielt das Modell der Business-Imrpovement-Districts (BIDs), das im Jahr 1975 erstmals in den USA umgesetzt wurde eine bedeutende Rolle.

5.1 Organisation und Aufgaben eines BID

Unter einem Business-Improvement-Dirstrict ist ein räumlich eindeutig abgegrenztes Gebiet zu verstehen, innerhalb dessen die Grundeigentümer und/oder Wirtschaftstreibenden eine Abgabe leisten, um ihr räumliches und wirtschaftliches Umfeld zu gestalten und zu verbessern (siehe dazu Hoyt 2006; Mitchell 2001; Symes & Steel 2003; Friesecke 2006; Houston 2003). In den meisten Fällen basiert die Gründung eines BID auf der Eigeninitiative von lokalen Geschäftsleuten und/oder Grundeigentümer. Die tatsächliche Einrichtung bedarf schließlich einer mehrheitlichen Zustimmung auf Basis eines von den Initiatoren festzulegenden Programms (die Regelungen hierfür variieren mitunter stark und sind in den jeweiligen BID-Gesetzen festgelegt). Während eines definierten Zeitraumes – in den meisten Fällen sind es 5 Jahre – wird in der Folge eine BID-gebundene Zwangsabgabe erhoben, die gemeinsam mit der Grundsteuer durch die Kommune eingezogen und an eine nicht-staatliche BID Organisation weitergegeben wird, welche die Mittel in eigener Autorität verwaltet (vgl. Mitchell 2001: 116). BIDs repräsentieren eine Form von Public-Private-Partnerships, wobei die Aufgabe der städtischen Verwaltung darin liegt, die Abgaben zusammen mit der Grundsteuer einzuheben, sowie die Aktivitäten zu unterstützen. Mit diesen Mitteln werden verschiedene Dienstleistungen wie Sicherheitsdienste, Maßnahmen der Straßen- und Gehsteiggestaltung, Sauberkeit des öffentlichen Raumes, Sanitäranlagen, Marketing- und Werbemaßnahmen oder die Gestaltung von Freiflächen, Parks oder Parkplätzen finanziert.

5.2 Stärken des Modells

Einige zentrale Charakteristika der Business-Improvement-Districts geben Anlass dazu, das Potential des Modells für eine mögliche Implementierung im österreichischen Kontext abzuwägen, da sie teilweise konkrete Antworten auf gegenwärtige Probleme innerstädtischer Entwicklung in Österreich darstellen.

(i) BIDs stellen ein gesetzlich festgelegtes Rahmenwerk für Aktivitäten der Stadtentwicklung zur Verfügung. Funktionen, Aufgaben und Verantwortlichkeiten sind klar definiert und den zuständigen Personen/Gruppen zugeordnet.

(ii) Für die Dauer der vereinbarten Zeitspanne ist eine Sicherstellung der finanziellen Mittel gewährleistet. Dies ermöglicht der BID-Organisation ein planbares Handeln sowie die Einstellung von Personal, wodurch die Umsetzbarkeit von Projekten und Zielen besser abgesichert wird.

(iii) BIDs stellen einen maßstabsunabhängigen Lösungsansatz dar. Sie sind sowohl in sehr kleinräumigen subzentralen Strukturen (einzelne Einkaufsstraßen oder Plätze) anwendbar, als auch in Arealen mittlerer Größe („Grätzl“, Bezirkszentren).

(iv) BIDs können an verschiedene Ansprüche und Schwerpunktsetzungen angepasst werden, was die Zielsetzung und den Einsatz finanzieller Mittel betrifft. Dadurch ist die Möglichkeit der bedarfsspezifischen Ausrichtung gegeben.

(v) BIDs beruhen auf der Eigeninitiative und Selbstverpflichtung der betroffenen Akteurinnen und Akteuren. Dies erhöht die Identifikation mit der Initiative und die Begeisterungsfähigkeit für die Umsetzung positiv.

(vi) Die Organisationsform ermöglicht keine Trittbrettfahrer. Das Vorhandensein von Institutionen oder Personen, die zwar von positiven Veränderungen profitieren, sich jedoch nicht finanziell daran beteiligen wollen, wird durch Verpflichtung minimiert.

5.3 Schwächen und Risken

Bei der Implementierung eines BIDs stehen die private Finanzierung und damit die wirtschaftlichen Interessen eindeutig im Vordergrund. Diese Übernahme öffentlicher Aufgaben durch private Investoren gefährdet die langfristige Sicherstellung öffentlicher (sozialer) Dienstleistungen. Diese Kritik richtet sich gleichermaßen an alle klassischen Formen von Public-Private-Partnerships, deren Konzept sich in der Praxis immer wieder als zu eng herausgestellt hat: „Zum einen kann eine Einbeziehung des privaten Sektors sich nicht auf Vertreter der Wirtschaft und Unternehmen beschränken… Genauso wichtig … ist eine angemessene Aktivierung und Beteiligung von Bewohnern und ihren Vertretungsorganisationen." (Froessler 1998: 24). Hier ist die abzuwägen, ob das Konzept an dieser Stelle noch Entwicklungspotential in sich trägt, das den Einbezug des privaten, nicht-wirtschaftlichen Sektors ermöglichen könnte.

Die Untersuchung von Funktion, Struktur und Management bestehender BIDs in den USA (vgl. Mitchell 1999) hat gezeigt, dass BIDs in ihrer bisherigen Anwendung nicht auf eine Beteiligung von Außenstehenden in Entscheidungsprozessen ausgerichtet sind. Lediglich die Hälfte der untersuchten BIDs nützen Instrumente zur Erhebung von Bürgerperspektiven, eine wirklich aktive Beteiligung wird allgemein nicht thematisiert. So sind BIDs in ihrer Umsetzung oftmals auf ein simples place marketing im Sinn einer Marktkommunikation reduziert. Symes & Steel (2003: 304) kritisieren, dass damit weniger auf die Bedürfnisse der lokalen Bevölkerung, als vielmehr auf die Bewerbung des Standortes nach außen abgezielt wird.

Zudem wird wiederholt die Problematik eines sozialen Ungleichgewichts im Zusammenhang mit BIDs angesprochen. Dabei entsteht der Vorwurf, dass sich reichere Nachbarschaften eine privat organisierte Sicherung der öffentlichen Ordnung leisten können, ärmere Viertel jedoch nicht, was zu einer interlokalen Ungleichheit führen kann (vgl. Barr 1997: 398). In diesem Zusammenhang stehen auch die angesprochenen Diskussionen über die undemokratische Privatisierung des öffentlichen Raumes (vgl. Glasze 2001: 160; Symes & Steel 2003: 309ff.).

Der Transfer eines derartigen Systems kann nur dann erfolgreich sein, wenn es entsprechend der Gegebenheiten vor Ort angepasst wird. In diesem Fall ist vor allem das unterschiedliche Verständnis von sozialstaatlichen Aufgaben und der Rolle der Planung in den USA und Europa zu berücksichtigen, da sehr unterschiedliche politisch-kulturelle Traditionen und gesellschaftlichen Wertevorstellungen existieren (vgl. Schneider-Sliwa 1995: 425). Darauf beruht eine deutlich andersartige Planungs- und Entscheidungskultur, die zahlreiche Aufgaben, welche in europäischen Ländern als Obliegenheiten des (Sozial)Staates festgelegt sind, in den USA nicht der Bundesregierung, sondern den Staaten, Kommunen und privaten Akteurinnen und Akteuren überträgt. In den USA werden weitaus weniger zentralstaatliche Mechanismen wirksam, der Staat greift nur in akuten Krisen eingreift (vgl. Barnekov et al. 1989: 34ff). Ausgleichende Wirkung bei räumlichen Disparitäten und sozialer Segregation sind in den USA nicht vorrangig. Zudem ist auch zu bedenken, dass die Abgabenbelastung in den USA deutlich unter dem österreichischen Niveau liegt, weshalb eventuell auch mit Widerständen gegen eine zusätzliche verpflichtende Abgabe gerechnet werden muss. Eine notwendige Anpassung des Konzepts auf Europäische Verhältnisse erlaubt nun, Spezifika europäischer bzw. österreichischer Planungskultur einzubringen, insbesondere die stärkere Einbindung der öffentlichen Verwaltung sowie ein breiteres Partizipationsmodell.

6 TRILATERALES MODELL: KOOPERATIVE QUARTIERSENTWICKLUNG

Im Zuge der folgenden Überlegungen für ein alternatives Rahmenkonzept zur Organisation städtischer Entwicklung wird das Modell der Business-Improvement-Districts bewusst nicht in seiner inhaltlich-thematischen Ausrichtung übernommen. Vielmehr soll versucht werden, seine Stärken – vor allem in organisatorischer Hinsicht - für neue Perspektiven der Stadtentwicklung in Österreich nutzbar zu machen. Das klassische Konzept der PPP wird dabei um die Dimension der Bürgerinnen- und Bürgerperspektive erweitert – hin zu einer öffentlich-privatwirtschaftlich-bürgerschaftlichen Partnerschaft.

Die wesentlichen Herausforderungen dabei sind es,

(i) eine geeignete räumliche Maßstabsebene für derartige Kooperationen zu identifizieren und mögliche Zielsetzungen und Aufgabenbereiche zu definieren,

(ii) die Zusammenarbeit zwischen Wirtschaft, Bevölkerung und öffentlicher Hand anzuregen, die bisher nicht oder nur sehr eingeschränkt stattfindet, sowie

(iii) die Funktionen und Aufgaben der einzelnen Akteurinnen und Akteure derart zu gestalten, dass auch den Bürgerinnen und Bürgern eine ernstzunehmende Rolle zukommt und das Engagement über die Laufzeit der Kooperation gehalten werden kann.

Anstelle des ökonomisch geprägten Begriffes des Business-Improvement-Districts entspricht die Bezeichnung Kooperative Quartiersentwicklung wohl eher dieser veränderten inhaltlichen Ausrichtung. In Anlehnung an das organisatorische Gerüst des BID-Modells können folgende Vorteile für diese neue Organisationsform nutzbar gemacht werden:

- Durch ein formales Rahmenwerk sind Funktionen und Aufgaben festgelegt.
- Die Selbstverpflichtung über einen festgelegten Zeitraum hinweg gewährleistet Kontinuität und finanzielle Sicherheit, das Vorhandensein von Trittbrettfahrern wird minimiert.
- Es entsteht ein realistischer Planungshorizont, die Chancen auf eine qualitativ abgesicherte Umsetzung von Maßnahmen sowie auf die Erreichung der Ziele steigen.
- Eigeninitiative und Selbstverpflichtung erhöhen Identifikation und Begeisterungsfähigkeit.
- Der begrenzte Zeithorizont erleichtert es, engagierte Beteiligte für das Projekt zu gewinnen.

Die Organisation einer zukünftigen kooperativen Quartiersentwicklung könnte also in Form eines vertraglich geregelten Zusammenschlusses der öffentlichen Hand (Kommune, Bezirksverwaltung) und der lokalen Wirtschaftstreibenden (Handel, Dienstleistungen), Grundeigentümer, Bürgerinnen und Bürger, unterstützt durch intermediäre, zivilgesellschaftliche Organisationen (Lokale Agenda 21, Gebietsbetreuungen etc.) gebildet werden. Aufgabe dieser trilateral ausgerichteten kooperativen Quartiersentwicklung ist die konsensuale Gestaltung des gemeinsamen Handlungsraumes innerhalb eines gewählten Zeitraumes, durch den Entwurf und die Realisierung verschiedener Projekte und Aktivitäten. Die Finanzierung könnte sich dabei aus einem Zuschuss der öffentlichen Hand sowie den eingehobenen Abgaben (hierzu ist ein geeigneter Schlüssel zur Bestimmung der Abgabenhöhe zu erstellen) zusammensetzen. Zudem könnte eine Kofinanzierung im Sinne einer Bereitstellung von Arbeitszeit (in kind-Kofinanzierung) anstatt monetärer Mittel, etwa seitens der Bürgerinnen und Bürgern aber auch der Kommune, möglich sein. Damit kann auch der Zugang einkommensschwächerer Schichten gewährleistet werden. Der Impuls zur Durchführung einer kooperativen Quartiersentwicklung sollte wünschenswerter Weise aus dem Quartier selbst kommen, kann aber durch verschiedene Organisationen (Gebietsbetreuungen, Kommune, Wirtschaftskammer etc.) eingebracht werden.

6.1 Raumausschnitt und Aufgabenbereiche

Als mögliche Bezugsräume bieten sich aus verschiedenen Gründen überschaubare Ausschnitte aus Sub- und Nebenzentren an. Die Entwicklungsziele City-naher Standorte sind meist auf eine Förderung der wirtschaftlichen Konkurrenzfähigkeit des (Einkaufs)Standortes, kaufkraftstarke Kundengruppen und touristische Anziehungskraft ausgerichtet und erzielen dahingehend auch mit klassischen Marketinginstrumenten Erfolge. Weniger zentrale Lagen sind hingegen stärker auf ihre Attraktivität nach Innen angewiesen, da die lokale Bevölkerung den Hauptanteil der Konsumentinnen, Konsumenten, Nutzerinnen und Nutzern ausmacht. Um eine entsprechende Identifikation mit der Initiative zu gewährleisten, sollte der Raumausschnitt überschaubar dimensioniert werden, was auch die Ausarbeitung gemeinsam getragener Entwicklungsziele erleichtert. Als Abgrenzungskriterien können etwa die Erhebung der kollektiven Wahrnehmung des alltäglichen Wohnumfeldes oder die Erfüllung sozial-ökonomischer Funktionen des Raumausschnittes herangezogen werden. Das Gebiet sollte aber auch nicht zu klein gefasst werden, da dies den finanziellen Spielraum durch die geringe Mitgliederzahl einengen würde.

Ausgangspunkt einer Quartiersentwicklung ist die Ausarbeitung eines Entwicklungsleitbildes mit klar formulierten Zielen für den gemeinsamen Handlungsraum sein, wobei auf ein Gleichgewicht von kommunalen, wirtschaftlichen, sozialen und kulturellen Interessen geachtet werden sollte. Dazu scheint ein breites Beteiligungs- und Analyseverfahren sinnvoll, in dessen Rahmen die verschiedenen Interessen und

Bedürfnisse erhoben und in ein konsensuales Gesamtkonzept integriert werden können. Auf Basis dieses Leitbildes sowie der Einigung über einen Zeitrahmen – in Anlehnung an das BID-Modell etwa 3-5 Jahre – können schließlich ein Finanzplan erstellt und konkrete Umsetzungsmaßnahmen ausgearbeitet werden. Letztere könnten beispielsweise eine bedarfsorientierte Gestaltung des öffentlichen Raumes, die Stärkung des ansässigen Einzelhandels, integrationsfördernde Projekte, Veranstaltungsmanagement, Werbung, Baumaßnahmen, Plattformen zur Vernetzung einzelner Interessensgruppen (Familien, Seniorinnen, Senioren, Dienstleister etc.) umfassen.

6.2 Organisation der Zusammenarbeit

Da die Kooperation dreier Interessensgruppen im Vergleich zu bilateralen Abkommen einen größeren Koordinationsaufwand erfordert, ist zu überlegen, wie die organisatorischen Strukturen effizient gestaltet werden können und wer die Rolle einer zentralen Anlaufstelle einnimmt. Ferner muss abgewogen werden, in welchen Stadien des Projektes man welche Vertreterinenn und Vertreter sinnvoll einbinden kann. Während die Einigung auf konzeptioneller Ebene, also das Erarbeiten von Zukunfts- und Handlungskonzepten, eine möglichst breite Beteiligung der Interessensvertreterinnen und Interessensvertreter im Zuge eines Erhebungsverfahrens erfordert, kann für die Umsetzung von Einzelprojekten der gezielte Einsatz von ausgewählten Akteurinnen und Akteuren effizienter sein. So können dabei Instrumente zum Tragen kommen, die weniger Zeitaufwand benötigen.

Wesentliche Punkte stellen die ernstzunehmende Einbindung der bürgerschaftlichen Vertreterinnen und Vertreter sowie deren Bindung über den festgelegten Zeitraum dar. Bei einem Zeitraum von bis zu 5 Jahren ist dabei auch die Frage der Kontinuität der Beteiligten zu stellen, insbesondere der Bürgerinnen und Bürger, für die entsprechende Anreize zur (Selbst-)Bindung geschaffen werden müssen. In diesem Zusammenhang muss vor allem die Nachvollziehbarkeit der Ergebnisse sowie deren Umsetzung gewährleistet werden. Ebenso sollte das Risiko minimiert werden, dass nach hohem persönlichem Einsatz bürgerschaftliche Ideen nicht zum Tragen kommen. Um die Dominanz zahlender Gruppen zu verhindern, sollten das Engagement und die Mitsprache der Bürgerinnen und Bürger ideell und möglicherweise auch finanziell durch die öffentliche Hand unterstützt werden. Hier ist ein klares Bekenntnis des Staates zur Bereitstellung öffentlicher Leistungen gefragt. Denkbar ist ein Finanzierungszuschuss seitens der Kommune (des Staates), um einen Ansporn für die lokale Wirtschaft zu schaffen, eine Kooperation mit den Bürgerinnern und Bürgern einzugehen. Bestehende Strukturen und Kooperationen sind nicht durch diese neue Organisationsform zu ersetzen, vielmehr soll ein Rahmen gefunden werden, in welchem diese bestmöglich miteinbezogen und nutzbar gemacht werden können. Als Vertretung der Bürgerinnnen und Bürger bieten sich bestehende intermediäre Organisationen wie Lokale Agenda 21 Büros, Grätzelmanagements, Gebietsbetreuungen oder beispielsweise auch Einrichtungen der Caritas an. Um die tatsächliche Wahrung aller Interessen während des Projektzeitraums zu sichern, könnte eine gewählte Kontrollgruppe zu deren laufenden Überprüfung eingesetzt werden.

7 FAZIT

Über den Bedarf an alternativen Organisationsformen zur Realisierung kooperativer Ansätze in der Quartiersentwicklung scheint Einigkeit zu herrschen. Ebenso über die Notwenigkeit, neue Möglichkeiten zur (Ko-)Finanzierung derartiger Vorhaben zu erarbeiten, da sich die öffentliche Hand zunehmend nicht mehr in der Lage sieht, alleine für die Ausgaben aufzukommen. Das Organisationsgerüst des BID-Modells kann im Sinne der vorgeschlagenen Adaptierung einen potentiellen Lösungsansatz für diese Anforderungen darstellen.

Innovative Aspekte der skizzierten Kooperationsform sind, neben dem Versuch drei Stakeholdergruppen gleichermaßen einzubinden, auch die Idee der Selbstverpflichtung, sowie die Umsetzung auf Basis von Eigeninitiative und zu einem großen Teil auch Selbstfinanzierung. Diesen Neuerungen liegt ein grundlegender Wandel des Staatsverständnisses vom fordistischen Sozialstaat hin zu einer Mentalität des sich verantwortlich Fühlens, des aktiven Mitgestaltens der eigenen Lebenswelt zugrunde. Die Forderung nach wachsendem bürgerschaftlichem Engagement kann jedoch nicht ausschließlich an zivile Personen gerichtet sein. Vielmehr muss stärker auch an Unternehmen appelliert werden, den lokalen Standort im Sinne einer Corporate Social Responsibility zu fördern und gesellschaftliche Verantwortung zu übernehmen. Die kollektive Selbstverpflichtung auf Ebene der kooperativen Quartiersentwicklung könnte einen Beitrag zur

Stärkung des Gemeinsinns und der lokalen Identität leisten, was letztlich auch zu einer stärkeren Bindung an den Standort führt, von der Kommune, Wirtschaftstreibende sowie Anreiner gleichermaßen profitieren würden.

8 REFERENZEN

BARANEK, E. & H. WALK: Partizipation und Nachhaltigkeit. Zwei Seiten ein und derselben Medaille; In: Feindt, P.H. & J. Newig, Hrsg.: Partizipation, Öffentlichkeitsbeteiligung, Nachhaltigkeit; Marburg, S. 65-86, 2005.

BARNEKOV, T., R. BOYLE & D. RICH: Privatism and Urban Policy in Britain and the Unites States; Oxford, 1989.

BARR, H.: More like Disneyland: State Action, 41 U.S.C. § 1983, and Business Improvement Districts in New York; In: Columbia Human Rights Law Review 28, S. 393-430, 1997.

BBR (Bundesamt für Bauwesen und Raumordnung), Hrsg.: Effizientere Stadtentwicklung durch Kooperation? Abschlussbericht zum ExWoSt-Forschungsfeld „3stadt2 – Neue Kooperationsformen in der Stadtentwicklung"; (= Werkstatt: Praxis, Heft 36), 2005.

BOGASON, P.: Public Policy and Local Governance: Institutions in Postmodern Society. Cheltenham, 2000.

EINIG, K, G. GRABHER, O. IBERT & W. STRUBELT: Urban Governance; In: Bundesamt für Bauwesen und Raumordnung Hrsg.: Urban Governance. Informationen zur Raumentwicklung. Heft 9/10, S. I – IX, 2005.

ERFA Tagung für Stadtmarketing und Citymanagement 2006: „Stadt der Zukunft – Vision statt Illusion"; 21. - 22.März.2006, Salzburg.

FELDTKELLER, A.: Die zweckentfremdete Stadt. Wider der Zerstörung des öffentlichen Raums; Frankfurt u. New York, 1995.

FRIESECKE, F.: Revitalization of Urban Areas through Business Improvement Districts (BIDs)-Trends and Expectations for Shrinking Cities; 5th FIG Regional Conference March 8-11, Accra, Ghana, 2006

FROESSLER, R.: Tendenzen der Stadtentwicklung in Europa. Befunde, Beobachtungen und Thesen; In: DISP 133, S. S. 22 – 27, 1998.

GLASZE, G.: Privatisierung öffentlicher Räume? Einkaufszentren, Business Improvement Districts und geschlossene Wohnkomplexe.- In: Berichte zur deutschen Landeskunde 75, 2/3, S. 160-177, 2001.

HATZ, G.: Sozialräumliche Folgen der Stadtsanierung durch Public Private Partnerships. Das Modell der „sanften Stadterneuerung" in Wien; In: Geographischer Jahresbericht aus Österreich, 60, 61, S. 77-105. 2004.

HELBRECHT, I.: Stadtmarketing: Konturen einer kommunikativen Stadtentwicklungspolitik; Stadtforschung aktuell 44, 1994.

HOUSTON, L. O.: Business Improvement Districts; 2. Auflage, Washington D.C., 2003

HOYT, L.: Importing Ideas: The Transnational Transfer of Urban Revitalization Policy; In: International Journal of Public Administration 29, S. 221-243, 2006.

JAKUBOWSKI, P. & S. HOHN: Public-Private-Partnership in der Stadtentwicklung – Aufwand und Ertrag. Dargestellt am Beispiel erfolgreicher Planungsprozesse in Osnabrück; In: Bundesamt für Bauwesen und Raumordnung, Hrsg.: Bürgermitwirkung in Stadtentwicklungsprozessen; Informationen zur Raumentwicklung, Heft 1.2007, S. 49-56, 2007.

JAKUBOWSKI, P., M. PAULY: Neue Kooperationsformen in der Stadtentwicklung – eine Effizienzanalyse im Lichte der Transaktionskostentheorie; In: Bundesamt für Bauwesen und Raumordnung, Hrsg.: Urban Governance; Informationen zur Raumentwicklung, Heft 9/10, S. 619-626, 2005.

JEKEL. T.: Regionalmanagement und Regionalmarketing. Theoretische Grundlagen kommunikativer Regionalplanung; (= Schriftenreihe des Salzburger Instituts für Raumordnung und Wohnen, Bd. 18), 1998.

LOBENDANZ, I., I. HORNY, T. EBNER & J. A. COCA-STEFANIAK: Salzburg – eliminating free-riders through an effective city-centre management organisation; Studie der Manchester Metropolitan University, 2007.

MITCHELL, J.: Business Improvement Districts and Innovative Service Delivery; In: Pricewaterhouse Coopers, Hrsg., Grant Report 1999. Arlington, 1999.

MITCHELL, J.: Business improvement districts and the 'new' revitalization of downtown; In: Economic Development Quarterly 15, S. 115-123, 2001

RÖBER, M: Auf dem Wege von „New Public Management" zu „Good Urban and Regional Governance"?; In: Sinning, H., Hrsg.: Stadtmanagement. Strategien zur Modernisierung der Stadt(-Region); Dortmund,, S. 37-46, 2006.

SACK, D.: Gratwanderung zwischen Beteiligung und Finanzengpässen. Ein Überblick über die deutsche PPP-Entwicklung; In: Zeitschrift für öffentliche und gemeinwirtschaftliche Unternehmen, Heft 4/2003, S.353-370, 2003

SCHNEIDER-SLIWA, R.: Politisch-kulturelle und Planungstraditionen in den USA; In: Raumforschung und Raumordnung, 6, S.425-435, 1995.

SINNING, H.: Urban Governance und Stadtentwicklung. Zur Rolle des Bürgers als aktiver Mitgestalter und Koproduzent; In: vhw FW 1/Jan-Feb, S.87-90, 2006.

SYMES, M. & M. STEEL: Lessons from America. The role of Business Improvement Districts as an agent of Urban Regeneration; In: Town Planning Review 74/3, S. 301-313, 2003.

SELLE, K.: Stadtentwicklung und Bügerbeteiligung – Auf dem Weg zu einer kommunikativen Planungskultur? Alltägliche Probleme, neue Herausforderungen; In: Bundesamt für Bauwesen und Raumordnung, Hrsg.: Bürgermitwirkung in Stadtentwicklungsprozessen; Informationen zur Raumentwicklung, Heft 1.2007, S. 63-71, 2007.

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Peripherisierung des Zentrums: PPP-Projekte Wiens am Standort 'City'

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Um die post-industrielle Planungskultur in Europa zu verstehen, sollten wir einen kurzen Blick auf den rasanten Wandel der Industrie um die letzte Jahrhundertwende werfen. Der Wandel von der Fertigungsindustrie zur Finanzindustrie, die nicht mehr ortsgebunden ist, änderte die Organisationsform der Stadt und den Charakter der Stadt(bau)planung - auch in Wien.

1 TRANSFORMATION DER POST INDUSTRIELLEN STADT

Die Tertiärisierung des sekundären Sektors schreitet beschleunigt voran und die Zahl der Industriearbeitsplätze schrumpft. Die Anteile der Produktionsflächen und vor allem der Lagerflächen der Industrie sinken, dagegen nehmen Büros und büroähnliche Flächen für Forschung, Entwicklung, Verwaltung und Marketing zu.

Bekanntlich optimiert die europäische Industrie; sie verlagert, wandert ab, schließt und gliedert sich in KMU's aus. Die - durch das Stadtwachstum inzwischen in der Kernstadt liegenden - Industrieareale mit verhältnismäßig geringerer Bebauungsdichte fallen brach oder unterliegen einer Erneuerungsnotwendigkeit. Im Moment des rückgängigen oder nur noch kurzfristigen Bedarfes an Fertigungsflächen wurde die Industrie auf ihre Betriebsimmobilien aufmerksam.

Betriebsgründe, die alle Zonen eines Produktionsablaufs beherbergen, erübrigen sich schon lange. Durch kostengünstige Straßentransporte und Just-in-time Lieferungen können die Lagerflächen fast gänzlich reduziert oder auf preiswerte Standorte verlagert werden. Die Produktteile durchlaufen mehrere Stationen in den Produktionshallen verschiedener Unternehmer, Regionen und Länder bis sie zu einem Fertigprodukt zusammengeführt werden; nicht selten mit Verpflegungs- und Erlebnisgarantie für die Kunden in werbewirksamen Stararchitektenbauten wie der Gläsernen Fabrik Dresden, der VW-Autostadt Wolfsburg oder bei BMW Leipzig. Die klassische Industrie in Standortkrise sorgt wieder einmal durch ihre Bauten für Image und Werbeeffekt.

Das Fließbandmodell der fordistisch-tayloristischen Ära läuft in Richtung voll automatisierter Robotertechnik in menschenleeren Produktionshallen oder macht halt im von Hightech-Spezialisten bevölkerten Produktionsgeschoss von Waferfabriken.

Die kürzeren Produktionszyklen, die nur mehr ein paar Jahre beziehungsweise ein paar Monate betragen, stellen die klassische Rolle der Industriebetriebe als Bauherren, Investoren, Planer so wie Nutzer ihrer Bauten in Frage: Sie werden zu Developern und Projektabwicklern und nicht selten zu Projektsteuerern. Durch die Verwertung von Betriebsimmobilien und vor allem von Betriebsgründen brachten die Immobilientöchter manchen Industriekonzernen in den letzten Jahren sehr hohe Einnahmen, die sich mit den Einnahmen aus der Produktion leicht messen konnten.

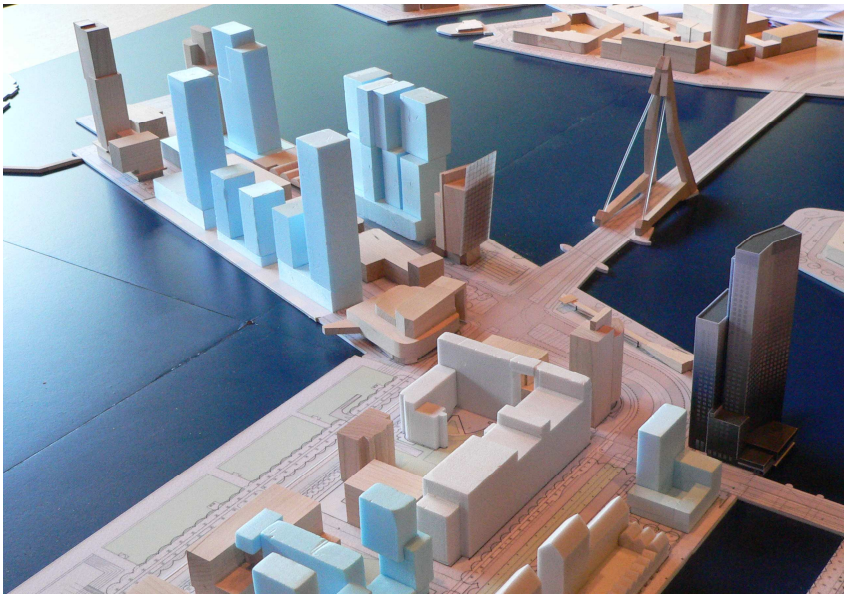
2 PUBLIC PRIVATEPARTNERSHIP-MODELLE NEO-MODERNER STADTPLANUNG

Um die Betriebsgelände optimal verwerten zu können, werden neue Bebauungsrechte bzw. Bebauungspläne gebraucht. Die ehemaligen Industrieareale bekommen neue Nutzungswidmungen und neue Bebauungspläne mit mehrfach höherer Bebauungsdichte. Die Bodenflächen werden stückweise an Investoren und Trägergesellschaften verkauft.

Die Absicherung der städtischen Versorgung, der Anschluss an das öffentliche Verkehrnetz sowie die Abtretung und Errichtung von Verkehrsflächen und Grünanlagen ist u.a. Voraussetzung für erfolgreiche Veräußerbarkeit der Flächen meist gemischter Baugebiete.

Hier kommt die Stadt mit ihren hoheitlichen Rechten ins Spiel. Der bekannte finanzielle und organisatorische Druck auf die Kommunen des post-industriellen Zeitalters, getarnt als EU-weite Städtekonkurrenz, ändert die Methoden der planenden Stadt. Die neuen Aufgaben der Stadt sind nun mehr Stadtmarketing oder Stadtmanagement.

Die ursprünglich US-amerikanischen Modelle der Public-Privat-Partnership wurden seit den 80er Jahren vermehrt auch in Europa umgesetzt: Einer der Partner, der 'Public Sector' hat die Macht der Planungshoheit und der Baurechtschaffung, der andere 'Privat Sector' Geld und Grund. Eines der ersten Beispiele ist Kop van Zuid in Rotterdam auf den ehem. Docklandschaften.



Q: City of Rotterdam + Aeroview

Die Stadtplanung wurde zum Stadtmanagement, die Behörde zur Projektkoordinatorin, die gesamte Stadt zum Standort, in dem nun mehr koordiniert, vermarktet, Werbung gemacht, Investoren angelockt und vor allem Strategien festgelegt werden sollen.

Time-to-market des Produktes 'City Projekt' wird zunehmend wichtiger, weil die Konjunkturschwankungen am Immobilienmarkt kurzfristiger werden. Die Planungsmethoden der Developer agieren nach subjektiven Kriterien. In Städten wie München wurden ab dem Ende der 80er Jahre, Jahre nach London massenhaft Büroflächen gebaut. Heute wird eine hohe Leerstandsrate am Büromarkt berichtet, die von der Not am vernachlässigten Wohnungsmarkt begleitet wird.

Ähnliches geschieht in den letzten Jahren in Wien mit den innerstädtischen Malls, deren Flächen sich fast bei jedem City-Projekt sprunghaft vermehrten: Heute sollen die Einkaufsflächen in Wien pro Kopf gerechnet eine der höchsten in Europa ausmachen. Das zweitgrößte Einkaufsgebiet Europas - Shopping City Süd - gleich hinter der Wiener Stadtgrenze, machte die Umlandgemeinde Vösendorf um einiges reicher. Um der Flächenkonkurrenz entgegen zu wirken, wurden in den letzten Jahren immer mehr Wiener Einkaufzentren bewilligt: Millennium City, Gasometer City, Shopping City Nord usw.

Nicht nur die Namensgebung auch die Architektur der neuen Developer-Projekte, die an die Nachkriegszeitmoderne erinnert, reflektiert die US-amerikanischen Einflüsse; ebenso die feierlich beleuchteten Glasfassaden der Turmbauten über introvertierten Malls, die sich mit ihren eigenen privat-public spaces zum Straßenraum verschließen; eine Art zu planen, die sich in den US-Städten langfristig als nicht markttauglich erwiesen hat; an Hand der Versuche zu Paradigmenwechsel in Sachen Projektentwicklung, in Richtung Schaffung der Nutzungsmischung, Verdichtung und öffentlichen Verkehrnetze.

New Urbanism and Smart Growth Bewegungen sowie die Projektentwickler der Investoren in den US-Städten tendieren in den neuen Projekten deutlich zu kleineren Geschäftseinheiten und sonstigen Funktionen in engen Verschränkungen mit den Aussenräumen. Während dort die mittelmeerähnlichen Außenräume, Straßen und Ortseinheiten in übersichtlichen kleinen Strukturen immer mehr zu einer Planunsstrategie werden, wachsen paradoxer Weise in Europa zunehmend Stadtteile mit großen Bausteinen wie gläsernen Officetürmen und Wohnbaukisten heran, die kaum einen Außenraumbezug besitzen und unterdessen von Garagen Ein- und Ausfahrten umgeben sind.

Die Projektabwicklung und Entscheidungsfindung für die jüngsten Stadtteilprojekte läuft in Developer-Manier: Der Erfolgsfaktor der Projektentwicklung, der 'Ertrag', wird über die erzielbaren Einnahmen der maximal vermietbaren Flächen und Volumen berechnet, die auch den Verkaufspreis bestimmen.

Auf der anderen Straßenseite kommen die kleinen Nahversorger-Geschäfte immer mehr unter Druck und überleben die Konkurrenz der naheliegenden Malls nicht mehr. In der Folge stehen die Erdgeschossräume ganzer Straßenzüge leer, was dem Viertel sowie ganzen Stadtteilen Image- und Immobilienwert kostet. Die Stadt ist grundsätzlich auf der Straßenebene wahrnehmbar, nicht auf den oberen Etagen der neo-modernen Bürotürme, der Headquarters, die weit sehen und noch mehr gesehen werden wollen. Die Stadt wird zum Standort, der sich gegenüber den Auswahlkriterien des transnational beweglichen Unternehmertums behaupten soll.

Unerwartet kommen wissenschaftliche Forschung und Marktforschung zu ähnlichen Resultaten: die Standortfaktoren, die so wichtig für die Standortauswahl der Welt-Konzerne sind, sind nicht so hart und eindeutig wie gedacht: die Konzentration des Kapitals und der Unternehmer macht zwar die Städte als Marktplatz attraktiv, jedoch überlappen sich die Kriterien für Wirtschaftsstandort-Stadt und nachhaltige Stadt eindeutig: Lebens-, Freizeit-, Bildungsqualität, kulturelle und soziale Vielfalt sowie Intensität der städtischen Versorgung und Transparenz der öffentlichen Prozesse gehören heutzutage sowohl zu den privat-wirtschaftlichen Auswahlkriterien als auch zu sozial-städtischen Entwicklungsstrategien. Sieht die Umsetzungsrealität aber nicht anders aus?

3 DEVELOPER-STADT AM POST-INDUSTRIELLEN MARKT

Nicht nur die Industrie wurde zum Projektentwickler und nutzt die Methoden des Immobilienmarktes, in dem sie Pläne erstellt, parzelliert und auf ihren Betriebsgeländen Infrastruktur errichtet, um sie nach einer erfolgreichen Abwicklung aufgewertet zu veräußern. Wie schon erwähnt, übernahm seit den 80er bzw. 90er Jahren auch die öffentliche Hand in Europa die unternehmerischen Handlungsmodelle mit dem gängigen Jargon.

Die Kommunen lagern Bereiche aus, privatisieren, verhandeln, suchen Investoren, machen Verkaufswerbung, kümmern sich um die Zielgruppen. Sie übergeben ihre Aufgaben an Private, agieren als Projektsteuerer – in erster Linie, um ihre eigenen komplexen Abläufe zu koordinieren und das Produkt City zeitgerecht zum Markt zu bringen. Sie setzen Strategien ein, um am Städtemarkt erfolgreich zu sein.

Die Stadt Wien ist eine der EU-Städte, die in den letzten Perioden auch mit strategischen Plänen anstatt mit herkömmlichen Stadtplänen agierte. Neben den allgemeinen Überbegriffen und Zielen der nachhaltigen Stadt wie Lebensqualität, Nutzungsmischung, Kurze Wege und Vielfalt umfasst der letzte Wiener Stadtentwicklungsplan wieder eine Reihe strategischer Projekte, die Konzentrations- und Handlungsgebiete der Stadtentwicklung sein sollen. Dazu gehören die Projekte für Brach- oder Verwertungsflächen der Industrie sowie Bahnhofflächen und Kasernen, die zum Teil durch Stadtwachstum vom Stadtrand ins Zentrum gerückt sind. Der wunderbare Augenblick einer neuen Möglichkeit, die Stadt in der Stadt zu erweitern und nicht nur an der Peripherie, wird von den Ergebnissen überschattet. In diesem Zusammenhang drückte Walter Siebel bei einem Expertentreffen in Wien die Sorge aus, dass die neuen Public Private Partnership-Projekte, die "(...)Sonderbedingungen, Sonderorganisation, Ausgliederung aus der normalen Verwaltung" voraussetzen, die Gefahr bergen, sich als spektakuläre Projekte zu verselbständigen und ihre Umwelt und Nachbarschaftseffekte nicht zu berücksichtigen.

Auch in Wien kam, nach der Phase der punktuellen Implementierung von Bauprojekten, die Zeit der innerstädtischen Stadtentwicklung auf den brachgefallenen oder mindergenutzten Arealen von Großunternehmen aber auch auf den 'Nicht-Grundstücken' über den Autobahnen, Schnellstrassen, auf den Bahnflächen und Trassen der historischen Stadtbahnbögen sowie in den historischen Grünanlagen. Im Zuge der Dezentralisierung und des Stadtteilzentren-Diskurses wuchs beispielweise die Donau City am Ufer der Donau auf einer Betonüberbrückungsplatte. Das Wachstum der Vienna DC, der immer höher und dichter gewordenen, großteiligen Siedlung, wurde durch das Investitionsinteresse der Immobilienfonds getragen, ebenso der restliche Wiener Hochhausboom der letzten Jahre. Entwickelt und auch zum Teil errichtet und auf jeden Fall gut verwertet werden die Plattenprojekte von der Wiener Entwicklungsgesellschaft für den Donauraum (WED), einem Konsortium der Banken und Versicherungen. Das neue Bauensemble sollte ein zweites Zentrum neben der Weltkulturerbe Wiener City sein, zeigt jedoch eher den Stadtrandcharakter von

Industriestädten, geprägt von 'unterirdischen' Schnellstrassen. Die Office-Bauten mit Ausblick wurden im Stück verkauft, obwohl die klassischen Büroflächenstandorte Wiens eine beachtliche Leerstandsrate aufweisen.

Donau City auf der Donau Platte samt neu geplanten Hochhäusern von D. Perrault. Q: MA 21 der Stadt Wien

Wienerberg City im Süden Wiens, besteht aus u.a. Bürozwillingstürmen von M. Fuksas, zwei Wohntürmen von Coop Himmelb(l)au, einer von Delugan_Meissl sowie einer von A. Wimmer, drei Riegel von Coop Himmelb(l)au und dem Atelier 4, einer Schule und einem Riegel von C. Brullmann.(Eigenes Foto)

Die Bebauungsprojekte der letzten Jahre wie Wienerberg City samt Twin Towers und Businesspark auf dem ehemaligen Betriebsareal der Ziegelwerke Wienerberger und Monte Laa auf den ehemaligen Lagerflächen der Porr werden durch weitere Projekte des PPP-Modells, wie dem Zentralbahnhof auf dem Areal des Südbahnhofs oder Siemens City auf dem Siemens-Areal fortgesetzt.

In Anbetracht der architektonischen Erscheinungsbilder und von Tag zu Tag sich ändernder Skylines bleibt ein Déjà vu-Effekt erhalten; ist es eine Rückkehr des Stils des Städtebaus der Nachkriegszeit-Moderne? Hat sich seitdem nichts geändert?

Die ursprünglichen Flächenwidmungs- und Bebauungspläne verloren ihre Bedeutung. Die Planungsprozesse der neuen Entwicklungsgebiete werden als moving targets 'flexibel' gestaltet. Aber wer kontrolliert den Stadtwerdungsprozess, da wir von den Wiener City-Projekten sprechen? Entstehen wirklich neue urbane Stadtteile, die dem Namen CITY gerecht werden, die Standortqualitäten mit lebendigen Verschränkungen der Kernstadtgebiete samt öffentlichen Räumen produzieren? Oder entwickeln sich Stadtrandsiedlungen mitten in der Stadt? Verbergen sich in dieser Art der PPP-Modelle alias Investoren-/Developerprojekte die ehemaligen Fehler der Planungspolitik der US-Städte, mit dem uferlosen Sprawl, entfunktionalisierten

Stadtzentren und hoher Segregation, deren Zentren ihre Lebensqualität, ihr Image und in der Folge ihre Bewohner an die Peripherie verloren haben?

Um die postindustriellen Städte in ihren Transformationsprozessen vor den negativen Folgen der kurzfristigen – gewinn-orientierten - Marktinteressen zu schützen, sollten die Stadtverwaltungen Planungsinstrumente zum Schutz der öffentlichen Interessen schaffen. So könnten bei den laufenden PPP-Projekten nicht nur unterschiedliche Nutzergruppen sondern auch die lokale Wirtschaft geschützt werden.

Die Anpassung der Planungsentscheidungen an den Privat-Partner, in der Folge das Sprengen des städtischen Maßstabs und die extreme Verdichtung zu Gunsten der Spekulation kann die Städte bzw. Stadtteile in ihrer Lebensqualität wieder einmal so gefährden, dass nicht zuletzt auch Investoreninteressen davon betroffen werden, weil die Stabilität des Marktwerts von Immobilien mit den Standortqualitäten eng verknüpft ist.

4 REFERENZEN

Kühn, Beate: Die Bedeutung der Architektur für die Identität eines Unternehmens; Risiko Industriebau; Springer Wien New York, 2003

ULMANN, MICHAEL: Chance Industriebau- Von Bilanzkosmetikern und Schnäppchenjägern; in Risiko industriebau; Springer Wien New York, 2003

Ghahremani, Amir: Flexible Immobilienbewirtschaftung; in Industrie ohne Bau? Produktionsmittel im Kopf? Neue Anforderungen an die Industrieimmobilie, Industriebau Praxisreport 2000; Österreichische Studiengemeinschaft für Industriebau Wien, 2000

FUNKE, URSULA: Stadtkonzeption, Stadtmarketing und Citymanagement; in Stadtentwicklung mit Stadtmanagement, 2005; S. 145 ff; VS Verlag für Sozialwissenschaften Wiesbaden

Rosemann, Jürgen: Leitbild oder Strategie? Zur Diskussion der städtebaulichen Planung in den Niederlanden; in Ohne Leitbild? Städtebau in Deutschland und in Europa, 1999, S. 349 ff; Karl Krämer Verlag Stuttgart + Zürich.

BRETSCHNEIDER, BETÜL: Remix City – Nutzungsmischung: Ein Diskurs zu neuer Urbanität; S.139 ff; Peter Lang Verlag; Frankfurt am Main, 2007

GOSLING, DAVID: The Evolution of American Urban Design; S.189 ff; Willey-Academy, West Sussex, 2003

HESSE, MARKUS: Konzepte und Beispiele städtebaulicher Funktionsmischung in den USA; in Planung städtebaulicher Nutzungsmischung in Stadterweiterungs- und Stadtumbauvorhaben in Europa; Werkstatt Praxis; 2/99; Bundes Ministerium für Bauwesen, Bonn 1999

www. newurbanism.com; www.ceunet.de/regionalcity.htm (Council of European Urbanism)

[1]Schwanke, Dean et al.: 'Mixed-use Development Handbook', Second Edition, ULI- Urban Land Institute, Washington D.C., 2003

SELLE, KLAUS: Öffentliche Räume in der europäischen Stadt – Verfall und Ende oder Wandel und Belebung? Reden und Gegenreden; in Die europäische Stadt; S.131 ff; edition Suhrkamp, 2004, Frankfurt am Main

BREUER, MÜLLER; WIEGAND: Nutzungsmischung im Städtebau; Enbericht2/2000; BBR (Hg.); S.53-58; Bonn

NIEHAUS; PETER: Stadtentwicklung und Industrie; in Industriebau ohne Bau? Produktionsmittel im Kopf? Neue Anforderungen an die Industrieimmobilie, Industriebau Praxisreport 2000; Österreichische Studiengemeinschaft für Industriebau Wien, 2000

HOFFMANN-AXTHELM DIETER: Die dritte Stadt; S.162-163; edition Suhrkamp,; Frankfurt am Main, 1993

PIRHOFER, GOTTFRIED: Strategische Planung in europäischen Städten; in 'Verständigungsversuche zu Wandel der Stadtplanung'; S.109 ff; Springer Wien New York, 2005

Siebel, Walter: Konstanz und Transformation von Planungsfunktionen; in 'Verständigungsversuche zu Wandel der Stadtplanung'; S.109 ff; Springer Wien New York, 2005

SeiSS, Reinhard: Wer baut Wien? Hintergründe und Motive der Stadtentwicklung Wiens seit 1989; S.17 ff; Verlag Anton Pustet, 2007 und in www.wienerzeitung.at/extra (3/8/2005)

🏆 *reviewed paper*

Augmented Reality (AR) für die Architekturvisualisierung mit DART 2.0 und 3D Studio MAX 7

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1 WELCHE POTENTIALE BIETET AUGMENTED REALITY (AR) FÜR DIE ARCHITEKTURVISUALISIERUNG?

Während die Echtzeit-Architektursimulation heute noch weitgehend in den Kinderschuhen steckt, gibt es bereits eine breite Palette von professionellen industriellen AR-Systemen. Die Automobilindustrie plant und entwickelt ihre Prototypen heute ausschließlich in AR-Umgebungen (Mixed-Mock-Ups). Verkleinerte AR-Visualisierungen unterstützen schon die Planung von Fabriken und Fertigungsanlagen. Echtzeit-Visualisierungen helfen bei Montagesequenzen, Wartung und Service.

Sind diese Techniken und Anwendungsbereiche in die Architekturvisualisierung übertragbar? Sicherlich nur bedingt. Interessant erscheint hier allerdings die Frage der Anwendbarkeit von AR-Systemen in folgenden drei Bereichen:

Wie funktionieren Mixed-Mock-Ups für Bauherren und Behörden? Können Montagesequenzen im Hochbau unterstützt werden? Wie sinnvoll ist der Einsatz von AR in Gebäudewartung und Facility Management?

Dieser Beitrag untersucht diese Fragen anhand der Software 'Designers Augmented Reality Toolkit' (DART 2.0) und 3D Studio MAX 7 und gibt einen kurzen Überblick über Funktionsweise und Aufbau anderer, aktueller AR-Systeme.

2 WAS IST 'AUGMENTED REALITY'?

Die “erweitere Realität” (engl. Augmented Reality) ist eine relativ neue Form der Mensch-Maschine-Interaktion (MMI). Mit Augmented Reality bezeichnet man im Allgemeinen die Echtzeit-Überlagerung menschlicher Sinneswahrnehmungen mit Computermodellen [1], [2]. Ein AR-System kann demensprechend visuelle, akustische und haptische Information in Echtzeit überlagern und wiedergeben. Azuma beschreibt folgende drei charakteristische Merkmale eines AR-Systems [3]:

- Kombination von realer und virtueller Welt
- Interaktivität und Echtzeitfähigkeit
- Registrierung in drei Dimensionen

Während die 'Virtual Reality' (VR) lediglich die Realität nachbildet, beabsichtigt die 'Augmented Reality' (AR) die vollständige Integration von virtueller und realer Welt.

3 KOMPONENTEN, VERFAHREN UND TRACKINGSYSTEME

Aufgabe eines AR-Systems ist es, die reale Umgebung mit computergenerierter Information zu ergänzen und die Wahrnehmung des Menschen zu erweitern [4].

Ein AR-System besitzt fünf wesentliche Hardwarekomponenten: (A) die Rechnereinheit mit Mischer und Renderer, (B) das Anzeigesystem mit Bildschirm oder Head-Mounted-Display (HMD) [5], (C) das Trackingsystem, (D) die Aufnahmesensorik (Kamera) und (E) weitere Eingabegeräte (3D-Maus, Tastatur etc.).

Zur Zeit gibt es vier unterschiedliche Visualisierungsverfahren. Sie unterscheiden sich durch ihre jeweilige Hardwarekombination:

- Video See Through (VST)
- Optical See Through (OST)
- Projective AR (PAR)
- Monitor AR (MAR)

Je nach der Lage von Betrachter und Objekt unterscheidet man immersive und nicht immersive Darstellungsmethoden. Monitorbasierte Systeme eignen sich zum Beispiel weniger, HMD´s hingegen besser für die immersive Darstellung.

Systeme zur Positionserfassung von Betrachter und Objekt (Trackingsysteme) können nach ihrem physikalischen Wirkungsprinzip unterschieden werden. Es gibt mechanische, optische, akustische, elektromagnetische oder inertiale Trackingsysteme. Je nach der Lage von Aufnahmesensorik und Referenzobjekt unterscheidet man Outside-In, Inside-Out und Inside-In-Systeme [6].

4 SOFTWAREPAKETE UND ANWENDUNGSBEREICHE

Mehr als dreizehn verschiedene Softwarepakete befinden sich heute in der Entwicklung (z.B.: AMIRE, APRIL, ARTHUR, ARToolKit, CATOMIRE, DART, D´Fusion, DWARF, I4D, jARToolKit, Phidget Toolkit, Unifeye SDK oder Tinmith). Einige davon stehen als Freeware zur Verfügung. Zum heutigen Entwicklungsstand müssen allerdings viele dieser Anwendungen oft erst mühsam selbst kompiliert werden oder setzen gute Programmierkenntnisse voraus (C oder C++). Das zur Zeit am weitesten verbreitete Programm ist ARToolkit. Es unterstützt allerdings nur markerbasierte Trackingsysteme und benötigt in der Regel sehr anspruchsvolle Kameratechnik. Der Schwerpunkt von AMIRE und CATOMIRE liegt bei grafischen Authoring-Tools [7], APRIL bietet eine recht entwicklungsfähige XML-basierte Umgebung, die auf der Anwendung 'Studierstube' beruht [8]. DART funktioniert als PlugIn zur Standardsoftware Macromedia Director, bietet viele Werkzeuge und kann ohne großen Aufwand relativ schnell installiert werden [9] [10]. Wegen der einfachen Handhabung und der guten Integration in Standardsoftware soll im Folgenden dieses Softwarepaket näher betrachtet werden.

Für den Hochbau gibt es heute drei hauptsächliche Anwendungsbereiche: (1) die Simulation für Möblierungsplanung und Innenraumgestaltung, (2) die verkleinerte Gebäudesimulation für Objektplanung und Städtebau und (3) die Rekonstruktion von historischen Gebäuden.

ARTHUR ist zum Beispiel ein interaktives Planungstool für die Architektursimulation. Mit ihm können virtuelle Gebäude im Modell betrachtet und bearbeitet werden. Unifeye SDK bietet Möglichkeiten für die Möblierungsplanung und die Innenraumgestaltung. Verbreitet sind auch Rekonstruktionen von historischen Gebäuden möglich.

Alle heutigen AR-Systeme für die Architekturvisualisierung arbeiten vorwiegend nicht-immersiv. Vor-Ort und Echtzeitvisualisierungen sind selten. Häufig findet man zeit- oder ortsversetzte, monitorbasierte Systeme. Die Architekturvisualisierung steht dabei vor zwei hauptsächlichen Problemen: (A) Die Echtzeitverarbeitung von enormen Datenmengen durch die Größe und den hohen Detaillierungsgrad von Gebäuden und (B) den Einsatz von geeigneten Trackingsystemen für die immersive Darstellung. Bisher werden die Gebäude oft nur verkleinert dargestellt oder besitzen einen relativ geringen Detaillierungsgrad.

Die oben genannten Anwendungsbereiche können nach den drei Phasen der Produktentwicklung gegliedert werden:

- Produktentwicklung (Gebäudeentwurf- und -planung)
- Produktion (Bauausführung und Qualitätsmanagement)
- Wartung und Service (Facility Management)

Interessant scheint an dieser Stelle ein Blick auf vergleichbare aktuelle AR-Anwendungen in anderen Branchen.

4.1 Mixed-Mock-Ups in der Produktentwicklung

Mixed-Mock-Ups sind visuelle Überlagerungen von realen Prototypen und virtuellen Simulationsdaten. Dabei unterscheidet man Modelle in realer Größe und Modelle im verkleinerten Maßstab [11], [12]. Im Fahrzeug- oder Flugzeugbau können damit zum Beispiel Teile einer Instrumententafel oder unterschiedliche Cockpitvarianten lagegerecht in einem realen Fahrzeugmodell dargestellt werden [13]. Diese Methode spart Kosten bei der Modellierung realer Prototypen und ermöglicht die einfache Einbindung des Endanwenders beziehungsweise des Kunden in den Gestaltungsprozeß.

4.2 Kontrolle von Montagesequenzen

BOEING verwendet AR bereits bei der Montage von Kabelbäumen [14]. Das System AREAS (Augmented Reality for Evaluating Assembly Sequences) ermöglicht die Aufzeichnung von Montagesequenzen zur Analyse einer geplanten Montagefolge. Interessant erscheint auch die Ausführung von Bohrlöchern an Flugzeugbauteilen [15] und die Unterstützung der Montage eines Türschlosses oder von Getriebeteilen in der Automobilindustrie [16], [17].

4.3 AR in Qualitätssicherung, Wartung und Service

AR-Systeme ermöglichen hier zum Beispiel die Überprüfung von Längenmaßen von Bauteilen [18]. Vorteile liegen dabei in der Reduktion von möglichen Messfehlern und in der Zeiteinsparung beim Prüfvorgang. Eine wichtige zukünftige Herausforderung ist dabei die lückenlose Integration der AR-Umgebung in das CAD-System des Unternehmens. Mit dem System KARMA (Knowledge-based Augmented Reality for Maintenance Assistance) beschreibt Feiner ein AR-gestütztes Wartungssystem für Laserdrucker [19]. Wartungssysteme für Kernkraftanlagen (STARS) [20] und für komplexe Produkte (STARMATE) [21] befinden sich heute in der Entwicklung. HARINGER & REGENBRECHT [22] integrieren Standardsoftware (Power Point mit dem Tool PowerSpace) in AR-basierte Wartungsanleitungen. Der Vorteil liegt hier im Ersatz für umfangreiche Checklisten und Manuals in Papierform.

5 POTENTIALE FÜR DIE ARCHITEKTURVISUALISIERUNG

Gute Perspektiven gibt es für AR-Systeme in Gebäudeplanung und -entwurf; zum Beispiel bei Mixed-Mock-Ups (Indoor / Outdoor) oder bei CAD/AR-Arbeitsplätzen. Es gibt sogar schon prototypische Entwicklungen zur Kontrolle von Montagesequenzen im Fertigteilbau. Sehr sinnvoll und technisch realisierbar erscheinen derzeit die Unterstützung von Facility Management, Gebäudeservice und -wartung.

5.1 Wirtschaftlichkeit, Mobilität und Integrationsfähigkeit

Welche Anforderungen hat ein solches AR-Sytem nun zu erfüllen? Es gibt dabei methodische und technische Anforderungen.

Methodisches Ziel der Verwendung eines operablen AR-Systems ist eine möglichst wirtschaftliche und durchgängige Unterstützung in allen Planungsphasen (Entwurf, Planung, Ausführung, Wartung und Service). Innerhalb dieser Planungsphasen gibt es immer unterschiedliche Partner: In der Entwurfs- und Genehmigungsplanung sind es vorwiegend der Bauherr, die Behörden und die Fachingenieure. In der Ausführungsplanung sind es die Fachingenieure und die ausführenden Firmen. Im Facility Management sind es wiederum der Bauherr beziehungsweise die Eigentümer, das Servicepersonal und andere beteiligte Firmen. Höchstwahrscheinlich arbeiten alle diese Partner mit unterschiedlicher Hardware und Software. Ein methodisch erfolgreiches AR-System sollte daher zu möglichst vielen Konfigurationen kompatibel sein, Standardsoftware oder zumindest Standardschnittstellen nutzen.

Technisch sind vor allem drei Dinge vorauszusetzen:

- Flexible, modulare und vor allem mobile Hardware
- gutes Laufzeitverhalten und gute Systemperformance
- gute technische Integration in andere Planungswerkzeuge

Die Mobilität und Flexibilität des Systems ist wichtig bei Indoor/Outdoor Mixed-Mock-Ups für Bauherren, Behörden und beim Facility Management. Die Attraktivität der Visualisierung steigt mit einer guten Rechnerperformance und einer guten Integrationsmöglichkeit in andere Planungswerkzeuge.

5.2 Architekturvisualisierung mit DART und 3D-Studio MAX

Bei der Konzeption und dem folgenden Systementwurf zu einem AR-System wären im Optimum alle oben genannten methodischen und technischen Anforderungen zu erfüllen.

Aus Gründen der Wirtschaftlichkeit entschied ich mich für das derzeit kostengünstigste Visualisierungsverfahren, die Monitor-AR (MAR) für eine nicht immersive Darstellung mit einem einfachen markerbasierten optischen Trackingsystem (Inside-Out).

Vorgesehender Anwendungsbereich: Unterstützung der Entwurfs- und Genehmigungsplanung mit einer AR-Visualisierung im verkleinerten Maßstab - Nutzerorientierung für Bauherren, Behörden und Fachingenieure.

Hardware

Rechnereinheit:	Fujitsu Siemens Computers GmbH. AMILO M 7425 1,40 GHz Intel Pentium M (Centrino) Prozessor 512 MB RAM ATI Mobility RADEON 9600/9700 Series
Anzeigesystem:	Integrierter 15” Bildschirm (1024/768 Pixel)
Trackingsystem:	markerbasiertes, optisches Trackingsystem (Inside-Out)
Kamera:	Creative Labs Webcam Notebook (RGB 24 bit, 320 / 240 Pixel bei 30 fps)
Eingabegeräte:	Targus USB Mouse

Betriebssystem und Systemsoftware

Betriebssystem:	Microsoft Wondows XP Home Edition Version 2002 SP 2
Visualisierung:	Macromedia Director MX 2004 mit DART 2.0
Modellierung:	3D Studio MAX R7

6 AUSBLICKE UND WEITERER FORSCHUNGSBEDARF

Auffallend gut war das Zusammenspiel mit anderer Standardsoftware. Datenaustausch und Datenübergabe gestalteten sich sehr einfach und rationell. Zum Beispiel konnten 3D-Modelle problemlos aus 3D-Studio MAX exportiert und in DART integriert werden.

Sehr gut gestalteten sich auch Latenzzeit und Systemperformance im Zusammenhang mit allen Hardwarekomponenten, genauso wie die Wirtschaftlichkeit. Die Materialkosten des AR-Systems betrugen in der Summe weniger als € 1.000,-. Die verwendete Software besteht aus Freeware, vorhandenen Trial- oder Lehrversionen. Die Arbeitszeit wurde nicht berechnet.

Wenig zufriedenstellend ist das markerbasierte optische Trackingsystem (Inside-Out). Während es für AR-Visualisierungen im verkleinerten Maßstab gerade noch ausreichend ist, wäre es für immersive Visualisierungen oder für Outdoor-Visualisierungen ungeeignet.

Zu empfindlich ist auch die Reaktion des Systems auf Wechsel von Helligkeit und Konstrast. Bereits kleine Änderungen im Kamerabild führten zu Fehlern im Tracking. Auch bei Vergrößerung des Abstandes Rechner – Objekt über 50 cm versagte das optische Tracking. Zu überlegen wäre, ob ein Wechsel zu einer hochauflösenden Kamera mit mindestens 640 / 480 Pixel bei 30 fps und RGB 24 bit hier Verbesserungen bringen würde. Mehr Erfolg verspricht ein Ersatz der Kamera durch ein HMD oder die Ergänzung des mangelhaften Trackingsystems durch ein besseres optisches oder kombiniertes inertiales Trackingsystem.

Dadurch könnte der Einsatzbereich des vorhandenen Systems von nicht immersiven auf immersive Darstellungen (Indoor und Outdoor) erweitert und ergänzt werden.

Attraktiv ist dieses System wegen seiner Einfachheit, Wirtschaftlichkeit und der guten Integrationsfähigkeit in vorhandene Planungswerkzeuge – auch und insbesondere für kleine und mittlere Unternehmensgrößen.

Gespannt warten darf man auf den ersten praktischen Einsatz dieses Systems.

7 LITERATURVERZEICHNIS

[1] MILGRAM, P., COLQUHOUM, H.: A Taxonomy of Real and Virtual World Display Integration, in: OHTA, Y., TAMURA, H. (Hrsg.): Mixed Reality – Merging Real and Virtual Worlds, Springer, Berlin 1999, S.

[2] TANG, A., OWEN, C., BIOCCA, F.,MOU, W.: Experimental Evaluation of Augmented Reality, in: Object Assembly Task, in: IEEE and ACM International Symposium: Proceedings of ISMAP 2002, IEEE Press, Germany / New York 2002

[3] AZUMA, R.:A Survey of Augmented Reality, Teleoperators and Virtual Environments, Hughes Research Laboratories, Malibu 1997

[4] FRIEDRICH, W., WOHLGEMUTH, W.: Das Leitprojekt ARVIKA, in: FRIEDRICH, W.: ARVIKA – Augmented Reality f. Entw., Prod. u. Service Publicis Corporate Publishing, Erlangen 2004, S. 13

[5] SUTHERLAND, I.: A Head-Mounted Three Dimensional Display, in: Fall Joint Computer Conference: Proceedings, 1968, S. 757 – 764

[6] FERRIN, F.: Survey of Helmet Tracking Technologies, in: Proceedings of SPIE, Vol. 1456: Large-Screen Projection, Avionic and HMD´s, SPIE, New York 1991, S. 86 – 94

[7] ABAWI, Daniel F.; DÖRNER, Ralf; HALLER, Michael; ZAUNER, Jürgen: Efficient Mixed, Reality Application Development, in: 1st European Conference on Visual Media Production, London, March 15 2004

[8] LEDERMANN, Florian; SCHMALSTIEG, Dieter: APRIL: A High-level Framework for Creating, Augmented Reality Presentations, in: IEEE Virtual Reality 2006, March 12-16, IEEE, Bonn /Germany 2005

[9] MACINTYRE, Blair; GANDY, Meribeth; BOLTER, Jay; DOW, Steven; HANNIGAN, Bren: DART: The Designer's Augmented Reality Toolkit, in: Proceedings of the 2nd IEEE and ACM International: Symposium on Mixed and Augmented Reality GVU Center, Georgia Institute of Technology, ISMAR '03 / IEEE 2003

[10]MACINTYRE, Blair; GANDY Meribeth; DOW, Steven; BOLTER Jay David: DART: A Toolkit for Rapid Design Explorationof Augmented Reality Experience, in: UIST 04, October 24 –27, 2004: Santa Fe, New Mexico / USA, GVU Center,Georgia Institute of Technology, ACM 2004

[11] POUPYREV, I., TAN, D., BILLINGHURST, M., KATO, H., REGENBRECHT, H.: Tiles – A Mixed Reality Authoring Interface, in: INTERACT 2001, Yokohama: Proceedings, IEEE Press, New York 2001

[12] PERSIANI, F., LIVERANI, A., DE CRESCENZIO, F.: Augmented Reality Approach to Vehicle Prototyping, IIEC, Amman, Jordan 2001

[13] LEWIN, M.; BOWDEN, R.; SARHADI, M.:Automotive Prototyping using Augmented Reality in: Proceedings of the 7th UK VR-SIG Conference, Glasgow 2000, S. 11 – 20

[14] CAUDELL, T., MIZELL, D.: Augmented Reality - An Application of Heads-Up Display, Technology in: Hawaii International Conference on Systems Science: Proceedings, IEEE Press, Kauii, Hawaii 1992, S. 659 – 669

[15] NEUMANN, U., CHO, Y.: A self-tracking augmented reality system in: ACM Symposium on, Virtual Reality and Applications: Proceedings, IEEE Press, New York 1996, S. 109 – 115

[16] REINERS, D., STRICKER, S., KLINKER, G., MÜLLER, S.: Augmented Reality for Construction, Tasks: Doorlock Assembly in: BEHRINGER, R., KLINKER, G., MIZELL, D.: Augmented Reality Placing Artificial Objects, A. K. Peters, Natick, MA 1999, S. 47 – 60

[17] EVERSHEIM, W., WECK, M., JAHN, D., KOSCHIG, M., FRICKER, I.:Augmented Reality, Technologie unterstützt manuelle Montage, in: VDI-Z 143 (2001) 9, 2001

[18] CHUNG, K., SHEWCHUK, J., WILLIGES, R.: An Application of Augmented Reality Thickness Inspection,in: Human Factors and Ergonomics in Manufacturing, Vol. 9 1999, S. 311 – 342

[19] FEINER, S.; MACINTYRE, B.; SELIGMANN, D.: Knowledge-Based Augmented Reality, in: Communications of the ACM: Vol. 36, 7 1993

[20] DUTOIT, A.; CREIGHTON, O.; KLINKER, G.; KOBYLINSKI, R.; VILSMEIER, C.: Architectural Issues in Mobile Augmented Reality Systems, in: 8th Asia-Pacific Software, Engineering Conference: Proceedings (APSEC 2001), IEEE Press, Macau, New York 2001

[21] SCHWALD, B.; FIGUE, J.; CHAUVINEAU, E.; VU-HONG, F.; ROBERT, A.: STARMATE - Using AR Technology for computer guided maintenance, in: 2001 - eBusiness and eWork Conference: Proceedings, Venedig 2001

[22]HARINGER, M.; REGENBRECHT, H.: A Pragmatic Approach to Augmented Reality Authoring, in: Int. Symposium on Mixed and Augmented Reality: Proceedings (ISMAR), Darmstadt 2002

Prozessinnovationen im regionalen Flächenmanagement durch Modellvorhaben der Raumordnung

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1 EINFÜHRUNG

Mit der Nationalen Nachhaltigkeitsstrategie hat sich die Bundesregierung dazu verpflichtet, das Siedlungs- und Ver-kehrsflächenwachstum in Deutschland von 129 ha im Jahr 2000 auf eine tägliche Zunahme von 30 ha pro Tag bis zum Jahr 2020 abzusenken (Deutscher Bundestag 2002). Langfristig wird damit eine Flächenkreislaufwirtschaft angestrebt (BBR/ BMVBS 2006). Sollte ein Einsatz neuer Instrumente oder die Verbesserung der Steuerungsleistung bereits be-stehender Instrumente nicht erfolgen, gilt die Dämpfung des Siedlungs- und Verkehrsflächenwachstums im erforderli-chen Umfang als unwahrscheinlich (Heiland et al. 2004; Einig/ Siedentop 2005). Geteilt wird diese Einschätzung auch von der Bundesregierung (Deuscher Bundestag 2004, S. 123). Diesen Bedarf an innovativen neuen instrumentellen Lösungen hat das Aktionsprogramm „Modellvorhaben der Raumordnung (MORO)“ mit dem Förderschwerpunkt „nachhaltige Siedlungsentwicklung“ aufgegriffen. Von 2003 bis 2006 wurden sieben MORO und zwei assoziierte Vorhaben durch das Bundesamt für Bauwesen und Raumordnung (BBR) und eine Forschungsassistenz (Convent Planung und Beratung GmbH) betreut (Gatzweiler/ Mensing 2006). Mit dem Aktionsprogramm fördert das Bundesministerium für Verkehr, Bau und Stadtentwicklung (BMVBS) und das BBR innovative Ansätze zu wichtigen Themen der Raum-ordnungspolitik (Gatzweiler 2006). Die mit etwa 60.000 € über zwei Jahre geförderten Regionen entwickelten in Ko-operation mit regionalen Akteuren vor Ort neue Ansätze im regionalen Flächenmanagement und unterzogen ihre insti-tutionellen Lösungen einem Praxistest. Perspektivisch sollte jedes MORO demonstrieren, wie integrierte Ansätze regio-nalen Flächenmanagements die Flächeninanspruchnahme in Richtung „Kreislaufwirtschaft“ lenken können. Durch Adaption dieser „guten Beispiele“ wird eine Diffusion der institutionellen Lösungsansätze im Bundesgebiet angestrebt (Fuhrich 2005). Der Abschluss aller Modellvorhaben zum Ende 2006 ermöglicht ein erstes Fazit. Zwar konnten die bundespolitischen Zielvorstellungen nicht in allen MOROs im vollen Umfang realisiert werden, dennoch ermöglichte die finanzielle und organisatorische Förderung interessante institutionelle Lösungen (BBR 2006):

- unverbundene Ansätze wurden zu einem integrierten regionalen Flächenmanagement weiterentwickelt (Mo-dellvorhaben in der Wirtschaftsregion Chemnitz-Zwickau),
- Konzepte für regionale Gewerbeflächenpools wurden entwickelt und in einem Fall bereits umgesetzt (Modell-vorhaben im Landkreis Friesland und im Regionalverband Neckar Alb),
- ein Finanzierungsfonds als Interessensausgleichsmechanismus wurde erarbeitet und umgesetzt (Modellvorha-ben im Lebens und Wirtschaftsraum Rendsburg),
- ein internetbasiertes Verfahren zur Erfassung von Innenentwicklungspotenzialen wurden entwickelt und in Zu-sammenarbeit von Region und Gemeinden angewendet (Modellvorhaben im Verband Region Stuttgart),
- eine Flankierung des Planungsinstrumentariums durch marktanaloge Instrumente wurde in der Region disku-tiert, dann aber verworfen (Modellvorhaben im Regionalverband Rhein-Neckar-Odenwald),
- Verfahren zur kooperativen Festlegung von Kontingenten der Baulandentwicklung wurden entwickelt und als Ziel- und Grundsatzkonzepte in Regionalpläne integriert (Modellvorhaben in der Regionalen Planungsgemein-schaft Thüringen und im Regionalen Planungsverband Vorpommern).
- ein Monitoring für die Siedlungsentwicklung wurde erarbeitet und exemplarisch umgesetzt (AG Siedlungs-entwicklung des Großraumes München)

Aus einer neo-institutionalistischen Sicht werden in diesem Beitrag die Erarbeitung und Implementierung institutionel-ler Innovationen in Modellvorhaben analysiert. Im 2. Kapitel wird die Erzeugung von Innovationen in Netzwerkstruktu-ren aus einer institutionenanalytischen Perspektive beleuchtet, dann ein Prozessphasenmodell regionalen Flächenmana-gements diskutiert (3. Kap.) und anschließend innovative Institutionelle Lösungen einzelner Modellvorhaben vorgestellt (4. Kap.).

2 INNOVATIONEN IM FLÄCHENMANAGEMENT AUS INSTITUTIONELLER SICHT

Institutionen sind Regeln (Crawford/ Ostrom 1995; North 1992). Sowohl formgebundene (formale) wie informelle Regeln, einschließlich der Vorkehrungen zu ihrer Durchsetzung, gelten entsprechend als Institutionen (Richter/Furubotn 1996, 7). Institutionen können einen Beschränkungscharakter aufweisen oder als Anreize wirken (Hodgson 2006, 2). Trotz ihres strukturierenden Einflusses determinieren sie das Verhalten von individuellen und korporativen Akteuren aber nicht vollständig (Mayntz/Scharpf 1995, 49).

Im Rahmen dieses Beitrages werden Regeln immer dann als innovativ betrachtet, wenn sie vor der Durchführung eines Modellvorhabens in einer Region noch nicht existierten, sondern erst eingeführt oder modifiziert werden mussten. In den meisten Fällen handelt es sich aber nicht um völlige Neuschöpfungen. In einigen Fällen wurden bereits in der Pra-xis bekannte Lösungsansätze aus anderen Regionen adaptiert. Innovation setzt somit nicht die Erfindung von etwas grundsätzlich neuem voraus. Innovation ist im Gegensatz zur Erfindung kein rein technischer Akt, sondern in soziale Prozesse eingebettet (Cavalli 2007; Ibert 2005). Der Prozess der Übertragung eines Vorbildes auf einen anderen Kon-text wird als Transposition bezeichnet (Sewell 1992). Durch imitierende Modifikation bekannter Lösungen entstehen neue institutionelle Praktiken. Transpositionsprozesse gelten somit als zentraler Mechanismus der Ausbreitung instituti-oneller Innovationen (Boxenbaum/ Battilana 2005). Neben der Adaption von Vorbildern und ihrer Anpassung an die örtlichen institutionellen Verhältnisse sind in Modellvorhaben aber auch bisher unbekannte institutionelle Regelungen, so genannte Proto-Institution (Lawrence et al. 2002), entwickelt worden.

Den Wandel von Institutionen erklären viele Theorien (Van de Ven/ Hargrave 2004) in erster Linie durch exogene Einflüsse. In diesem Beitrag wird eine andere Perspektive gewählt, die es gestattet Änderung, Kreation und Implemen-tation von Institutionen als Ausdruck endogener Kräfte zu modellieren (Hargrave/ Van de Ven 2006).

Insbesondere institutionelle Unternehmer spielen in endogenen Prozessen institutionellen Wandels eine zentrale Rolle. Ein institutioneller Unternehmer kann ein individueller oder korporativer Akteur sein. Wesentlich ist nur, dass ein Inte-resse an der Veränderung einer bestehenden oder die Schaffung einer neuen Institution besteht und der Akteur auch über ausreichende Ressourcen verfügt, um diesen Plan zu verfolgen (DiMaggio 1988; Hwang/ Powell 2005). Für den innovativen Charakter institutioneller Neuerungen ist die „innovative Kapazität“ eines institutionellen Unternehmers entscheidend (Boxenbaum/ Battilana 2004). Damit ist nicht nur die thematische Handlungskompetenz des Unterneh-mers, im Sinne eines „skillful actors“ (Fligstein 1997), sondern sein visionäres Vermögen angesprochen. Welche Rolle institutioneller Unternehmer im Rahmen von institutionellen Veränderungen lokaler oder regionaler Governancestruk-turen spielen können, ist allerdings weitgehend von den politischen Machtverhältnissen abhängig (Lowndes 2005). Da die Erzeugung und Durchsetzung institutioneller Innovationen Verhaltensänderungen voraussetzt, gilt die Modifikation tradierter Praxismuster als vorrangiges Ziel aber auch größte Herausforderung institutioneller Unternehmer (Lounsbury 2005), insbesondere dann, wenn Netzwerke involviert sind, in denen sich gleichberechtigte Akteure begegnen.

Sobald die Modifikationen institutioneller Arrangements aus Interaktionen vieler Akteure hervorgeht, stellt sich auto-matisch das Problem kollektiven Handelns. Gemeint sind Situationen, in denen erst durch Kooperation bzw. Koordina-tion der Handlungen mehrer Akteure ein vorgegebenes Ziel oder ein höheren Netto-Nutzen erreicht werden kann (Hol-zinger 2002, 55). In Kontexten regionalen Flächenmanagements stellen sich kollektive Handlungsprobleme beispiels-weise bei der Setzung verbindlicher Ziele oder wenn eine Zustimmung zu einer Regeländerung auf der politischen A-genda steht. In Netzwerkstrukturen verfügen institutionelle Unternehmer nicht über ausreichende Machtressourcen, um institutionelle Änderungen gegen den Willen anderer durchzusetzen. Eine Modifikation bestehender institutioneller Arrangements ist in Netzwerken nur dann erfolgreich, wenn sie im Konsens erfolgt. Da dieser aber kooperatives Han-deln der Beteiligten voraussetzt, in vielen Handlungssituationen aber eher Interessengegensätze dominieren, ist institu-tioneller Wandel in Netzwerken oft mit Konflikten verbunden (O´Toole 1997, Hargrave/ Van de Ven 2006). Dies bestä-tigte sich auch in den Modellvorhaben. Nur in wenigen Fällen erhielten die neuen institutionellen Ansätze direkt die nötige Folgebereitschaft bzw. fanden im Rahmen der Beurteilung durch die regionalen Planungsversammlung oder die Landesplanung sofort die erforderliche Akzeptanz.

3 PROZESSMODELL REGIONALEN FLÄCHENMANAGEMENTS

Regionales Flächenmanagement besteht in der möglichst kooperativen Gestaltung der Interaktionsbeziehungen all jener Organisationen, die mit der planerischen Vorbereitung und der praktischen Umsetzung von Bauvorhaben in einer Regi-on beschäftigt sind (Einig 2003a). Im Gegensatz zum kommunalen Flächenmanagement, bei dem die einzelne Gemein-de der Dreh- und Angelpunkt des Instrumentenverbundes ist, gibt es beim regionalen Flächenmanagement keinen Zent-ralakteur, es findet vielmehr in Netzwerken statt. Seine Steuerungsleistung geht aus der arbeitsteiligen Zusammenarbeit autonomer und gleichberechtigter korporativer Akteure hervor, die vorrangig dem öffentlichen Sektor angehören, mehr und mehr aber auch Organisationen des Privatrechts integrieren. Die zahlreichen, bereits heute schon verfügbaren rechtsverbindlichen wie informellen Instrumente gilt es in einem regionalen Verbund abgestimmt einzusetzen. Dies erfordert ein Höchstmaß an Koordination. Nur so kann interorganisatorisches Handeln zu effizienten Resultaten führen. Je mehr Instrumente allerdings in einem integrierten Ansatz regionalen Flächenmanagement kombiniert werden, desto komplexer gestaltet sich das resultierende Netzwerk interorganisatorischer Prozesse. Mit einem Prozessphasenmodell, das aus der Analyse unterschiedlicher Fallbeispiele regionalen Flächenmanagements abgeleitet wurde, lässt sich diese Komplexität übersichtlich in sechs aufeinander folgenden Schritten gliedern (BBR 2006, S. 22; Einig 2003a) (siehe Abb. 1). Diesem Prozessphasenmodell liegt die Beobachtung zugrunde, dass sich integrierte Ansätze regionalen Flä-chenmanagements durch vergleichbare Instrumentenkombinationen und eine ähnliche Abfolge von Prozessphasen aus-zeichnen. Die Empirie zeigt allerdings, und die durchgeführten Modellvorhaben bilden da keine Ausnahme, dass nur sehr selten alle Prozessphasen in einer Region im vollen Umfang zu beobachten sind. In der Regel wird das Potenzial miteinander zu kombinierender Instrumente nur selten ausgeschöpft. Meistens werden Schwerpunktsetzungen getrof-fen. In den Modellvorhaben konzentrierten sich die Akteure deshalb auf einzelne Prozessphasen. Dies spricht nicht gegen das Modell, umfasst doch der gesamte Zyklus so lange Zeitspannen, dass im Rahmen einer Laufzeit von zwei Jahren auch nur einzelne Prozesse praktisch durchlaufen werden können.

Die Phasen des Modells bilden die einzelnen Stufen des Gesamtprozesses regionalen Flächenmanagements als zeitlich geordnete Abfolge von Ereignisketten (Einzelprozessen) ab (Langley 1999). Dies entspricht nur begrenzt der Wirklich-keit und repräsentiert eher einen idealtypischen Zyklus. Die angenommene Phasenabfolge ermöglicht eine einfache Orientierung. Neuere Arbeiten zur Repräsentation von Prozessen lehnen lineare Abbildungen allerdings ab und betonen eher Verschränkungen, Rückkoppelungen, Divergenzen, parallele Tracks und Brüche im Prozessablauf (Mintzberg et al. 1976; Lindblom 1980, S. 5 ff.). Auch beim regionalen Flächenmanagement treten in der Praxis mehrfach zirkuläre Prozesse auf. Diese abweichenden Fälle konnten bisher aber noch nicht in ein einheitliches und dabei noch übersichtli-ches Schaubild integriert werden.

Abb. 1: Gesamtzyklus regionalen Flächenmanagements als zeitlich geordnete Abfolge von Prozessphasen

4 INNOVATIVE INSTITUTIONEN IN DEN MODELLVORHABEN

Da hier nicht alle durchgeführten Modellvorhaben ausführlich thematisiert werden können (siehe hierzu BBR 2006), werden im Folgenden exemplarische innovative Lösungsansätze vorgestellt.

Kooperatives Verfahren zur Erhebung von Innentwicklungspotenzialen im Verband Region Stuttgart

Ausgangsproblem: In allen Modellregionen wurde die schlechte regionale Informationslage über kommunale Innent-wicklungs- und Wiedernutzungspotenziale bemängelt.

Lösungsansatz: Es wurde ein internetgestütztes Verfahren entwickelt, welches vor Ort in Zusammenarbeit von Regio-nalplanung und einzelnen Gemeinden zur Erfassung und Diskussion der kommunalen Innenentwicklungspotenziale eingesetzt werden kann. Die erarbeitete „regionale Übersicht“ steht via Internetplattform allen mitwirkenden Kommu-nen zur Verfügung (Region Verband Stuttgart 2006).

Innovative Charakter: Für die Regionalplanung hat das neu entwickelte Verfahren den Vorteil, dass neue Bauleitplan-entwürfe direkt mit den örtlichen Innenentwicklungspotenzialen abgeglichen werden können. Auch bieten die zugrunde gelegten Innenentwicklungspotenziale keinen Anlass mehr zu abweichenden Meinungen, da sie ja gemeinsam mit der Gemeinde vor Ort abgestimmt worden sind. Für die Kommunen ist der Ansatz interessant, da sie in die Erfassung der Innenentwicklungspotenziale direkt eingebunden sind und die regionale Potenzialübersicht den Vergleich mit anderen Kommunen und ihre Behandlung durch die Regionalplanung gewährleistet. Der kooperative Erfassungsansatz fördert somit eine gemeinsame Vertrauensbasis. Die eigens entwickelte Internetplattform ermöglicht eine dezentrale und fort-schreibungsfähige Pflege.

Transpositionserfolg: Das Verfahren wird nun auch in anderen Regionen Baden-Württembergs zur kooperativen Er-fassung von Innenentwicklungspotenzialen eingesetzt.

Institutioneller Unternehmer: Die technische Seite des Modellvorhabens und die Anwendung des Ansatzes in Koope-ration mit den Gemeinden wurde durch die Begleitforschung (Institut für Städtebau und Landesplanung, TH Karlsruhe) bewältigt, während die verfahrenspraktische Seite und die Beschaffung des regionalen Konsens durch Mitarbeiter des Verbandes Region Stuttgart erfolgten.

Mengensteuerung kommunaler Baulandausweisung in der Regionalen Planungsgemeinschaft Mittelthüringen

Ausgangsproblem: Bisher war die Regionalplanung in Thüringen zu keiner Mengensteuerung kommunaler Bauland-ausweisungen legitimiert. Eine Regionalisierung des 30-ha-Ziels der Bundesregierung konnte in der Vergangenheit daher auch nicht erfolgen.

Lösungsansatz: Es wurde ein Regionalisierungverfahren für das 30-ha-Ziel vorgeschlagen und die regionale Obergren-ze des bis 2020 für Mittelthüringen tolerierbaren Siedlungs- und Verkehrsflächenzuwachs festgelegt. Anschließend wurde ein Diskurs begonnen, wie dieser regionale Flächenzuwachs auf die einzelnen Gemeinden heruntergebrochen werden kann. In moderierten Workshops und Fachdialogen wurden drei Allokationsmodelle diskutiert, in der Regiona-len Planungsversammlung eine Auswahlentscheidung getroffen und anschließend ein Ziel- und Grundsatzkonzept für den Regionalplanentwurf erarbeitet. Das favorisierte „Sparmodell“ sollte in seinen Kernaussagen als Ziel der Raumord-nung im Entwurf implementiert werden (Der Zuwachs der Siedlungs- und Verkehrsfläche in Mittelthüringen bis zum Jahr 2020 darf 925 ha nicht übersteigen. Zur Ermittlung der Obergrenze für Flächenneuausweisungen des örtlichen Bedarfs ist für jede Gemeinde der Richtwert von 0,09 ha pro 1000 Einwohner und Jahr zu verwenden. Flächenneuaus-weisungen im Außenbereich sind nur zulässig, wenn ein Bedarf nachgewiesen wird, der im Innenbereich nicht realisiert werden kann). Da der Entwurf des Regionalplan durch das Land genehmigt werden muss, erfolgte auch eine Diskussion der neuen Regelungsstruktur mit der Landesplanung. Diese lehnt allerdings den Zielcharakter ab, so dass als Kompro-miss eine Formulierung als Grundsatz erfolgte, der allerdings Abweichungen der Gemeinden gestattet.

Innovativer Charakter: Das neue institutionelle Arrangement ermöglicht eine Mengensteuerung der kommunalen Baulandentwicklung im Außenbereich durch positivplanerische Festlegung im Regionalplan. Da die Festlegung als Grundsatz der Raumordnung erfolgen wird, ist eine präzise Einhaltung der regionalen Obergrenze im Vollzug nicht mehr zu sichern, da Gemeinden von den Kontingenten abweichen können.

Transpositionserfolg: Das entwickelte Verfahren und der Ansatz zur Normierung im Regionalplan werden von den restlichen drei Regionalen Planungsgemeinschaften in Thüringen übernommen.

Institutioneller Unternehmer: Mitarbeiter der regionalen Planungsstelle und des Landesverwaltungsamtes von Thü-ringen haben den Ansatz entwickelt und in die nötige Überzeugungsarbeit in zahlreichen Foren und Workshops geleis-tet. Für die Implementation entscheidend war die Zustimmung der regionalen Planungsversammlung.

Regionaler Interessenausgleich durch Finanzfonds im Lebens- und Wirtschaftsraum Rendsburg

Ausgangsproblem: Eine Strategie zur Verringerung der Flächeninanspruchnahme berührt bei den beteiligten Akteuren unterschiedliche Interessen. Sie ist mit Vorteilen verbunden, kann für einzelne Gemeinden aber auch Nachteile mit sich bringen, etwa den Verzicht auf eine eigene Entwicklung. Da meistens kein Mechanismus für Interessenausgleiche exis-tiert, gelingen kooperative Lösungen regionaler Verteilungsproblemen häufig nicht.

Lösungsansatz: Mit 13 Kommunen wurde ein Finanzfond zum Vorteils-Lasten-Ausgleich für die Region entwickelt. Dieser Fonds sieht die Erhebung von zwei Beiträge durch beteiligte Kommunen vor: Beitrag 1 muss – als allgemeine Umlage – von allen Kommunen gezahlt werden. Beitrag 2 ist eine selektive Abgabe, die an der Wohnbaulandentwick-lung im Außenbereich anknüpft. Jede Kommune zahlt einmalig je neu geschaffener Wohneinheit auf einer der kontin-gentierten Entwicklungsflächen außerhalb des Innenbereichs 2.500,- Euro in den Fonds ein. Die Flächenkontingente wurden auf interkommunalem Wege in einem Gebietsentwicklungsplan festgelegt. Eine Berechnungsformel sichert, dass im Falle einer Bebauung mit geringer verdichteter Bauweise und größeren Grundstücksgrößen der Beitrag je Wohneinheit sich verteuert. Umgekehrt wird die Entscheidung zugunsten kleinerer Grundstücksgrößen und einer ver-dichten Bauweise belohnt. Die beiden Städte Rendsburg und Büdelsdorf sind von der Zahlung des Beitrags 2 befreit. Diese Regelung soll sowohl dazu beitragen, die wohnbauliche Entwicklung auf die Zentren zu lenken und generell die Innenentwicklung zu fördern als auch die Ausweisung neuer Wohngebiete in den Außenbereichen der Umlandkommu-nen zu verteuern.

Innovativer Charakter: Durch die Abgabenlösung wird ein Anreiz zur Innenentwicklung und höheren Verdichtung im Außenbereich gesetzt. Die Kommunen haben der Regelung freiwillig zugestimmt. Aus dem Fonds werden regionale Leitprojekte finanziert, aus denen alle Kommunen einen Vorteil ziehen (z. B. die Renovierung des einzigen Gymnasi-ums).

Transpositionserfolg: Obwohl der Lösungsansatz bundesweit auf großes Interesse stößt, ist eine konkrete Adaption noch nicht in Sicht.

Institutioneller Unternehmer: Eine zentrale Rolle hat die Begleitforschung gespielt (Raum & Energie, Institut für Planung, Kommunikation und Prozessmanagement GmbH), die den Lösungsansatz in Zusammenarbeit mit den kom-munalen Partnern entwickelte. Ohne die Adaptionsbereitschaft der Gemeinden wäre der Ansatz allerdings nicht Umge-setzt worden. Die Landesplanung, als eigentlicher Träger der Regionalplanung und Initiator der Stadt-Umland-Gebietsentwicklungsplanung, hat diesen Ansatz ebenfalls unterstützt.

5 FAZIT

Im Rahmen der geförderten Modellvorhaben zeigte sich recht schnell, dass das Arsenal der bereits existierenden In-strumente für die Bewältigung der flächenpolitischen Herausforderung nicht ausreicht. Es mussten deshalb angepasste institutionelle Problemlösungen entwickelt werden. Da die Regionalplanung in vielen Ländern nicht über ausreichende eigene Steuerungsressourcen verfügt (Einig/ Spiecker 2002; Einig 2005), die beispielsweise zur Setzung und Kontrolle des Vollzuges von restriktiven Flächensparzielen oder die Einführung neuer Instrumente und Verfahren notwendig sind, waren die Modellvorhaben weitgehend auf kooperative Strategien zur Gestaltung des institutionellen Wandels festge-legt. In den meisten Modellvorhaben nahmen die Träger der Regionalplanung dabei die Rolle eines institutionellen Unternehmers wahr. Institutioneller Wandel konnte in den meisten Modellvorhaben durch regionale Politikverflechtung gestaltet werden, bei der Gemeinden, Landkreise und Regionalplanung, als Verbundsystem organisiert, gemeinsam an der Bewältigung der anstehenden Aufgaben arbeiten (Einig 2003b).

6 LITERATUR

BBR (2006) = Bundesamt für Bauwesen und Raumordnung (Hrsg.): Umbau statt Zuwachs. Siedlungsentwicklung und öffentliche Daseinsvorsorge im Zeichen des demographischen Wandels. Bonn

BBR/BMVBS (2006) (Hrsg.): Perspektive Flächenkreislaufwirtschaft. Kreislaufwirtschaft in der städtischen/stadtregionalen Flächennutzung – Fläche im Kreis. Ein ExWoSt-Forschungsfeld, Band 1 Theoretische Grundlagen und Planspielkonzeption. Bonn

Boxenbaum, E.; Battilana, J. (2004): The innovative capacity of institutional entrepreneurs: a reconstruction of corporate social responsibility. In: Perspectives on Institutional Entrepreneurship, Academy of Management Annual Conference, New Orleans

Boxenbaum, E.; Battilana, J. (2005): Importation as innovation: transposing managerial practives across fields. In: Strategic Organization, Vol. 3, No. 4, 355-383

Cavalli, N. (2007): The symbolic dimension of innovation processes. In: American Behavioral Scientist, Vol. 50, No. 7, 958-969

Crawford, S. E.; Ostrom, E. (1995): A Grammar of Institutions. In: American Political Science Review, Vol. 89, No. 3, 582-600

Deutscher Bundestag (2002): Bericht der Bundesregierung über die Perspektiven für Deutschland – Nationale Strategie für eine nachhaltige Entwicklung. Bt.-Drucksache 14/8953

Deutscher Bundestag (2004): Bericht der Bundesregierung über die Perspektiven für Deutschland – Nationale Strategie für eine nachhaltige Entwicklung. Fortschrittsbericht 2004. Bt.-Drucksache 15/4100

DiMaggio, P.J. (1988): Interest and agency in institutional theory. In: Zucker, L. (Ed.), Institutional patterns and organizations. Cambridge, MA: Ballinger, 3-22

Einig, K. (2003a): Regionales Flächenmanagement: im instrumentellen Verbund effizient zusammenarbeiten. In: vhw Forum Wohneigentum, Zeitschrift für Wohneigentum in der Stadtentwicklung und Immobilienwirtschaft, H. 5, S. 258-263

Einig, K. (2003b): Positive Koordination in der Regionalplanung. Transaktionskosten des Planentwurfs in Verhandlungssystemen. In: Informationen zur Raumentwicklung, H. 8/9, S. 479-503

Einig, K. (2005): Regulierung des Siedlungsflächenwachstums als Herausforderung des Raumordnungsrechts. In: DISP 160, Heft 1, 48-57

Einig, K.; Siedentop, S. (2005): Strategien zur Senkung des Flächenverbrauchs. In: Czybulka, Detlef (Hrsg.): Wege zu einem wirksamen Naturschutz: Erhaltung der Biodiversität als Querschnittsaufgabe. Sechster Warnemünder Naturschutzrechtstag. Baden-Baden: Nomos, S. 159-181

Einig, K.; Spiecker, M. (2002): Die rechtliche Zulässigkeit regionalplanerischer Mengenziele zur Begrenzung des Siedlungs- und Verkehrsflächenwachstums. In: Zeitschrift für Umweltrecht, 13. Jg., Sonderheft „Flächenhaushaltspolitik“, 150-157

Fligstein, N. (1997): Social skill and institutional theory. In: American Behavioral Scientist, Vol. 40, No. 4: 397-405

Fuhrich, M. (2005): Innovationen durch Modellvorhaben – die Wirkung von guten Vorbildern. In: Informationen zur Raumentwicklung, H. 9/10.2005, 609-617

Gatzweiler, H. (2006): Leitbilder in der Praxis. Impulse zur Umsetzung durch Modellvorhaben der Raumordnung. In: Informationen zur Raumentwicklung, H. 11/12, 677-691

Gatzweiler, H.; Mensing, K. (2006): Innovative Projekte zur Regionalentwicklung. Ein MORO-Forschungsfeld trägt erste Früchte. In: Raumforschung und Raumordnung, Vol. 64, H. 1, 49-55

Hargrave, T. J.; Van de Ven, A.H. (2006): A collective action model of institutional innovation. In: Academy of Management Review, Vol. 31, No. 4, 864-888

Heiland, S.; Reinke, M.; Siedentop, S. (2004): Beitrag naturschutzrechtlicher Instrumente zur Steuerung der Flächeninanspruchnahme. BfN F+E-Vorhaben 80382010, Endbericht, Dresden, Berlin

Hodgson, G. M. (2006): What are Insitutions? In: Journal of Economic Issues, Vol. XL, No. 1, 1- 25

Holzinger, K. (2002): Transnational Common Goods: Strategic Constellations, Collective Action Problems, and Multi-Level Provision. Habilationsschrift, Universität Bamberg

HWANG, H.; POWELL, W. W. (2005): Institutions and Entrepreneurship, In: Alvarez, S. A.; Sorenson, O.; Agarwal, R. (Eds.): Handbook of Entrepreneurship Research. Berlin u.a.: Springer, 201-232

Ibert, O. (2005): Wie lassen sich Innovationen planen? In: Informationen zur Raumentwicklung, H. 9/10.2005, 599-607

Langley, A. (1999): Strategies for theorizing from process data. In: Academy of Management Review, Vol. 24, No. 4, 691-710

Lawrence, T.B., Hardy, C.; Phillips, N. 2002. Institutional effects of interorganizational collaboration: the emergence of proto-institutions. In: Academy of Management Journal, Vol. 45, No. 1, 281-291

Lindblom, C. E. (1980): The Policy-Making Process. Belmont, Calif.: Wadswoth.

Lounsbury, M. (2005): Towards a practice perspective on institutional entrepreneurship: Mutual fund money management change and the performativity-theorization link. Manuskript

Lowndes, V. (2005): Something old, something new, something borrowed. How institutions change (and stay the same) in local governance. In: Policy Studies, Vol. 26, No. 2/4, 291-309

Mayntz, R.; Scharpf, F. W. (1995): Der Ansatz des akteurszentrierten Institutionalismus. In: Mayntz, R.; Scharpf, F. W. (Hrsg.): Gesellschaftliche Selbstregelung und politische Steuerung. Frankfurt/M.: Campus, 39-72

Mintzberg, H.; Raisinghani, D.; Théoret, A. (1976): The structure of unstructured decision processes. In: Administrative Science Quarterly, Vol. 24, 580-589

North, D. C. (1992): Institutionen, institutioneller Wandel und Wirtschaftsleistung. Tübingen: Mohr

O´Toole, L. J. (1997): Implementing public innovations in network settings. In: Administration & Society, Vol. 29, No. 2, 115-138

Richter, R.; Furubotn, E. (1996): Neue Institutionenökonomik. Eine Einführung und kritische Würdigung. Tübingen: Mohr

Sewell, W.H. (1992): A theory of structure: Duality, agency, and transformation. In: American Journal of Sociology, Vol. 98, No. 1, 1-29

Van de Ven, A. H.; Hargrave, T. H. (2004): Social, technical, and institutional change: A literature review and synthesis. In: Poole, M. S.; Van de Ven, A. H. (Eds.): Handbook of organizational change. New York: Oxford University Press, 259-303

Verband Regin Stuttgart (Hrsg.) (2006): Nachhaltiges Regionales Siedlungsflächenmanagement in der Region Stuttgart – Schlussbericht des Forschungsprojekts MORO-RESIM. In: Schriftenreihe des Verbands Region Stuttgart, Band 23, Stuttgart

🏆 *reviewed paper*

PAS – ein System zur Datenkonsolidierung für große Immobilienbestände

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1 ABSTRACT

Besitzer großer Immobilienbestände, wie Kommunen, Einrichtungen der öffentlichen Hand oder Non-Property Companies haben häufig nur eine unzureichende Kenntnis über den zu betreuenden Bestand. Ursache der fehlenden Transparenz sind neben organisatorischen Defiziten die – meist historisch gewachsene – Vielfalt der Informationssysteme und die fehlenden Verknüpfungen von Sachdaten zu Kartendaten. Vor diesem Hintergrund helfen gängige Software-Produkte nicht weiter, vielmehr gilt es auf Basis der bestehenden Systeme eine konsolidierte DV-Lösung zu erstellen, die den spezifischen Anwendungsinteressen des Eigentümers gerecht wird. Das nachfolgend besprochene PAS – PortfolioAnalyseSystem der Deutschen Bahn Services Immobilien GmbH verdeutlicht beispielhaft und praxisnah einen entsprechenden Ansatz, der für o.g. Akteure von hohem Interesse sein wird.

2 AUSGANGSLAGE

Die Deutsche Bahn AG verfügt als Non-Property Company über einen erheblichen Immobilienbestand (rd. 1,4 Mrd. m²). Ein nicht unerheblicher Teil ist heute betrieblich nicht notwendig und ist zu verwerten. Ziel der DB Services Immobilien GmbH, dem Immobiliendienstleister der DB AG, ist die Bewirtschaftung des Liegenschaftsbestandes sowie die Aufbereitung und Verwertung des nicht mehr betriebsnotwendigen Immobilienbestandes.

3 MERKMALE DES IMMOBILIENBESTANDES:

3.1 Äusserst heterogener Immobilienbestand

Auf Basis der aktuellen Einschätzung sind ca. 240 Mill. m² Flächen bzw. rund 45.000 Objekte betrieblich entbehrlich und somit dem Grunde nach verwertbar. Im Bestand befinden sich bebaute, aber mehrheitlich unbebaute Immobilien. Diese sind mehr oder minder durch bahnspezifische (Vor-)Nutzungen geprägt. In dem Liegenschaftsbestand befinden sich sowohl Spezialgebäude wie Lokschuppen, ehemalige Ausbesserungswerke oder Ladestraßen als auch stillgelegte Streckenbänder oder Kleingartenanlagen. Der Flächenbestand verteilt sich auf ganz Deutschland und in geringem Maße auf den Norden der Schweiz; ein leichter Schwerpunkt ist im Osten Deutschlands festzustellen. Es liegt daher auf der Hand, dass nur eine Teilmenge tatsächlich verkauft oder vermietet werden kann. Die Gründe hierfür sind vielfältig, genannt seien exemplarisch vorhandene Restriktionen wie technische Infrastruktur, die eine Verkauf wirtschaftlich nicht rechtfertigen, ungünstige Zuschnitte, mangelhafte Zuwegung und eine eingeschränkte Marktsituation. Auf der anderen Seite stellen Bahnimmobilien nach wie vor ein herausragendes Entwicklungspotenzial im innerstädtischen Kontext dar, wie dies aktuelle Entwicklungen der Zentralen Bahnflächen München, von Stuttgart 21, des Areals Basel-DB-Güterbahnhof oder Düsseldorf-Bilk zeigen. Die Grafik gibt einen Überblick zum Nutzungspotenzial der nicht betriebsnotwendigen Immobilien. Zwar wird ca. ein Drittel des Flächenbestandes als potenzielles Bauland eingestuft, allerdings schränken Markt, Beräumungsaufwand und nicht gesichertes Planungsrecht dieses Volumen noch ein.

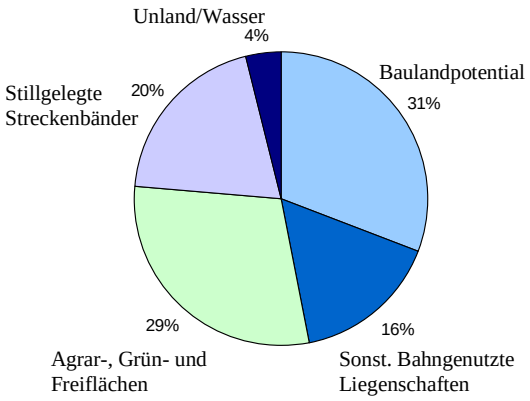

Abbildung 1: Verteilung nach Nutzungspotenzialen

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Editors: Manfred SCHRENK, Vasily V. POPOVICH, Josef BENEDIKT

3.2 Geringes Maß an Transparenz zum Immobilienbestand

Große, historisch gewachsene Immobilienbestände von Non-Property Companies oder auch der Öffentlichen Hand weisen oft einen hohen Grad an Intransparenz auf. Dies bedeutet, grundlegende Objektktinformationen, wie Flächengröße, Bewirtschaftungsdaten, Buchwerte, Angaben zu aufstehenden Bebauung, etc. sind zwar vorhanden, aber häufig nicht konsolidiert und nicht in einen räumlichen Bezug gesetzt worden. Die Informationen werden in unterschiedlichen Systemen bereit gestellt und variieren hinsichtlich ihrer Aktualität. Darüber hinaus gibt es immobilienspezifisches Fachwissen zu Einzelobjekten des Bestandes das in hohem Maße personenabhängig ist. Zudem können immobilienwirtschaftlich relevante Informationen, inbesondere bestehende Restriktionen, wie Grundstückslasten, Medientrassen, Altlastenrisiken erst im Rahmen eines aufwendigen Aufbereitungsprozesses generiert werden. Diese Informationen müssen ebenfalls in Systemen hinterlegt und aktualisiert werden. Bei der Deutschen Bahn AG kommt erschwerend hinzu, dass durch Ausgründung von Vertriebsgesellschaften und den Vorbereitungen zur Kapitalmarktfähigkeit des Konzerns eine Gliederung des Eigentums an Grundstücken und Gebäuden auf einzelne Konzerngesellschaften erfolgte (Bahnreform Stufe 2). Widersprüchliche Interessen hinsichtlich der Immobiliennutzung bzw. -verwertung sind daher nicht zu vermeiden.

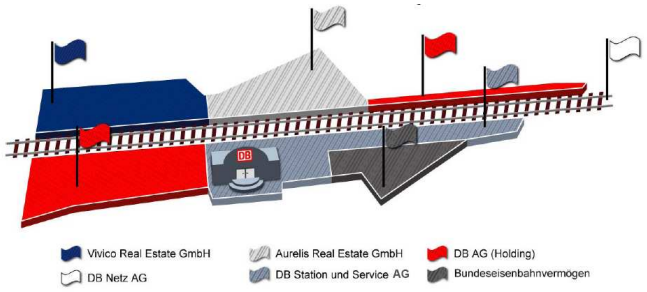

Abbildung 3: schematische Immobilienverteilung im Umfeld eines Bahnhofes

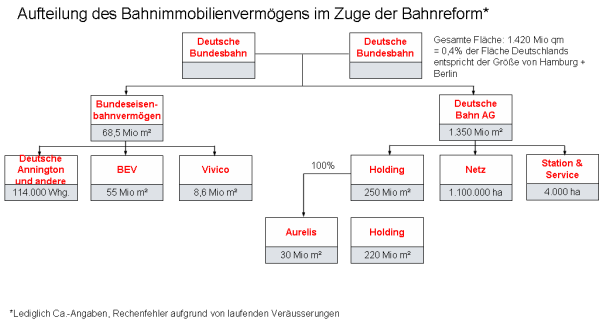

Abbildung 2: Aufteilung des Bahnimmobilienvermögens im Zuge der Bahnreform

3.3 Immobilienspezifische Datenvielfalt

Eine auswertbare Informationshaltung, die liegenschaftsrelevante Fragestellungen aus verschiedenen Blickwinkeln „auf Knopfdruck“ beantworten kann, ist aufgrund der komplexen Informationshaltung oftmals nicht ohne weiteres möglich. Das Schaubild verdeutlicht exemplarisch die Vielschichtigkeit der Daten. Die Gründe für diese bei Eigentümern umfangreicher Immobilienbestände nicht untypische Datenvielfalt sind in erster Linie den unterschiedlichen und nicht koordinierten Anforderungen einzelner Gesellschaften und Bereiche zuzuschreiben, die zudem in ihrer Entstehung und Aktualisierung zeitlich variieren. Dem einzelnen Informationsträger sind zusätzliche Stammdaten anhängig. Aufgrund einer Vielzahl von unterschiedlichen IT-Insel-Lösungen gibt es zahlreiche Schnittstellen mit den sich daraus

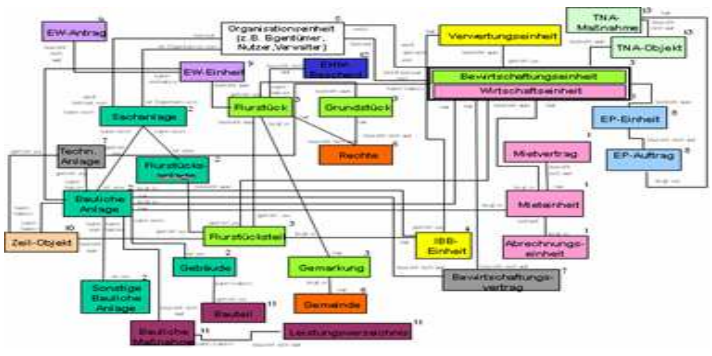

Abbildung 4: Schematische Darstellung der Systeme und deren Schnittstellen

ergebenden Problematiken (unterschiedliche Datenstände, Aktualitäten etc.). Die Nutzbarkeit der Systeme mit den zahlreichen Informationen ist schwierig, die Erstellung von übergreifenden Auswertungen stellt in der Regel einen hohen Aufwand dar – gerade weil die Bezugseinheiten variieren und georeferenzierte Informationen nur eingeschränkt oder nicht vergleichbar vorliegen.

4 ZIELE DES OPERATIVEN PORTFOLIOMANAGEMENTS BEI DER DBSIMM

Eine strukturierte und vergleichende Erfassung des nicht betriebsnotwenigen Liegenschaftsbestandes der DB AG erfolgte erstmalig mit Aufstellung des Bereichs Operatives Portfoliomanagement im Jahr 2003. Diese maßgebliche Verdichtung der Informationsqualität zu den Immobilien stellt die Basis für die erfolgreiche Bearbeitung folgender Schwerpunkte dar:

4.1 Erfassung und Analyse des Immobilienbestandes

Mittels eindeutiger Kriterien und definierter Ausprägungen erfolgt eine Erfassung des Liegenschaftsbestandes auf Desk-Top-Ebene. Weitere Informationen, wie Buchwerte, Bewirtschaftungsergebnisse und sozioökonomische Daten erlauben eine vergleichende Betrachung – bspw. in Form einer Portfoliomatrix oder eine gezielte Auswahl von geeigneten Objekten im Rahmen von Portfolioanalysen – bspw. zur Abgrenzung eines zur Verwertung bestimmten Immobilienpaketes. Mit einer ersten Einschätzung zur potenziellen Nutzung der Liegenschaften steht eine weitere qualitative, wenngleich nur eingeschränkt belastbare Qualitätsdimension zur Verfügung, die im Rahmen von Analysen von maßgeblichen Bedeutung ist. Zudem wurde ein Modell entwickelt, welches aufgrund einer Vielzahl von Parametern in pauschalierter Form die Ermittlung eines objektbezogenen Potenzialwertes erlaubt. Eine regelmäßige Aktualisierung der Erfassung ist durchzuführen.

4.2 Identifikation verwertungsgeeigneter Objekte / Planung

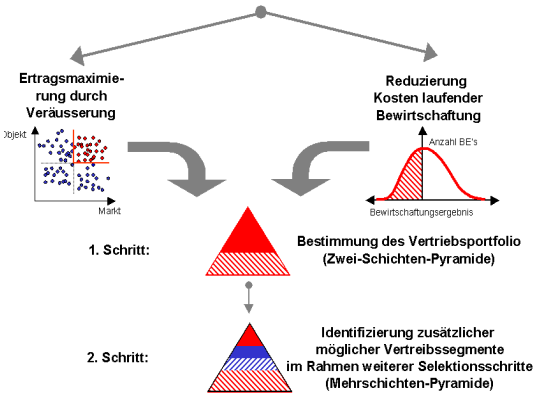

Abbildung 5: Veräußerungsstrategien

Auf Basis der Bestandserfassung können vertriebsgeeignete Objekte für den Zeitraum der Mittelfristplanung selektiert werden. In der Mehrzahl handelt es ich um Objekte hoher Qualität in markstarken Räumen. Selbstverständlich werden aber auch schwergängigere Objekte (bspw. Objekte in Randlagen, Cash-Fresser, etc.) beigemischt – der Mix ist letztlich eine Frage der strategischen Vorgaben. Erlös und Aufwand der ausgewählten Objekte wird grob ermittelt und bildet kummuliert den maßgeblichen Rahmen für die Ergebnisprognose der Vertriebsaktivitäten. Diese Objekte werden dann in den Prozess der Flächenaufbereitung überführt um sie anschließend über den Vertrieb dem Kunden zuzuführen. Die Auswahl passender Objekte für eine Pakettransaktion erfolgt auf der gleichen Basis unter Berücksichtigung definierter Ausprägungen zu den einzelnen Kategorien.

4.3 Steuerung der Aufbereitungsprozesses der zu verwertenden Liegenschaften

Ebenso wie die Planung erfolgt die Aufbereitung der Immobilien in den Niederlassungen der DB Services Immobilien GmbH. Die Durchführung, Steuerung und laufende Optimierung der Aufbereitungsprozesse fällt ebenfalls in die Zuständigkeit des Operativen Portfoliomanagements. Im einzelnen ist hierbei notwendig, die vertriebsgeeigneten und aufzubereitenden Flächen im Geoinformationssystem flimas anzulegen und die Eckdaten der Fläche im PortfolioAnalyseSystem PAS (s.u.) aufzunehmen. In PAS werden nun alle weitergehenden Informationen zur Liegenschaft verdichtet, so die Erkenntnisse zur Infrastrukturbelastung, die Restriktionen, die sich im Rahmen der sog. Machbarkeitsprüfung, einer bahninternen Abfrage zu Anlagen, Lasten und Gestattungen, ergeben und es erfolgt abschließend mittels einer Wirtschaftlichkeitsrechnung unter Berücksichtigung des potenziellen Erlöses und der zu erwartenden Aufwendungen eine Verwertungsempfehlung. Die Objekte werden nach Abschluß der Aufbereitung an den Vertrieb übergeben, das Portfoliomanagement hält während der Vertriebs- oder Vermietungsaktivitäten den Sachstand zu den Liegenschaften aktuell.

5 VORGEHENSWEISE/UMSETZUNG BEI DER DATENKONSOLIDIERUNG

5.1 Analyse und Prüfung vorhandener DV-Systeme bei der DB AG

Bezug nehmend auf das Aufgabenspektrum des Operativen Portfoliomanagements und den Anforderungen der DB Services Immobilien GmbH wurden die vorhandenen bahninternen DV-Systeme mit den darin enthaltenen Informationen gesichtet. Im Fokus dabei stand zunächst welche Informationen können für die Optimierung einer Transparenz für den Liegenschaftsbestand sofort, d.h. ohne weitergehende Informationsanreicherung verwendet werden und in welchen Systemen liegen diese Daten vor?

Die vorliegenden Daten lassen sich zunächst in 3 Blöcke unterteilen.

Liegenschaftsdaten	**Rechnungswesen**	**Daten aus**
Stammdaten wie Bundesland, Kreis, Gemeinde, Objektgröße und Realnutzung zu sämtlichen Liegenschaften	Abrechnungen zu den Liegenschaften (Mieteinnahmen und Nebenkostenabrechnung	Objektbezogenen Daten zu Wertigkeiten (Buchwerte der Liegenschaften und der baulichen Anlagen)

Anhand dieser 3 „Datenblöcke“ und den dazugehörigen „führenden Systemen“ (Geoinformationssystem FLIMAS, SAP RE, SAP RA) lag bereits ein Teil der wesentlichen liegenschaftsrelevanten Daten vor. Allerdings hatten die vorliegenden Informationen unterschiedliche Bezugseinheiten (bspw. Bewirtschaftungseinheit, Flurstück, Sachanlage). Weitergehende Aussagen und Zusammenhänge ließen sich nur durch Verknüpfung der Daten anhand einer eindeutigen Bezugseinheit, die in allen drei Datenblöcken vorkommt, generieren. Diese Bezugseinheit musste folglich noch definiert werden.

Im nächsten Schritt erfolgte die Prüfung, welche weitergehende Informationen benötigt werden, welche Datenfelder vorzuhalten sind, welche Aussagen und Auswertungen sollen realisiert werden, welche standardisierten Berichte sind gefordert und schließlich welches DV-System kommt in Frage oder gibt es Systeme auf dem Markt.

5.2 Systementscheidung

Die Prüfung einer anforderungsgerechte Weiterentwicklung der „führenden System“ unter Berücksichtigung verschiedener Parameter wie zeitliche Realisierung, Kosten, Betriebsführung erwies sich als zu aufwendig und teilweise nicht realisierbar.

Die Prüfung der auf dem Markt befindliche Standard-Portfolio-Management-Systems ergab, dass ein Einsatz aufgrund der Spezifika der Bahnliegenschaften, der heterogenen Datenlandschaft und der im Zuge der Aufbereitung durchzuführenden sukzessiven Informationsverdichtung nicht in Frage kam. Somit blieb als umsetzbare Option letztlich nur die Eigenentwicklung eines DV-Systems zur Portfoliosteuerung.

5.3 Anforderungsammlung und Umsetzung

Die Systemanforderungen an das PortfolioAnalyseSystem (PAS) wurden in einem Fachkonzept festgeschrieben. In diesem Konzept wurden neben den rein funktionalen Anforderungen auch die relevanten Ziel- bzw. Anwendergruppen mit den unterschiedlichen Berechtigungskonzepten beschrieben. Berücksichtigung fanden die Bearbeitungsprozesse für die Erfassung und Aufbereitung der Liegenschaften und die zu generierenden Managementberichte – ein modularer Aufbau musste somit ermöglicht werden. Zu der Erstellung des Fachkonzeptes gehörte insbesondere die Modellierung eines Datenmodells mit definierten Schnittstellen sowie die Vereinheitlichung der Daten anhand eines eindeutigen Informationsträgers, bzw. einer Bezugseinheit. Dadurch können die Daten aus den führenden Systemen miteinander verknüpft und es entstehen vielschichtigere Informationen aus verschiedenen Fachbereichen. Das DV-System muss allerdings eine Synchronisierung der Informationsträger der Fachsysteme ermöglichen.

Durch den gewählten modularen Aufbau musste gewährleistet werden, dass die einzelnen Module sukzessive im Rahmen der kontinuierlichen Bearbeitung realisiert werden konnten. Durch permanente Weiterentwicklung konnten veränderte prozessuale Rahmenbedingungen berücksichtigt und mit in die

Entwicklung aufgenommen werden. Die technische Umsetzung von PAS erfolgte durch die DV Abteilung der DB Services Immobilien GmbH.

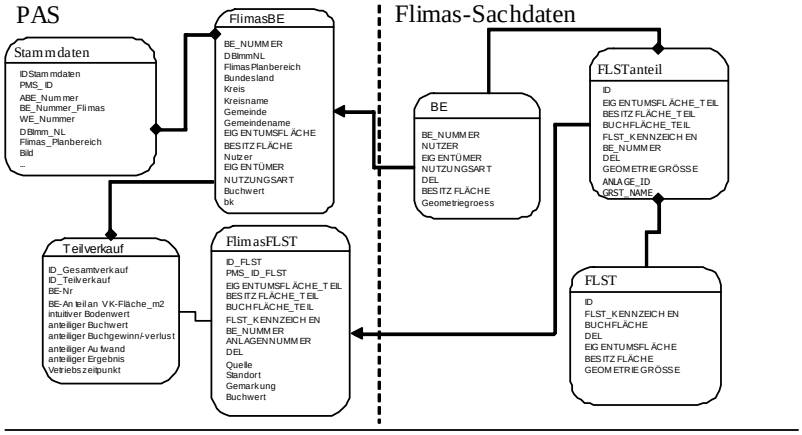

Abbildung 6: Schematische Darstellung Schnittstelle PAS – flimas

6 SYSTEMBESCHREIBUNG

6.1 Systemeinordnung und Schnittstellen

Dem PortfolioAnalyseSystem liegt der Data-Warehouse-Gedanke zugrunde, die wesentlichen Informationen aus führenden Vorsystemen werden also in PAS zusammengeführt. Daten aus Vorsystemen werden nur bezogen, d.h. sie werden nur im führenden System gepflegt. In PAS werden diese Objektdaten lediglich angezeigt und mit weitergehenden Informationen versehen. Die Schnittstellen zu den führenden Systemen sind eindeutig definiert und der Datenfluss ist anhand eines eindeutigen Informationsträgers gewährleistet.

Die Download-Schnittstellen zu PAS werden verwendet, um Daten aus den definierten Systemen in regelmäßigem Turnus zusammenzuführen. Neben den zeitlich fest definierten Download-Schnittstellen gibt es auch Schnittstellen, die einen manuellen Datenbezug ermöglichen.

Das nachfolgende Diagramm verdeutlicht, wie PAS als zentraler Datenempfänger fungiert und die für Portfolioauswertungen und Verwertungsaufbereitungen relevanten Daten zunächst aggregiert.

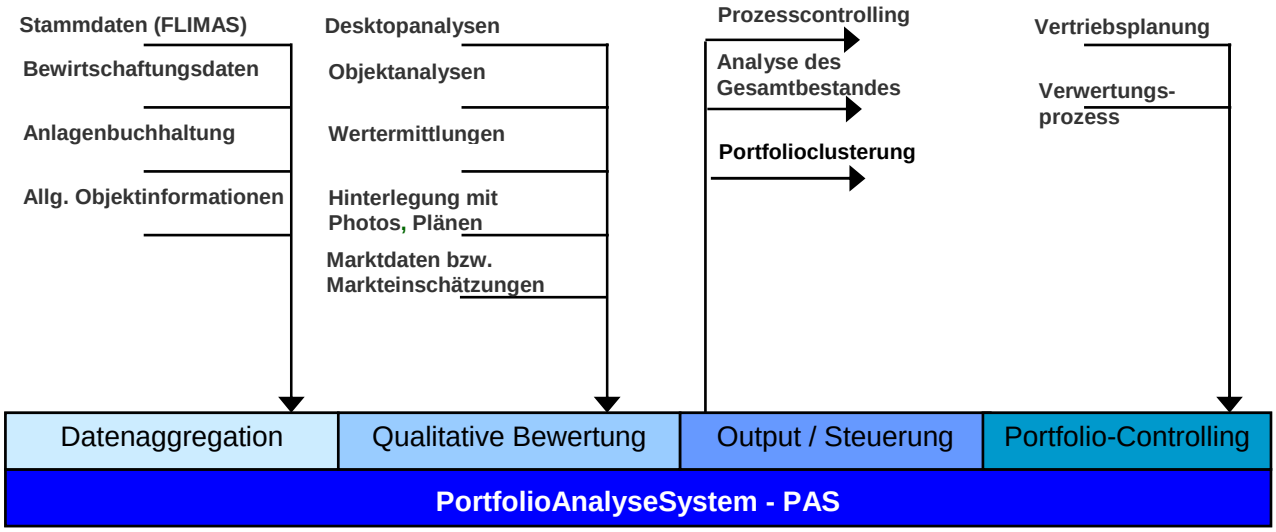

Abbildung 7: Schematische Darstellung PAS

In der qualitativen Bewertung werden die bezogenen Daten mit weitergehenden Informationen angereichert. Objekte werden anhand Desktopanalysen zunächst grob anhand eines einheitlichen Bewertungsmaßstabes bewertet. Daran anschließend erfolgen detailliertere Datenerhebungen zu den Liegenschaften wie bspw. Objektanalysen und Wertermittlungen. Fotos und Pläne können ebenso hinterlegt werden wie geeignete Marktdaten bzw. Markteinschätzungen.

Dieser aufbereitete Datenpool der Liegenschaften dient der Steuerung des Gesamtimmobilienbestandes. Anhand wesentlicher Informationen sowie durch die Bereitstellung von managementrelevanten

Auswertungen erfolgt die Analyse des Gesamtimmobilienbestandes. Diese Analyse kann sich auf Teilportfolien mit unterschiedlichen Fragestellungen beschränken. Anhand eines Prozesscontrollings wird die Übersicht über den jeweiligen Aufbereitungsstandes einer Liegenschaft ermöglicht.

Der aufbereitete Immobilienbestand bildet letztlich die Grundlage für den Verwertungsprozess – inbesondere für die Erstellung der Vertriebs- bzw. Mittelfristplanung.

6.2 Datengrundlage von PAS: das Geoinformationssystem flimas

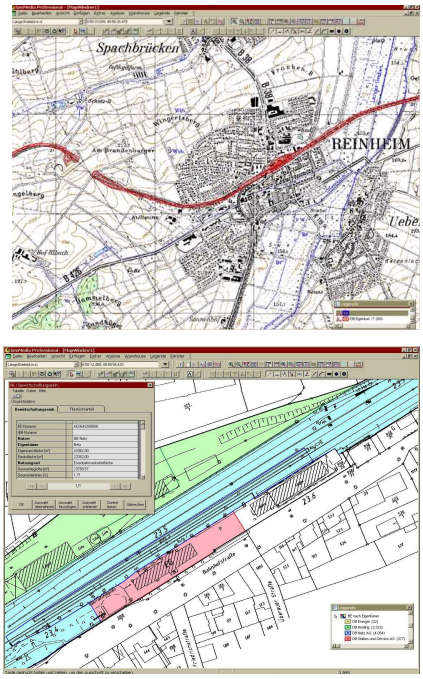

Abbildung 8 & 9: Screenshots aus flimas

Eine Datengrundlage des PortfolioAnalyseSystems bildet das das Flächen-Informations- und -managementsystem (flimas) der Deutschen Bahn AG. In diesem System werden die Liegenschaften der unterschiedlichen Flächeneigentümer des Bahnkonzerns dargestellt. In flimas werden Geometrie- und Sachdaten zusammengeführt und somit können aktuelle Aussagen zu dem Liegenschaftsbestand getroffen werden. Die dazu notwendigen Objekte (Flurstück, Grundstück, Bewirtschaftungseinheit etc.) stehen dabei zur Verfügung. Flimas dient als Grundlage für die Desktop-Portfoliobewertung von Liegenschaften. Darüber hinaus werden in flimas die verwertungsgeeigneten Teilflächen als Objekte angelegt - im Rahmen des Verwertungsprozesses erfolgt eine sukzessive Informationsverdichtung. Die Kartendaten sind zwar mit Sachdaten in flimas verknüpft, die Informationen der Sachdaten umfassen jedoch nur die Stammdaten und wenige weitere Informationen. Diese vorliegenden Informationen sind für eine umfassende Steuerung des Aufbereitungsprozesses sowie zur Herstellung einer Transparenz über den Liegenschaftsbestand nicht ausreichend. Da die Erweiterung um weitergehende Sachdaten in flimas technisch nicht ohne weiteres möglich war, erfolgt diese Informationserhebung zu den Objekten im PortfolioAnalyseSystem.

6.3 Das PortfolioAnalyseSystem (PAS)

Das PortfolioAnalyseSystem greift die in flimas vorhandenen Objekte mit den dazugehörigen Stammdaten über eine eindeutig definierte Schnittstelle ab. In PAS erfolgt dann, wie bereits beschrieben, die sukzessive Informationsverdichtung zu den übernommenen Objekten. Diese Informationsverdichtung erfolgt mehrstufig und orientiert sich an dem Aufbereitungsprozess der Liegenschaften. PAS ist modular aufgebaut und orientiert sich streng an dem Aufbereitungsprozess für die Liegenschaften. PAS wurde auf Basis von MS-Access und SQL realisiert. Derzeit arbeiten rund 200 Mitarbeiter in 8 Niederlassungen bundesweit sowie die Zentralen der DB S Imm in Frankfurt und Berlin mit diesem System.

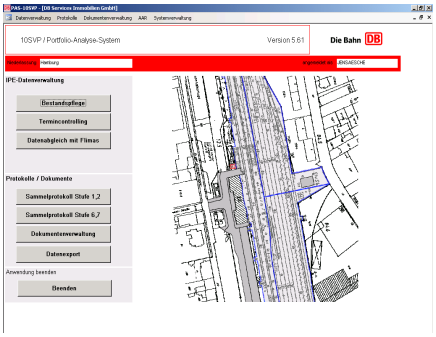

Abbildung 10:Startmaske PAS

Vom Prinzip enthält PAS für die verschiedenen Bearbeitungsschritte die entsprechenden Eingabemasken bereit. Daten werden direkt dort für das entsprechende Objekt eingegeben und auf einem zentralen Server abgespeichert. Die für die Aufbereitung der Liegenschaften erforderlichen Dokumente sind standardisiert vorgegeben und werden direkt aus PAS befüllt und auf einem zentralen Laufwerk abgespeichert.

PAS gliedert sich in die Bereiche Datenverwaltung und Protokolle/Dokumente.

- Datenverwaltung
  - Der Block Datenverwaltung enthält die Auswahlfelder
  - Bestandspflege: Übersicht der aggregierten Stammdaten sowie weitergehende Eingabemasken
  - Termincontrolling: terminliche Steuerung des Aufbereitungsprozesses der Liegenschaften
  - Datenabgleich flimas: Schnittstelle zu dem Geoinformationssystem flimas

- Protokolle/Dokumente

Hinter diesem Reiter sind die prozessrelevanten Dokumente der Objekterfassung, -analyse und Verwertungsaufbereitung hinterlegt. Darüber hinaus ist in der der Dokumentverwaltung ein Dokumentmanagement realisiert, das sämtliche aus PAS heraus generierte Dokumente verlinkt, so dass diese bequem von dort aus geöffnet werden können. Durch einen umfassenden Datenexport werden die in PAS enthaltenen Daten in Form standardisierter Berichte ausgegeben.

6.4 Systemdetails zum PortfolioAnalyseSystem (PAS)

Die Bestandspflege enthält zunächst die wesentlichen Informationsgrundlagen der Liegenschaften, die aus den führenden Systemen aggregiert dargestellt werden. Diese zentrale Ansichtsmaske erlaubt lediglich die Imformationsanzeige zu den entsprechenden Liegenschaften – eine Änderung von diesen aus führenden Systemen übernommenen Daten ist hier nicht möglich.

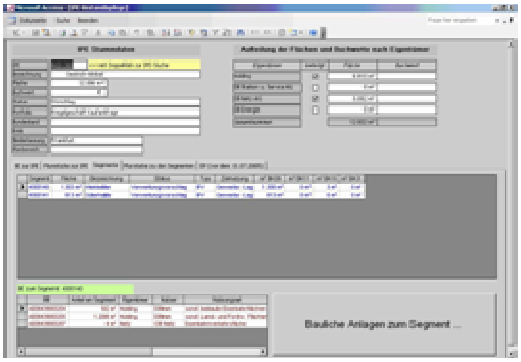

Abbildung 11: Stammdatenmaske

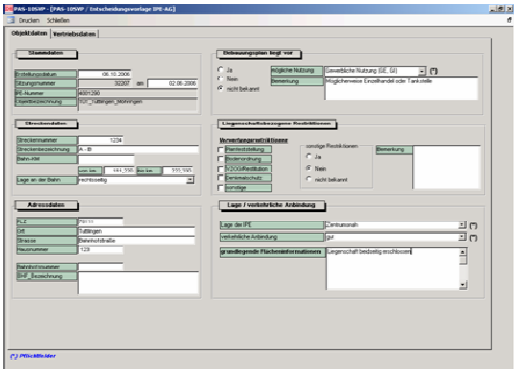

Abbildung 12: Objektanalyse

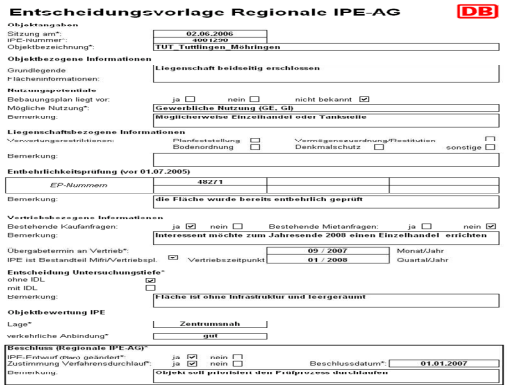

Abbildung 13: Generiertes Dokument

Abbildung 14: Termincontrolling

Durch diese zentrale Übersichtsmaske sind bereits einige wesentliche Liegenschaftsinformationen wie Verortung, Portfoliocluster, Flächengröße und Buchwerte ersichtlich.

Für eine umfassende Transparenz über den Liegenschaftsbestand sowie Informationen zum Verwertungsprozess ist eine weitergehende Informationserhebung erforderlich. Diese Informationen werden in den dafür vorgesehenen Eingabemasken erhoben. Diese Maken sind modular aufgebaut und orientieren sich an dem in definierten Stufen gegliederten Aufbereitungsprozess.

Die Objektdaten werden durch eine Vielzahl weitergehender Objektinformationen wie Adressdaten, Angaben zu Bebauungsplänen, Restriktionen und mögliche Nutzung, Lage sowie grundlegenden Flächeninformationen ergänzt. Darüber hinaus werden vertriebsrelevante Informationen wie möglicher Verwertungoptionen und Verwertungshorizont mit aufgenommen. Diese Informationsverdichtung ist mehrstufig aufgebaut und durchläuft einen Prüfprozess, der einerseits die Entbehrlichkeit einer Liegenschaften von bahnbetriebszwecken feststellt. Andererseits wird durch die erhobenen Informationen Transparenz über sämtliche Bahnliegenschaften hergestellt. Durch weitergehende Datenerhebungen wie das Erstellen einer Wirtschaftlichkeitsbetrachtung und das Einholung von Wertermittlungen kann auf Grundlage der erarbeiteten Datenbasis in PAS eine gesichterte Verwertungsentscheidung von Liegenschaften unter Berücksichtigung der wirtschaftlichen Auswirkungen getroffen werden. Somit stellt PAS eine wesentliche Grundlage im Rahmen der zu erstellenden vertriebsvorgelagerten Tätigkeiten dar. Durch ein integriertes Dokumentenmanagement, werden sämtliche entscheidungsrelevanten Dokumente, die aus dem System generiert werden dauerhaft und nachvollziehbar gespeichert.

Da die Liegenschaften mehrstufige Prüfprozesse durchlaufen, ist in PAS ein Termincontrolling realisiert, dass den Aufbereitungsstand zu den einzelnen Liegenschaften und die Laufdauer in den Prozesstufen dokumentiert. Neben der Transparenz zum Liegenschaftsbestand trägt PAS somit zu einer Transparenz im Entscheidungsprozess beim Verkauf von Bahnliegenschaften und deren Aufbereitungsprozess maßgeblich bei. Schwachstellen in der Aufbereitung lassen sich sicher erkennen.

7 CHANCEN UND GRENZEN DER ÜBERTRAGBARKEIT VON PAS

Bei dem PortfolioAnalyseSystem handelt es sich um eine Eigenentwicklung der DB Services Immobilien GmbH. Die Vielfalt der DV-Systeme, deren Restriktionen sowie der heterogene Immobilienbestand mit den daraus resultierenden Besonderheiten war zunächst ausschlaggebend für die Realisierung eines Systems in Eigenentwicklung. PAS ist maßgeschneidert für die Bedürfnisse der Deutschen Bahn AG im Immobilienmanagement, vor allem ermöglicht es die laufende Informationsverdichtung, die Steuerung der Aufbereitungsprozesse und erlaubt eine wesentlich vereinfachte Aufstellung der Planung über den Mittelfristzeitraum. Als In-house-Realisierung sind gerade die Kosten für die langfristigen Anwendung äusserst günstig verglichen mit herkömmlichen DV-gestützen Portfolioanalysetools, die insbesondere aus der Wohnungs- und Büroimmobilienverwaltung bekannt sind. Zudem besteht jederzeit die Möglichkeit, Prozessveränderungen und Systemanforderungen in PAS umzusetzen.

Auch wenn PAS als Anwendungsinstrumentarium für die Portfoliosteuerung aufgrund der spezifischen Anforderungen der DB AG so kaum auf vergleichbare Bestandshalter übertragbar ist, kann doch festgehlaten werden, dass a) diese Bestandshalter im Hinblick auf die Transparenz zum Liegenschaftsbestand vor ähnlichen Herausforderungen stehen werden wie das Operative Portfoliomanagement bei der DB Services Immobilien GmbH, dass b) „Produkte von der Stange“ ihnen nur begrenzt weiterhelfen, dass c) ähnliche

Analyseschritte zur Konsolidierung der internen DV-Systeme durchzuführen sind und dass d) eine erfolgreiche und zielführende Umsetzung eines integrierten Systems zum Immobilienmanagement eine klare Zieldefinition voraussetzt. In diesem Sinne tauscht die DB Services Immobilien GmbH ihre Erfahrung bei der Entwicklung und Anwendung des PortfolioAnalyseSystem gerne mit Bestandshalter umfangreicher Immobilienbestände aus, die an der Etablierung vergleichbarer Lösungen interessiert sind.

🏆 *reviewed paper*

Auswirkungen von Flughäfen auf den Immobilienmarkt – Erkenntnisse einer Kaufpreisanalyse für das Marktsegment „individuelles Wohnen“

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1 EINLEITUNG

Im Zusammenhang mit der Zunahme des Luftverkehrs nehmen die Diskussionen über negative Auswirkungen von Flughäfen immer mehr zu (z.B. Ausbau des Flughafens Berlin-Schönefeld, Änderung der Flugrouten am Flughafen Zürich und der Bau einer neuen Landebahn in Frankfurt am Main). Aus diesem Grund gewinnt die Frage, inwieweit sich Flughäfen auf die Werte von Immobilien auswirken, immer stärker an Bedeutung.

Doch bei der Diskussion dieser Frage wird oft unterschlagen, dass Flughafenstandorte sehr unterschiedliche “Beziehungen“ zu ihrem direkten Umfeld, den umgebenden Kommunen und zur Region, in der sie liegen, entwickeln. Flughäfen wirken sich sowohl durch negative (z.B. Lärm) als auch durch positive Einflüsse (z.B. Impulse für den Arbeitsmarkt) auf die verschiedenen Immobilienmarktsegmente aus, wobei sich beide Einflüsse auch überlagern können.[35] Ferner weisen die Einflüsse in räumlicher Hinsicht eine unterschiedliche Wirksamkeit auf. Die Ausstrahlungen der positiven Einflüsse eines Flughafens reichen oftmals weiter als die der negativen Einflüsse. Diese Einflüsse sind noch nicht tiefer untersucht, insbesondere quantifiziert worden.

Die Umgebung kann auf unterschiedliche Weise und Intensität von einem Flughafen profitieren. So besteht beispielsweise durchaus eine hohe Attraktivität für international bzw. überregional agierende Gewerbe- und Dienstleistungsbetriebe aufgrund der sehr guten Verkehrslage und zusätzlicher Infrastrukturangebote.

Auch die negativen Auswirkungen eines Flughafens zeigen sich in unterschiedlichem Ausmaß; sie lassen sich zumeist auf Belastungen durch den Flughafenbetrieb zurückführen. Die Belastungen werden dabei zu einem großen Teil durch den nicht unerheblichen Lärm startender und landender Flugzeuge hervorgerufen. Diese Belastungen im Umfeld eines Flughafens können bei Wohnimmobilien beispielsweise zu sinkender Nachfrage führen und insoweit deren Wert beeinflussen. Bisher liegen aber noch keine aussagefähigen Untersuchungen vor, wie dieser Lagefaktor quantifiziert werden kann.

Im folgenden Beitrag wird am Beispiel des Marktsegmentes „individuelles Wohnen“ (Einfamilienhäuser) aufgezeigt, welche Größenordnung der Einflussfaktor Fluglärm für das untersuchte Marktsegment im Bereich des Flughafens Hannover-Langenhagen erreicht.

2 BISHERIGE STUDIEN

Die bisher zum Thema Flughäfen und Immobilienwerte durchgeführten Studien und Untersuchungen36 basieren zumeist auf Bodenrichtwertanalysen und / oder Maklerbefragungen und versuchen in der Regel lediglich den Einfluss von Fluglärm auf die Werte von Immobilien zu quantifizieren. Statistische Analysen von Bodenrichtwerten haben allerdings gezeigt, dass es nicht ausreicht, die Auswirkungen von Flughäfen wie beispielsweise den Einfluss des Fluglärms auf Immobilienwerte über Bodenrichtwerte zu quantifizieren. Die einzelnen Einflussgrößen wirken sich nur in der Gesamtheit mit anderen, die Qualität einer Immobilie bestimmenden Einflüssen aus; einzelne Einflüsse lassen sich im Rahmen von Bodenrichtwertanalysen aufgrund der methodisch bedingten Einschränkungen hinsichtlich des vorhandenen Datenbestandes in der Regel nicht isolieren. Aus den bisher vorliegenden Maklerbefragungen können aufgrund methodischer Unzulänglichkeiten und des fehlenden bzw. nur scheinbar hergestellten Marktbezuges ebenfalls keine brauchbaren quantitativen Aussagen bezüglich der Auswirkung von Fluglärm auf den Immobilienmarkt abgeleitet werden.[37]

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[35] Homa/Weigt: Analyse von Immobilienpreisänderungen im Umfeld des Flughafens Frankfurt/M., Vortrag beim Regionalen Dialogforum, 17. Juni 2005.

[36] beispielsweise von Kampe, Kühling, Dr. Uherek sowie Thießen und Schnorr.

[37] Weigt: Auswirkungen von Flughäfen auf die Entwicklung des Immobilienmarktes unter besonderer Berücksichtigung des Fluglärms; Vortrag im Rahmen des Geodätisches Kolloquium an der Technischen Universität Darmstadt, 2. Februar 2006.

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Aus methodischen Gründen und aus Gründen des Marktbezuges ist vielmehr zu fordern, dass bei der Ermittlung des Einflusses von Fluglärm auf Immobilienwerte originäre Marktdaten (Kaufpreise unbebauter und bebauter Grundstücke) analysiert werden.

3 MODELLBILDUNG

Bisher liegen noch keine aussagefähigen Kaufpreisanalysen vor, die die Auswirkungen von Flughäfen auf die Entwicklung des Immobilienmarktes erfassen. Daher sind detaillierte Untersuchungen der Auswirkungen von Flughäfen auf den Wert von Immobilien mit Hilfe von Kaufpreisanalysen noch eine Aufgabe, die es wissenschaftlich zu behandeln gilt.

Im Folgenden wird ein Modell vorgestellt, das einen direkten Bezug zwischen Flughäfen und Immobilienpreisen unter besonderer Berücksichtigung des Fluglärms herstellt und auf originären Marktdaten des regionalen Immobilienmarktes (Kaufpreise von unbebauten und bebauten Grundstücken) basiert. In das Modell sind Erfahrungen aus zwei Fallstudien, die am Beispiel internationaler Flughäfen in Deutschland (Köln/Bonn und Hannover-Langenhagen) durchgeführt worden sind, eingeflossen. Dabei sind rund 15.000 Kaufpreise unter Verwendung der Cluster- und multiplen Regressionsanalyse auf Signifikanz maßgeblicher Einflussgrößen untersucht worden.

3.1 Einflussgrößen

Für die Kaufpreisanalyse mussten zunächst die zu analysierenden Marktdaten (Kaufpreise) beschafft und die maßgeblichen Einflussgrößen bestimmt und erfasst werden. Die den Preis von Immobilien beeinflussenden Einflussgrößen lassen sich den drei Qualitätskomponenten

- Lage,
- Nutzbarkeit und
- Beschaffenheit

zuordnen (vgl. Abbildung 1). Diese drei Komponenten berücksichtigen die Gesamtheit aller preisbeeinflussenden physischen, rechtlichen und wirtschaftlichen Merkmale und Eigenschaften eines Grundstückes.[38]

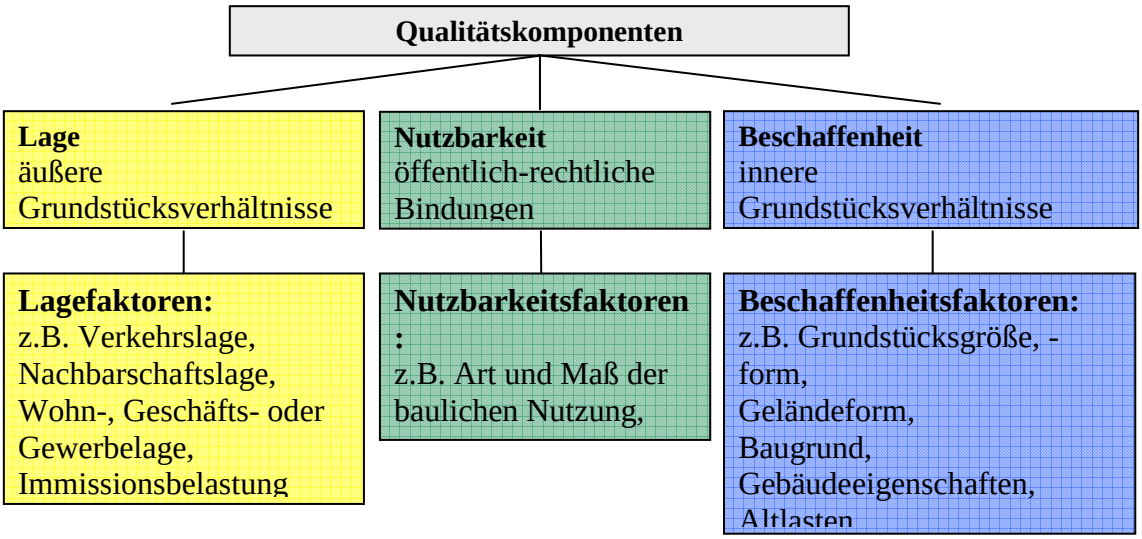

Abbildung 1: Qualitätskomponenten

Unter der **Lage** eines Grundstückes werden seine örtlichen Nutzungsbeziehungen zu anderen Grundstücken sowie zu Einrichtungen des öffentlichen Lebens (z.B. Schulen, Stadtzentrum, Bahnhof) verstanden. Sie beschreibt somit die äußeren Verhältnisse eines Grundstückes und wird geprägt durch die

[38] vgl. Seele: „Zur Methodik bei der Wertermittlung bebauter Gewerbe- und Industriegrundstücke“, Der öffentliche bestellte und vereidigte Sachverständige, 6/1988 S. 140ff.

Verkehrsanbindung (Verkehrslage), die Nachbarschaftslage, die Wohn- und Geschäftslage sowie die Umwelteinflüsse (Immissionslage).[39]

Einige Aspekte der Qualitätskomponente Lage sind nur sehr schwer anhand konkreter Zahlenwerte oder fest definierter Skalen zu quantifizieren und in Kaufpreisanalysen zu berücksichtigen. So sind die Nachbarschafts- und Wohnlage zu einem großen Teil durch ein Zusammenwirken zahlreicher, oft von subjektiven Empfindungen des Einzelnen abhängigen Faktoren geprägt. Der Einfluss der Lage kann daher bei ansonsten identischen Grundstücken zu erheblichen Unterschieden in ihren Werten führen. Z.B. stellt die Lage an einer viel befahrenen Straße aufgrund der guten Werbemöglichkeiten für einen Gewerbebetrieb einen positiven Lagefaktor, für eine reine Wohnimmobilie aufgrund erhöhter Immissionsbelastungen demgegenüber einen negativen Lagefaktor dar.

Aber auch Faktoren wie Image, Sozialstruktur, geschichtliche Entwicklung oder landschaftliche Reize eines Gebietes spielen bei der Bewertung der Lage eine wichtige Rolle, hängen aber ebenso in hohem Maße von den Vorlieben des einzelnen Marktteilnehmers ab.

Die **Nutzbarkeit** eines Grundstückes leitet sich aus den öffentlich-rechtlichen Bindungen und Beschränkungen zur baulichen und sonstigen Nutzung her.[40] Hierzu zählen Art und Maß der baulichen Nutzung gemäß BauNVO[41] sowie der erschließungsrechtliche Zustand des Grundstückes. Aufgrund klarer gesetzlicher Vorschriften ist ein Vergleich bzw. eine Unterscheidung von Grundstücken oder Baugebieten hinsichtlich dieser Nutzbarkeitsfaktoren problemlos möglich und lässt sich im Rahmen von Kaufpreisanalysen berücksichtigen.

Unter der Beschaffenheit eines Grundstückes werden die wertbildenden Faktoren tatsächlicher und rechtlicher Art, die sich aus dem Grundstück selbst ergeben, verstanden. Zu den Beschaffenheitsfaktoren tatsächlicher Art gehören u.a. die Grundstücksfläche, der Zuschnitt, Altlasten, die Qualität und Tragfähigkeit des Bodens, zu den Beschaffenheitsfaktoren rechtlicher Art zählen beispielsweise der Denkmalschutz sowie weitere grundstücksbezogene Rechte und Belastungen.

3.2 Kaufpreise

Die Gutachterausschüsse für Grundstückswerte haben gemäß § 193 Abs. 3 BauGB[42] die gesetzliche Aufgabe, eine Kaufpreissammlung zu führen und auszuwerten. Kaufpreise bilden als originäre Daten in ihrer Gesamtheit das Marktgeschehen am besten ab. Nicht zuletzt liefern Kaufpreisanalysen damit dem Grundstücksverkehr wichtige Marktinformationen und dienen so der Markttransparenz.[43] Abbildung 2 verschafft einen Überblick über die Höhe der Kaufpreise pro Wohnfläche [€/m²] für bebaute Grundstücke im Untersuchungsgebiet des Flughafens Hannover-Langenhagen.

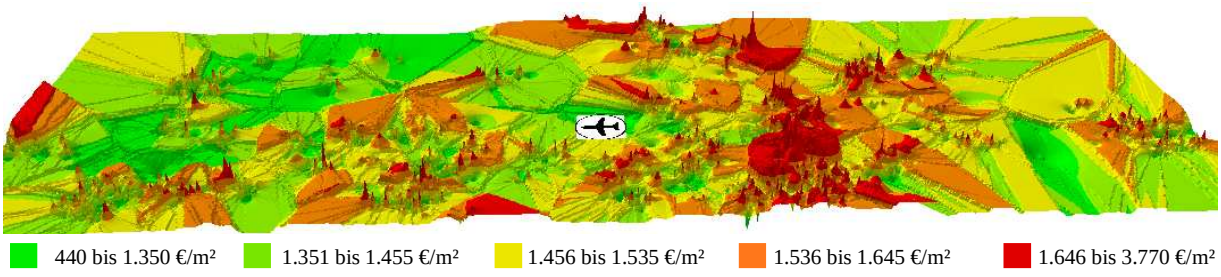

Abbildung 2: 3-D Darstellung der Kaufpreise/Wohnfläche für bebaute Grundstücke [€/m²]

39 vgl. § 5 Abs. 6 Wertermittlungsverordnung (WertV) vom 6. Dezember 1988 (BGBl. I S. 2209), geändert durch Artikel 3 des Gesetzes vom 18. August 1997 (BGBl. I S. 2081).

40 vgl. Seele, a.a.O., S. 140ff.

41 Baunutzungsverordnung (BauNVO) in der Fassung der Bekanntmachung vom 23. Januar 1990 (BGBl. I S. 133), geändert durch Artikel 3 des Gesetzes vom 22. April 1993 (BGBl. I S. 466)

42 Baugesetzbuch (BauGB) in der Fassung der Bekanntmachung vom 23. September 2004 (BGBl. I S. 2414), zuletzt geändert durch Artikel 1 des Gesetzes vom 21. Dezember 2006 (BGBl. I S. 3316)

43 Reuter, F.: Zur Problematik statistischer Vergleichsmodelle bei der Ermittlung von Verkehrswerten; in Statistische Methoden in der Grundstückswertermittlung, DVW Schriftenreihe 16/1995; S. 113ff.

3.3 Statistische Analyse

Für die statistische Analyse von Kaufpreisen liegen oftmals nicht genügend Kaufpreise vor, so dass Probleme entstehen können, wenn eine große Anzahl von Einflussgrößen zu bestimmen ist.[44] Für die im Rahmen der Fallstudien durchgeführten statistischen Analysen standen Kaufpreise aus der Kaufpreissammlung der Gutachterausschüsse für Grundstückswerte für den Bereich der Region Hannover, des Rhein-Sieg-Kreises und des Rheinisch-Bergischen-Kreises in ausreichender Anzahl zur Verfügung, so dass bei diesen Kaufpreisanalysen die Kaufpreise als Massenerscheinung im Sinne der Statistik aufgefasst werden können.

Im Folgenden werden die zur statistischen Auswertung herangezogene Cluster- und multiple Regressionsanalyse kurz vorgestellt.

3.3.1 Regressionsanalyse

Bei der statistischen Analyse der Kaufpreise geht es darum, die Beobachtungen (Kaufpreise) durch Einflussgrößen zu erklären. Das einfachste Modell zu Erklärung von Kaufpreisen liefert das Regressionsmodell. Es ist dadurch charakterisiert, dass mit Hilfe von Einflussgrößen qualifizierbare Aussagen gemacht werden können, um die vorliegenden Kaufpreise zu erklären.[45] Es wird grundsätzlich zwischen der einfachen und der multiplen Regressionsanalyse unterschieden.

Für die Prüfung der Ergebnisse der Regressionsanaylse werden

- das Bestimmtheitsmaß (R^2),
- die F-Statistik sowie
- der Standardfehler der Schätzung

herangezogen.

3.3.2 Clusteranalyse

Die hier verwendete Clusteranalyse ist ein statistisches Analyseverfahren mit dem Ziel, die Einflussgrößen auf ihre Kollinearität hin zu überprüfen und Einflussgrößen, die eine Kollinearität aufweisen, aufgrund ihrer Ähnlichkeit in eine Gruppe zusammenzufassen. Die Clusteranalyse erfolgt in drei Arbeitsschritten:[46]

- Bestimmung der Ähnlichkeit,
- Auswahl des Fusionierungsalgorithmusses und
- Bestimmung der Clusterzahl (Klassenzahl).

4 BEISPIEL FLUGHAFEN HANNOVER-LANGENHAGEN

Am Beispiel des Flughafens Hannover-Langenhagen wird die Durchführung einer Kaufpreisanalyse vorgestellt. In die Fallstudie „Hannover-Langenhagen“ sind die Erfahrungen der Kaufpreisanalyse aus der Fallstudie „Köln-Bonn“ eingeflossen. Das dort angewandte Modell wurde um die Erfahrungen, die im Rahmen der Kaufpreisanalyse gewonnen werden konnten, für die Fallstudie „Hannover-Langenhagen“ erweitert.

Die Fallstudie „Hannover-Langenhagen“ basiert auf der Analyse von Kaufpreisen, die dem Immobilienmarktsegment „individuelles Wohnen“ (Einfamilienhäuser) zuzuordnen sind.

4.1 Festlegung des Untersuchungsgebietes

In einem ersten Schritt erfolgte die Festlegung des Untersuchungsgebietes. Sie basiert auf der Ausweisung der Schutzzonen gemäß § 2 FluLärmG[47] des Flughafens Hannover-Langenhagen sowie den An- und Abflugrouten der beiden Start- und Landebahnen. Das gesamte Untersuchungsgebiet erstreckt sich über eine

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44 Koch, K.R.: Statistische Grundlagen zur Untersuchung von Immobilienwerten; in Statistische Methoden in der Grundstückswertermittlung, DVW Schriftenreihe 16/1995, S. 7.

45 ebenda, S. 8.

46 vgl. Backhaus, E.; Plinke, W.: Multivariate Analysemethoden, Springerverlag, 11. Auflage 2005, S. 492.

47 Gesetz zum Schutz gegen Fluglärm (FluLärmG) vom 30. März 1971 (BGBl. I S. 282), zuletzt geändert durch Artikel 46 der Verordnung vom 29. Oktober 2001 (BGBl. I S. 2785).

Fläche von rund 650 km² um den Flughafen, mit einer Ost-West-Ausdehnung von rund 50 km und einer Nord-Süd-Ausdehnung von rund 13 km. In Ost-West-Richtung wird das Untersuchungsgebiet durch Burgdorf im Osten und Wunstorf-Steinhude im Westen und in Nord-Süd-Richtung durch Wedemark-Mellendorf im Norden und den nördlichen Stadtrand von Hannover im Süden begrenzt (siehe Abbildung 3).

Abbildung 3: Darstellung des Untersuchungsgebietes (Hannover-Langenhagen)[48]

4.2 Erfassung des Marktsegments „individuelles Wohnen“ (Einfamilienhäuser)

Im Untersuchungsgebiet liegen 93 Gemeinden und 9 Stadtteile der Stadt Hannover. Um die Erfassung des Marktsegments „individuelles Wohnen“ strukturiert vornehmen zu können, wurde das Untersuchungsgebiet zunächst weiter unterteilt und in 21 Übersichtskarten dargestellt. Für die Erfassung selbst wurde eine nochmalige Unterteilung auf der Basis von 132 Detailkarten (bei größeren Gemeinden bzw. Stadtteilen waren mehrere Detailkarten zu erstellen) vorgenommen. Als Grundlage für diese Unterteilungen dienten die Daten der Geoserver des Landesvermessungsamtes Niedersachsen.[49] Mit Hilfe der Detailkarten (siehe Abbildung 4) konnte nun das gesamte Gebiet in seiner baulichen Struktur erfasst werden.

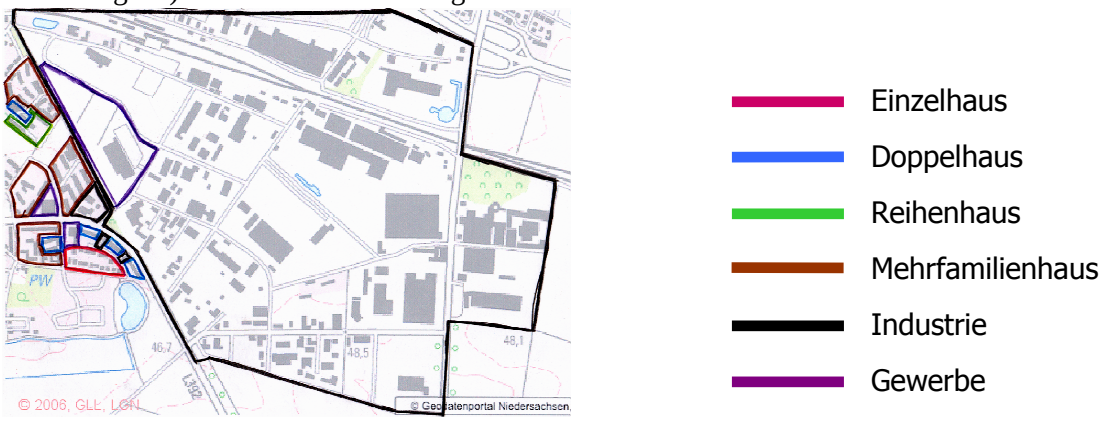

Abbildung 4: Detailkarte 11 (Wunstorf-Eichriede)[50]

Bauliche Strukturen, die nicht eindeutig zugeordnet werden konnten, wurden mit Hilfe von Luftbildern und Ortsbesichtigungen klassifiziert. Die gewonnenen Informationen dieser Bestandsaufnahme sind in die Detailkarten eingetragen und in einer Excel-Tabelle festgehalten worden.

4.3 Erfassung der Einflussgrößen

Nach der Festlegung des Untersuchungsgebietes und der Erfassung des Marktsegements „indivduelles Wohnen“ (Einfamilienhäuser) wurden im nächsten Schritt die maßgebenden preisbeeinflussenden

48 Quelle: http://geoportal.geodaten.niedersachsen.de/organizer/, 03.10.2006.

49 www.geodaten.niedersachsen.de und www.lgn.niedersachsen.de, 03.10.2006.

50 www.geoportal.geodaten.niedersachsen.de/?Action_Layer_Display=process&Map_name=test_map-bkg, 03.10.2006 und eigene Bearbeitung.

Einflussgrößen erhoben. Gebäudespezifische Einflussgrößen (z.B. Wohnfläche) wurden - bei bebauten Grundstücken - für jeden Kaufpreis bestimmt, während die nicht gebäudespezifischen Einflussgrößen aus verfahrensökonomischen Gründen bezogen auf Bodenrichtwertzonen bestimmt wurden. Dies ist möglich, da jeder Kaufpreis eindeutig einer Bodenrichtwertzone zugeordnet werden kann und mit dieser Vorgehensweise eine für die Kaufpreisanalyse ausreichende Genauigkeit bei der Bestimmung der Einflussgrößen gewährleistet ist. Für die statistische Analyse sind bis zu 26 Einflussgrößen erfasst und ausgewertet worden. Die Erfassung der Einflussgrößen soll beispielhaft an den Lagefaktoren „Verkehrslage“ und „Immissionslage“ beschrieben werden.

Die Verkehrslage setzt sich aus verschiedenen Einflussgrößen zusammen. Es wird dabei zwischen der äußeren und der inneren Verkehrslage unterschieden.

- Die äußere Verkehrslage beschreibt die allgemeine Lage zum Straßen- und Schienennetz sowie die Lage zu größeren Städten (Mittel-, Oberzentren). Zur Bestimmung der äußeren Verkehrslage wurden u.a. die Erreichbarkeit des nächsten Fernbahnhofs, des nächsten Mittel- und des nächsten Oberzentrums mit dem motorisierten Individualverkehr sowie die Erreichbarkeit des nächsten Fernbahnhofs mit dem öffentlichen Personennahverkehr (ÖPNV) erfasst.
- Die innere Verkehrslage beschreibt den Anschluss an das übergeordnete innerörtliche Verkehrsnetz und an das ÖPNV-Netz, die Erreichbarkeit von Bildungseinrichtungen (z.B. Kindergärten, Schulen) und das Vorhandensein von Dienstleistungsbetrieben und Einkaufsmöglichkeiten. Für die Kaufpreisanalyse ist die innere Verkehrslage über die Entfernung zu Bildungseinrichtungen erfasst worden.

Für die Bestimmung der Erreichbarkeit mit dem Individualverkehr wurde der Internet-Routenplaner Map 24[51] genutzt, im Hinblick auf die Erreichbarkeit bei ÖPNV Nutzung auf die Internetseite Fahrplanauskunft für Niedersachsen und Bremen (EFA) zurückgegriffen.[52] Nach der Erfassung der Daten sind zur Bewertung der Fahrzeiten vier Klassen (sehr gut, gut, mittel und schlecht) gebildet worden. Diesen qualitativen Einstufungen sind entsprechende Zeitintervalle zugeordnet worden.

Zur Erfassung der Immissionslage ist sowohl der Grundlärm als auch der Fluglärm als Einflussgröße aufgenommen worden.

- Der Grundlärm setzt sich aus einer Reihe von Lärmquellen (Straßen- und Schienenverkehrslärm, Industrie- bzw. Gewerbelärm sowie Freizeitlärm) zusammen. Die Berechnungen des Grundlärms wurden getrennt für den Tag (siehe Abbildung 5) und die Nacht durch das niedersächsische Umweltministerium zur Verfügung gestellt. Für die statistische Analyse erfolgt eine Unterteilung in acht Klassen von unbelastet bis sehr schädlich.

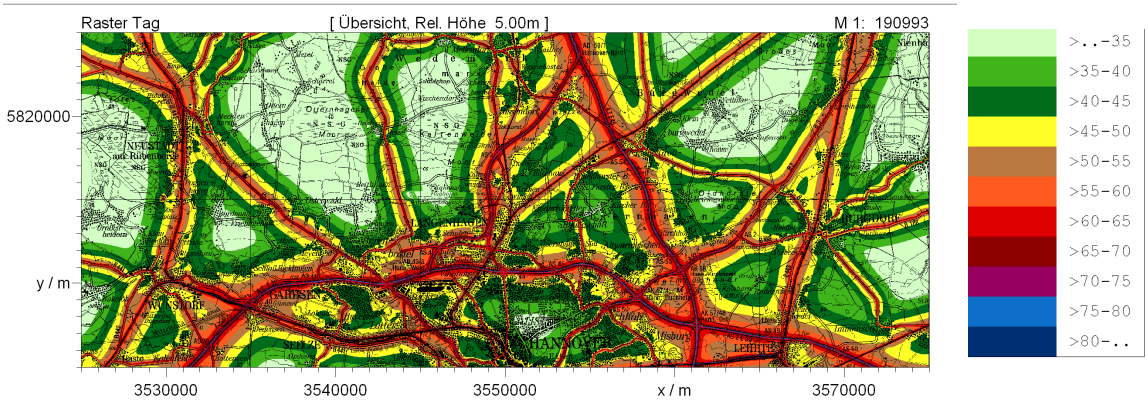

Abbildung 5: Grundlärmkarte (Tag)

- Zum Fluglärm zählen die durch den eigentlichen Flugbetrieb, insbesondere durch Starts und Landungen, beim An- und Abflug sowie beim Überflug auftretenden Schallemissionen, also sämtliche Geräusche eines Luftfahrtzeuges während des Betriebes am Boden (z.B. Rollgeräusche, Schubumkehr und Triebwerksprobeläufe) und in der Luft. Zur Ermittlung des Fluglärms (Tag und

51 http://www.de.map24.com, 13.12.2006

52 http://www.efa.de, 13.12.2006

Nacht) wurde ebenfalls auf die Daten des niedersächsischen Umweltministeriums[53] zurückgegriffen (siehe Abbildung 6). Für die statistische Analyse erfolgt eine Differenzierung in fluglärmbelastete (> 51 dB(A)) und fluglärmunbelastete (≤ 51 dB(A)) Bereiche.

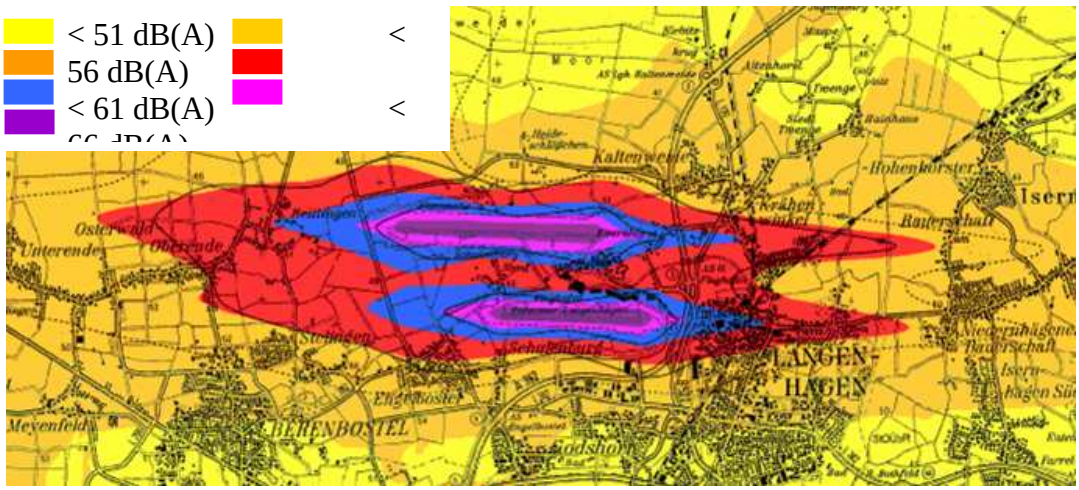

Abbildung 6: Ausschnitt aus der Fluglärmkarte (Tag)[54]

4.4 Kaufpreisanalyse des Marktsegments „individuelles Wohnen“ (Einfamilienhäuser) für den Einflussfaktor Fluglärm

Im Folgenden wird die Kaufpreisanalyse für das Marktsegment „individuelles Wohnen“ (Einfamilienhäuser) vorgestellt, hier sind nur Kaufpreise von bebauten Grundstücken berücksichtigt worden. Dabei sind zunächst zwei Modelle iterativ berechnet worden; das

- Gesamtmodell (mit allen Kaufpreisen) und das
- fluglärmunbelastete Modell (mit den fluglärmunbelasteten Kaufpreisen).

Das Gesamtmodell dient sowohl der Überprüfung, ob sich Fluglärm signifikant (wertmindernd) auf Kaufpreise auswirkt, als auch der Überprüfung der Modellgüte. Die Berechnung des fluglärmunbelasteten Modells ist notwendig, um die Größenordnung der Wertminderung durch den Einflussfaktor Fluglärm zu bestimmen. Für die Berechnung der Modelle stand eine ausreichende Anzahl von Kaufpreisen zur Verfügung (siehe Tabelle 1). Die 4.571 Kauffälle verteilen sich auf 90 Bodenrichtwertzonen im Untersuchungsgebiet, von denen 28 Zonen fluglärmbelastet sind.

	gesamt	unbelastet	belastet
bebaute Grundstücke < 300.000 €	4.226	3.104	1.122
bebaute Grundstücke ≥ 300.000 €	345	240	105

Tabelle 1: Anzahl der ausgewerteten Kaufälle bebauter Grundstücke im Untersuchungsgebiet Hannover-Langenhagen

Aufgrund der großen Spannbreite von rund 41.000 € bis rund 1.000.000 € in den Kaufpreisen erfolgte eine Unterteilung der Kaufpreise in eine Klasse < 300.000 € und eine Klasse ≥ 300.000 €.

Im ersten Schritt der Kaufpreisanalyse wurde eine Clusteranalyse für die bebauten Grundstücke, deren Kaufpreis unter 300.000 € liegt, durchgeführt (26 Einflussgrößen). Die Durchführung der Clusteranalyse ist aufgrund möglicher Ähnlichkeiten einzelner Einflussgrößen, die den funktionalen Zusammenhang zwischen den Kaufpreisen und den Einflussgrößen verzerren können, notwendig. Für die Analyse der Ähnlichkeit zwischen den Einflussgrößen wurde das hierarchische Ward-Verfahren verwendet. Da die vorhandene Datengrundlage eine große Streuung in den Einflussgrößen[55] aufwies, war eine Standardisierung[56] erforderlich, die mit Hilfe von SPSS durchgeführt wurde.

53 http://www.umwelt.nierdersachsen.de, 15.10.2006

54 http://www.umwelt.niedersachsen.de/master/C8612741_N600_L20_D0_I598.html, 15.10.2006

55 So geht die Entfernung zum Mittelzentrum mit Werten von 0 bis 15,7 und die Einwohnerzahl mit Werten von 136 bis 33.398 in die Analyse ein.

Durch die Clusteranalyse haben sich elf Gruppen aus den ursprünglich 26 Einflussgrößen ergeben. So wurde beispielsweise durch die Clusteranalyse festgestellt, dass die Einflussgrößen Grundlärm_Tag und Grundlärm_Nacht eine hohe Ähnlichkeit aufweisen und durch die Einflussgröße Grundlärm_Tag repräsentiert werden.

In einem zweiten Schritt wurden die zusammengefassten Einflussgrößen mit Hilfe der multiplen Regressionsanalyse einer statistischen Analyse unterzogen. Die aus einem ersten Iterationsschritt resultierende Regressionsfunktion wurde zur Überprüfung der Güte des Datenbestandes genutzt. Ziel dieser Prüfung ist es, Ausreißer zu ermitteln und für die weiteren iterativen Schritte der Regressionsanalyse aus dem Datenbestand zu löschen. Durch die Iterationen soll eine höhere Genauigkeit des funktionalen Zusammenhangs erreicht werden.

Die ermittelte **Regressionsfunktion des Gesamtmodells** lautet:

$$\begin{aligned} Kaufpreis = & -609.817{,}268 - 6{,}011 * Kaufzeitpunkt - 5.765{,}462 * Gebäudeart \\ & + 776{,}239 * Baujahr + 707{,}890 * Wohnfläche \\ & + 2.079{,}871 * Ausstattung - 5.960{,}350 * Fluglärm\_Tag \\ & + 0{,}114 * Einwohnerzahl + 2.333{,}115 * Kindergarten \\ & - 1.531{,}365 * Oberzentrum \end{aligned} \quad (1)$$

Kenngrößen zur Regressionsfunktion des Gesamtmodells	
korrigiertes Bestimmtheitsmaß	rund 63 %
F-Wert	rund 700
Standardfehler der Schätzung	rund 24.000 €
⇨ entspricht einer Abweichung vom mittleren Kaufpreis von rund 12 %	

Tabelle 2: Kenngrößen zur Regressionsfunktion des Gesamtmodells

Die ermittelte **Regressionsfuktion des fluglärmunbelasteten Modells** lautet:

$$\begin{aligned} Kaufpreis = & -622.723{,}556 - 6{,}015 * Kaufzeitpunkt - 5.986{,}074 * Gebäudeart \\ & + 796{,}208 * Baujahr + 710{,}775 * Wohnfläche \\ & + 1.906{,}481 * Ausstattung - 290{,}765 * Mittelzentrum \\ & + 2.538{,}557 * Kindergarten - 1.594{,}156 * Oberzentrum \end{aligned} \quad (2)$$

Kenngrößen zur Regressionsfunktion des fluglärmunbelasteten Modells	
korrigiertes Bestimmtheitsmaß	rund 64 %
F-Wert	rund 610
Standardfehler der Schätzung	rund 23.500 €
⇨ entspricht einer Abweichung vom mittleren Kaufpreis von rund 12 %	

Tabelle 3: Kenngrößen zur Regressionsfunktion des fluglärmunbelasteten Modells

Die Güte der ermittelten Funktionen (siehe Tabelle 2 und 3) kann aufgrund ihrer statistischen Kenngrößen

- Bestimmtheitsmaß,
- F-Statistik und
- Standardfehler der Schätzung

als gut bezeichnet werden. Die Funktionen sind insofern geeignet, den Einfluss des Fluglärms auf Kaufpreise darzustellen.

Für die Ermittlung des quantitativen Einflusses des Fluglärms wurde zunächst mit jeder der beiden Regressionsfunktionen zu jedem Kaufpreis ein Modellkaufpreis berechnet, die prozentuale Abweichung

[56] Hierbei erfolgt eine Transformation der unterschiedlich skalierten Zahlenwerte in einen einheitlichen Wertebereich von 0 bis 1.

jedes Kaufpreises zum zugehörigen Modellkaufpreis gebildet und die Mittelwerte (I - IV) der Abweichungen berechnet (siehe Tabellen 4 und 5).

Gesamtmodell	
I Mittelwert der Abweichungen der fluglärmunbelasteten Kaufpreise von den Modellkaufpreisen	**II** Mittelwert der Abweichungen der fluglärmbelasteten Kaufpreise von den Modellkaufpreisen
0,3 %	0,5 %

Tabelle 4: Güte des Gesamtmodells für bebaute Grundstücke < 300.000 €

Die Mittelwerte der Abweichungen im Gesamtmodell (I und II) waren sehr gering; sie ergaben sich zu rund 0,3 % bzw. 0,5 %. Der geringe Unterschied dieser Mittelwerte lässt auf eine hohe Güte der Regressionsfunktion des Gesamtmodells schließen.

Fluglärmunbelastetes Modell	
III Mittelwert der Abweichungen der fluglärmunbelasteten Kaufpreise von den Modellkaufpreisen	**IV** Mittelwert der Abweichungen der fluglärmbelasteten Kaufpreise von den Modellkaufpreisen
-1,5 %	-4,8 %

Tabelle 5: Quantifizierung des Einflussfaktors Fluglärm für bebaute Grundstücke < 300.000 €

Der Mittelwert III lag bei -1,5 %. Daraus lässt sich schließen, dass die Regressionsfunktion des fluglärmunbelasten Modells ebenfalls eine ausreichend hohe Güte aufweist. Der Mittelwert IV ergab sich zu rund -4,8 %. Hinsichtlich dieses Mittelwerts ist zu beachten, dass die hier berechneten Modellkaufpreise fiktiv fluglärmunbelastet sind.[57] Der Mittelwert IV repräsentiert - die Abweichungen wurden über die Differenzen zwischen fluglärmbelasteten Kaufpreisen und den zugehörigen (fiktiv) fluglärmunbelasteten Modellkaufpreisen gebildet - den Einfluss des Fluglärms. Allerdings muss dieser Wert noch um Modellungenauigkeiten bereinigt werden. Dazu wird die Differenz zwischen dem Mittelwert III und IV gebildet, wodurch die Modellungenauigkeiten weitestgehend eliminiert werden und sich die Größenordnung der Wertminderung des Einflussfaktors Fluglärm zu rund 3,5 % bestimmt.

5 FAZIT

Für das Marktsegment „individuelles Wohnen“ (Einfamilienhäuser) hat die Kaufpreisanlayse für bebaute Grundstücke unter Verwendung der Clusteranalyse und der multiplen Regressionsanalyse ergeben, dass die Kaufpreise der bebauten Einfamilienhausgrundstücke in dem Untersuchungsgebiet um den Flughafen Hannover-Langenhagen signifikant durch den Faktor Fluglärm beeinflusst werden.

- Die ermittelte Größenordnung der Wertminderung des Einflussfaktors Fluglärm beträgt für bebaute Grundstücke mit einem Kaufpreis < 300.000 € rund 3,5%.
- Für bebaute Grundstücke mit einem Kaufpreis ≥ 300.000 € beträgt die ermittelte Größenordnung der Wertminderung des Einflussfaktors Fluglärm rund 7,5%.[58]

Diese Ergebnisse können jedoch aufgrund der eingangs angesprochenen Tatsache, dass Flughafenstandorte sehr unterschiedliche “Beziehungen“ zu ihrem direkten Umfeld, den umgebenden Kommunen und zur Region, in der sie liegen, entwickeln, nicht grundsätzlich verallgemeinert werden. Die Kaufpreisanalysen der angesprochenen Fallstudien „Hannover-Langenhagen“ und „Köln/Bonn“ haben vielmehr gezeigt, dass die Auswirkungen von Flughäfen auf die verschiedenen regionalen Immobilienmärkte sich nicht einheitlich darstellen. Insofern bedarf jeder Flughafen einer gesonderten Betrachtung. Weiterhin ist es wichtig, die verschiedenen regionalen Immobilienmarktsegmente hinsichtlich der Auswirkungen von Flughäfen auf den entsprechenden Immobilienmarkt zu untersuchen. Insofern ist es notwendig und auch vorgesehen, weitere

[57] Dadurch, dass die Modellkaufpreise mit den Einflussgrößen der fluglärmbelasteten Kaufpreise im fluglärmunbelasteten Modell berechnet wurden, und damit der Fluglärmeinfluss herausfällt, beinhalten die Modellkaufpreise keinen Fluglärmeinfluss mehr.

[58] vgl. Weigt: Auswirkungen von Flughäfen auf den Immobilienmarkt am Beispiel des Marktsegmentes „individuelles Wohnen“, erscheint in Kürze in FuB.

Flughafenstandorte und Immobilienmarktsegmente wie beispielsweise den Flughafenstandort Hamburg und die Immobilienmarktsegmente Mehrfamilienhäuser, Bürogebäude und flughafenspezifische Dienstleistungen einer Kaufpreisanalyse zu unterziehen.

6 LITERATURVERZEICHNIS

BACKHAUS, E.; PLINKE, W.: Multivariate Analysemethoden, Springerverlag, 11. Auflage 2005, S. 490.

Baunutzungsverordnung (BauNVO) in der Fassung der Bekanntmachung vom 23. Januar 1990 (BGBl. I S. 133), geändert durch Artikel 3 des Gesetzes vom 22. April 1993 (BGBl. I S. 466).

Baugesetzbuch (BauGB) in der Fassung der Bekanntmachung vom 23. September 2004 (BGBl. I S. 2414), zuletzt geändert durch Artikel 1 des Gesetzes vom 21. Dezember 2006 (BGBl. I S. 3316).

Gesetz zum Schutz gegen Fluglärm (FluLärmG) vom 30. März 1971 (BGBl. I S. 282), zuletzt geändert durch Artikel 46 der Verordnung vom 29. Oktober 2001 (BGBl. I S. 2785).

HOMA, U., WEIGT, D.: Analyse von Immobilienpreisänderungen im Umfeld des Flughafens Frankfurt/M., Vortrag beim Regionalen Dialogforum, 17. Juni 2005.

KAMPE, T.: Auswirkungen durch die Erweiterung eines Großflughafens auf den regionalen Grundstücksmarkt und deren Einfluss auf etwaig zu leistende Entschädigungen am speziellen Beispiel des Flughafens Berlin-Schönefeld, Diplomarbeit, (unveröffentlicht) Oktober 2002.

KOCH, K.R.: Statistische Grundlagen zur Untersuchung von Immobilienwerten; in Statistische Methoden in der Grundstückswertermittlung, DVW Schriftenreihe 16/1995.

KÜHLING, W.: Ermittlung von Boden- und Gebäudewertverlusten bei Wohneigentum durch den geplanten Großflughafen Berlin-Schönefeld, Oktober 2005.

REUTER, F.: Zur Problematik statistischer Vergleichsmodelle bei der Ermittlung von Verkehrswerten; in Statistische Methoden in der Grundstückswertermittlung, DVW Schriftenreihe 16/1995.

SEELE, W.: Zur Methodik bei der Wertermittlung bebauter Gewerbe- und Industriegrundstücke, in Der öffentliche bestellte und vereidigte Sachverständige, 6/1988.

THIEßEN, F.; SCHNORR, S.: Immobilien und Fluglärm, Chemnitz 2005.

UHEREK, H.-W.: Gutachterliche Stellungnahme zu Auswirkungen der Entwicklung des Flughafens Leipzig/Halle auf die Baulandpreise in der berührten Region – untersucht an Bodenrichtwerten –, (unveröffentlicht) 2000.

WEIGT, D.: Auswirkungen von Flughäfen auf die Entwicklung des Immobilienmarktes unter besonderer Berücksichtigung des Fluglärms; Vortrag im Rahmen des Geodätisches Kolloquium an der Technischen Universität Darmstadt, 2. Februar 2006.

WEIGT, D.: Auswirkungen von Flughäfen auf den Immobilienmarkt am Beispiel des Marktsegmentes „individuelles Wohnen“, erscheint in Kürze in FuB

Wertermittlungsverordnung (WertV) vom 6. Dezember 1988 (BGBl. I S. 2209), geändert durch Artikel 3 des Gesetzes vom 18. August 1997 (BGBl. I S. 2081).

🏆 *reviewed paper*

Beteiligungsprozesse und digitale Medien
Wikis, Weblogs & Co als neue Formen des Dialogs in der räumlichen Planung?

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1 EINLEITUNG

Beteiligungsprozesse unter Einbeziehung digitaler Medien stellen in den letzten Jahren eine neue Partizipationsform dar, die bestehende Verfahren erweitert. Der Einsatz digitaler Medien bietet die Möglichkeit, den Bürger auf eine neue Art und Weise einzubeziehen, deren planungsrelevantes Wissen verfügbar zu machen und Beteiligungsprozesse in der räumlichen Planung innovativ und neu zu organisieren.

Durch die Entwicklung des Internets vom reinen Abrufmedium zu einer Plattform, auf der sich Nutzer selbst aktiv einbringen können, bietet das Internet neben der einfachen Informationsverbreitung einen Kommunikationsraum, um mit den Bürgern in einen Austausch zu treten und kann so neue Impulse für bestehende Partizipationsformate geben.

Seit den ersten Pilotprojekten von Online-Beteiligung im Kontext räumlicher Planung in Deutschland haben sich die Kommunikationstools, die über das Informieren hinausgehen, weiterentwickelt. Neue Kommunikationstechnologien, im Kontext von Web 2.0 als „social software“ bezeichnet, werden aufgegriffen und in Beteiligungsprozessen in der räumlichen Planung angewendet.

Zu dem etablierten Kommunikationstool Forum gesellen sich nun Wikis als „Newcomer“ aus aktuellen Praxisbeispielen und Weblogs als mögliche zukünftige Kommunikationsplattformen. Mit der Erweiterung der angewendeten Kommunikationstools werden eine Klärung der Begrifflichkeiten und eine nähere Betrachtung notwendig.

- Was kann die Anwendung neuer Kommunikationstechnologien im Kontext von Beteiligungsprozessen in der räumlichen Planung leisten?
- Welche Komponenten sind für deren interaktive Gestaltung kennzeichnend?

Diese Fragen standen im Mittelpunkt einer Diplomarbeit an der Universität Hannover (SCHÄFER 2006), die aus Sicht einer Planerin die Anwendung der internetgestützten Kommunikationstools Forum, Wiki und Weblogs im Kontext informeller Beteiligungsprozessen in der räumlichen Planung anhand von Fallbeispielen untersucht hat und deren Ergebnisse die Grundlage diese Beitrags bilden.

2 RÄUMLICHE PLANUNG UND DIGITALE MEDIEN

In der räumlichen Planung kann der Einsatz digitaler Medien neue Impulse für die Gestaltung von Beteiligungsprozessen geben. Ein weiterer Kommunikationskanal wird eröffnet, den Bürger zur Information und Teilhabe nutzen können. Vor dem Hintergrund europäischer Richtlinien wie der Aarhuskonvention und dem Umweltinformationsgesetz gewinnt die Anwendung digitaler Medien zur Information, Dokumentation, Kommunikation und interaktiven Beteiligung zusätzlich an Bedeutung.

In Deutschland zeigen erste Praxisbeispiele mögliche Anwendungsfelder auf kommunaler Ebene in der formellen und informellen Planungspraxis auf. Während im formellen Bereich rechtliche Fragestellungen im Vordergrund stehen, ist im informellen Bereich ein experimenteller Einsatz digitaler Medien möglich. Der Beitrag betrachtet den Einsatz digitaler Medien im Kontext informeller Bürgerbeteiligung. In der informellen Planungspraxis zeigen Praxisbeispiele mögliche Anwendungsfelder auf, die sich in die Bereiche Leitbildentwicklung, Stadtgestaltung, Bürgerhaushalt und Planvorbereitung gliedern lassen (siehe Abb.1).

Hier finden die Kommunikationstools Diskussionsforum und Wikis ihre Anwendung. Gemeinsam mit dem Tool Weblog können diese als etablierte und zukünftige Hauptmedien informeller Online-Beteiligung im Kontext räumlicher Planung bezeichnet werden.

Als Fallbeispiele wurden die Praxisbeispiele: Online-Ideenwettbewerb zum Leitbild „Wachsende Stadt“ Hamburg (Fokus: Anwendung Diskussionsforum), Online-Dialog zur Weiterentwicklung des Kulturforums in Berlin (Fokus: Wiki-Anwendung) sowie das thematisch flankierende Online-Forum des Regionalen Dialogforum zum Flughafenausbau Frankfurt Rhein-Main (Fokus: Weblog-Anwendung) untersucht.

	Wachsende Stadt - Hamburg	Familienfreundliche Stadt - Hamburg	Familienstadt - München	Neubaugebiet - Esslingen	Alexanderplatz - Berlin	Stadionbad - Bremen	Kulturforum - Berlin	Gleisdreieck - Berlin	Mauerdialog - Berlin	Bürgerhaushalt - Esslingen	Bürgerhaushalt - Berlin	Bürgerhaushalt - Hamburg	Landschaftsplan - Königslutter	Reg FNP - Frankfurt
Information														
Veranstaltung			X	X		X		X		X	X		X	X
Kommunikation														
Versammlung	X		X	X	X	X	X	X	X	X	X		X	
Umfrage								X			X			
Ortsbegehung					X	X	X	X	X				X	
offline / online	**Leitbildentwicklung**			**Stadtgestaltung**						**Bürgerhaushalte**			**Planvorbereitung**	
Informationstool														
Bibliothek	X	X	X	X	X			X	X	X	X	X	X	X
RSS/Podcast		X						X	X	X	X	X		
Kommunikationstool														
Umfrage	X	X	X											
Diskussionsforum	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lob/Kritik-Forum	X	X	X	X	X		X	X	X	X	X	X	X	X
Chat		X	X							X				
Wiki		X	X				X	X	X		X	X		
interaktive Karten							X	X	X				X	
SMS									X					
Zeitraum	Nov 02	Okt 05	Mai 06	01	Apr 03	04	04/05	Nov 05	Jun 06	Sep 03	05	Apr 06	04/05	04
Betreuung	TuTech GmbH	TuTech GmbH	TuTech GmbH	Zebralog e.V. Fraunh. AIS	Zebralog e.V. Fraunh. AIS	ifib GmbH	Zebralog e.V.	Zebralog e.V.	Zebralog e.V.	Zebralog e.V. Fraunh. AIS	Zebralog e.V. Fraunh. AIS Difu	TuTech GmbH	entera Uni Hannover	Zebralog e.V. Fraunh. AIS

Abb.1: Stand der Anwendung internetgestützter, informeller Beteiligungsverfahren im Kontext räumlicher Planung in Deutschland

3 KOMMUNIKATIONSTOOLS – CHARAKTERISTIKA & NUTZUNGSKONZEPTE

Was macht die Kommunikationstools Diskussionsforum, Wikis und Weblogs aus? Wie unterscheiden Sie sich voneinander? Und wie funktionieren sie grundsätzlich? Grundsätzlich deshalb, da es wichtig ist, zwischen dem Tool und dem jeweiligen Nutzungskonzept zu unterscheiden. KUBICEK (1998:59) spricht in diesem Zusammenhang von Medien erster und zweiter Ordnung. Den technischen Kern, beziehungsweise das Kommunikationstool an sich, bezeichnet er als Medium erster Ordnung. Beispiele hierfür stellen die im Folgenden beschriebenen Kommunikationstechnologien dar. Sie bilden Grundlage für eine Fülle von Nutzungen. So kann ein Weblog als persönliches Tagebuch oder auch zur Diskussion von Themen und Fragestellungen konzipiert werden. Erst durch die Zuweisung eines Nutzungsformates werden die Tools in diesem Sinne nach KUBICEK zu Medien zweiter Ordnung (ebd.).

Um die Kommunikationstools für die Gestaltung von Beteiligungsprozessen in Wert zu setzen, muss es gelingen, ihnen geeignete und klar definierte Nutzungskonzepte zuzuweisen.

3.1 Diskussionsforum

Das Diskussionsforum ist als Kommunikationstool in seiner Anwendung innerhalb internetgestützter Beteiligungsverfahren etabliert. Bereits in den ersten Praxisbeispielen fand es seine Anwendung und ist auch in aktuellen Beispielen Hauptbestandteil der Verfahren.

3.1.1 Charakteristika

Die Kommunikation in einem Diskussionsforum orientiert sich an einem bestimmten Thema, findet asynchron, das heißt zeitversetzt, und in Schriftform statt. Die Diskussionsbeiträge sind in so genannten „Threads“ (Fäden) organisiert, das heißt, im thematischen Zusammenhang aufeinander verweisende Beiträge bilden einen Diskussionsstrang. Jeder Diskussionsstrang beginnt mit einem Beitrag (Posting), der ein neues Thema in die Diskussion einbringt. Gemeinsam mit Beiträgen, die sich darauf beziehen und darauf reagieren, bilden diese einen Diskussionsstrang. Dabei können zwei Typen nach der Darstellung der Beiträge unterschieden werden, was Auswirkungen auf den Nutzungscharakter haben kann. Bei der Baumstruktur

(verästelte Beitragsdarstellung) werden die Beiträge im Bezug zueinander dargestellt und alle Beiträge haben dasselbe Gewicht. Bei der Boardstruktur (listenähnliche Ansicht) kommt dem Ausgangsbeitrag viel Gewicht zu und die darauf beziehenden Beiträge haben eher den Charakter einer Stellungnahme. Zur Beteiligung an der Diskussion durch das Verfassen von Beiträgen ist in den meisten Foren eine Registrierung notwendig. Weitere Funktionen, die viele Foren anbieten, sind die Einbindung von Bildern oder „Smileys“, die Gefühlszustände wie beispielsweise Zustimmung oder Ablehnung ausdrücken. Die meisten Diskussionsforen sind in der Regel moderiert, so dass ein Moderatorenteam die Diskussion strukturiert, in dem es neue Unterforen eröffnet, Beiträge verschiebt oder löscht. Ähnlich wie bei realen Diskussionen tragen die Moderatoren auch bei internetgestützten Diskussionen entscheidend dazu bei, dass die Diskussion ergebnisorientiert, übersichtlich und lebendig verläuft.

3.1.2 mögliche Nutzungskonzepte

Die Anwendung von Diskussionsforen im Kontext räumlicher Planung dient zur Erörterung von planerischen Themen und Fragestellungen und bildet in den Praxisbeispielen eine Basisanwendung, die beispielsweise mit der Anwendung von Wikis und anderen Tools kombiniert wird. Die Anwendung moderierter Diskussionsforen dient dazu, Themen und planungsrelevantes Wissen einzufangen, indem Teilnehmer die Möglichkeit erhalten, sich in die Diskussion einzubringen und eigene Themenschwerpunkte in planerischen Kontexten zu definieren. Ein moderiertes Diskussionsforum stellt dazu den entsprechenden Kommunikationsraum zur Verfügung; die Teilnehmer füllen diesen mit Inhalt.

Die Untersuchung des moderierten Diskussionsforums im Fallbeispiel hat gezeigt, dass sich der Großteil der Beiträge aufeinander bezieht und dadurch eine Erörterung und Weiterentwicklung von Themen möglich war. Die Unterteilung der Diskussion in zeitlich aufeinander folgende Phasen mit unterschiedlichen Zielsetzungen unterstützte eine ergebnisorientierte Diskussion (LÜHRS, R. et al. 2004). Ein weiteres Ergebnis war, dass sich die Teilnehmer während des Verfahrens austauschten und so die eingebrachten Themen und Ideen vielfältig diskutiert wurden, da unterschiedliche Sichtweisen dazu eingebracht wurden.

registrierte Teilnehmer	Teilnehmer + Beitrag	Beiträge	Ideen
540	265	4.000	57

Abb.2: Nutzungszahlen des Online-Ideenwettbewerbs zum Leitbild „Wachsende Stadt“ Hamburg , 4. Nov-2. Dez 2002

Wikis und Weblogs zählen, im Gegensatz zum Kommunikationstool Diskussionsforum, zu neueren internetgestützten Kommunikationstechnologien, die mit dem Begriff Web 2.0 als eine neue Phase des Internets verbunden werden. Mit dem Begriff Web 2.0 wird eine aktive Nutzungsform des WWW bezeichnet, die durch eine Reihe interaktiver Anwendungen und einer veränderten Wahrnehmung des Internets gekennzeichnet ist und den Internetnutzer in den Mittelpunkt stellt.

3.2 Wiki

Die Anwendung von Wikis gilt in internetgestützten Beteiligungsverfahren in Deutschland als „Newcomer“. Seit 2005 wurden verschiedene Modelle des Kommunikationstools in Praxisbeispiele mit planerischem Hintergrund ausprobiert.

3.2.1 Charakteristika

Unter Wikis versteht man eine offene Sammlung von Internetseiten, die nicht nur gelesen, sondern auch von jedem online über ein Formular einfach geändert werden können. So wird ein gemeinsames Schreiben an Texten, unabhängig von Raum und Zeit, ermöglicht. Der Name Wiki ist eine Abkürzung von dem hawaiianischen Wort „wikiwiki“ und bedeutet so viel wie „schnell“.

Durch die Änderung einer Internetseite beziehungsweise eines Textes wird eine neue Version erstellt. So entstehen teilweise mehrere Versionen eines Textes, je nachdem wie häufig Änderungen vorgenommen werden. Die alten Versionen bleiben weiterhin bestehen und können eingesehen werden. Häufig gibt es die Möglichkeit, einen Vergleich zwischen Versionen vorzunehmen, um Änderungen nachzuvollziehen. Neben

der Änderung von Inhalten kann auf angegliederten Diskussionsseiten ein Austausch über vorgenommene Änderungen oder notwendige Ergänzungen stattfinden.

Das bekannteste Beispiel für die Anwendung des Kommunikationstool ist die Online-Enzyklopädie Wikipedia, in der jedermann einen Lexikonbeitrag verfassen oder andere Beiträge ändern kann. Eine nennenswerte Anwendung im Bereich räumlicher Planung sind StadtWikis, die ortsspezifisches Wissen und Informationen zu allen möglichen Themen rund um eine Stadt oder Region sammeln. Das StadtWiki der Stadt Karlsruhe gilt mit derzeit 25.600 Artikeln (Stand 18.02.2007) als größtes StadtWiki in Deutschland.

3.2.2 mögliche Nutzungskonzepte

Anwendungen unter Nutzung der Wiki-Technologie im Bereich räumlicher Planung dienen dem Ziel, die Ergebnisse internetgestützter Beteiligungsverfahren selbstständig durch die Teilnehmer in einem kollaborativem Schreibprozess zu formulieren und fordern ein hohes Maß an Interaktion. Experimentiert wurde bisher mit folgenden Formen vom gemeinsamen Schreiben: konkurrierende Wikis, ein gemeinsames Wiki und vorgegebene Themen-Wikis. Beim Nutzungskonzept der konkurrierenden Wikis sind die Teilnehmer aufgerufen, Artikel selbst zu initiieren und in Konkurrenz zueinander weiterzuentwickeln, da diese zum Abschluss durch alle Teilnehmer bewertet werden (vgl. Online-Dialog Kulturforum, Berlin). Dieses Konzept erfordert großes Engagement von den Teilnehmern und erzeugt jedoch dadurch eine hohe Identifikation der Teilnehmer mit den Ergebnissen. Ein gemeinsames Wiki (vgl. Online-Dialog Gleisdreieck, Berlin) sowie die Themen-Wikis (vgl. Mauerdialog, Berlin) werden durch die Moderation begonnen und können durch die Teilnehmer verändert werden. Bisherige Erfahrungen haben gezeigt, dass die Identifikation der Teilnehmer dabei weitaus geringer und die Aufgabe für die Teilnehmer schwer fassbar ist.

Die Anwendung der Wikis hat sich in Kombination mit einem Diskussionsforum in aktuellen Praxisbeispielen bewährt. Im Forum werden diskutierte Themen gegen Ende einer Diskussionsphase in Artikeln (Wikis) als Ergebnis durch die Teilnehmer in einem weitgehend selbst organisierten Prozess gemeinsam formuliert und konkretisiert. Die Moderation tritt bei der Wiki-Anwendung in den Hintergrund.

Die Betrachtung der Anwendung von konkurrierenden Wikis im Fallbeispiel hat ergeben, dass Änderungen am Text entweder formeller Art sind, wie beispielsweise das Verbessern eines Tippfehlers, dem Artikel neuen Inhalt hinzufügen, Textteile gelöscht werden oder im Bezug auf das Geschriebene eine Detaillierung vorgenommen wird. Ein Großteil der textlichen Änderungen war mit dem Hinzufügen von neuem Inhalt verbunden. Man kann also sagen, dass in dem Prozess des gemeinsamen Schreibens an Artikeln ein konstruktiver Umgang herrschte und sich die Änderungen nicht nur auf das Löschen von Textteilen beschränkte. In dem Beispiel konnten zusätzlich zum Text auch Grafiken und Fotografien eingebunden werden, die zur Veranschaulichung der im Artikel formulierten Ideen dienten. Auch diese grafische Ebene unterlag Änderungen, entsprechend der Modifikationen am Text. So wurden Grafiken ergänzt, gelöscht oder durch neue ersetzt. Die grafische Ebene spielte bei der Veranschaulichung räumlicher Vorstellungen eine bedeutende Rolle.

Besucher	registrierte Teilnehmer	Teilnehmer Wiki	Wikis
3.100	152	20	14

Abb.3: Nutzungszahlen des Online-Dialogs zum Kulturforum Berlin,
30. Mai-19. Jun 2005, Wiki-Anwendung 9.-16. Jun 2005

3.3 Weblog

Weblog als neue Kommunikationstechnologie ist im Begriff sich im deutschsprachigen Raum als möglicherweise zukünftige Kommunikationsplattform zu etablieren. Die möglichen Anwendungsfelder sind vielfältig. Die zukünftige Entwicklung der Anwendung in der räumlichen Planung bleibt abzuwarten.

3.3.1 Charakteristika

Ein Weblog ist eine Internetseite, auf der durch den Betreiber Einträge veröffentlicht werden, die von allen kommentiert werden können. Ein solches Weblog kann mit wenigen Klicks meist kostenlos von jedermann eingerichtet werden, der über einen Internetzugang verfügt.

Im Mittelpunkt eines Weblogs stehen einzelne Beiträge, die umgekehrt chronologisch angezeigt werden. Der neueste Beitrag steht oben, ältere Texte finden sich weiter unten oder sind in einem Archiv zugänglich. Zu jedem Beitrag können Kommentare verfasst werden, die zu dem Beitrag angezeigt werden.

Ein weiteres wichtiges Merkmal sind inhaltliche Kategorien (Tags). Diese Kategorien sind frei wählbar und ermöglichen es dem Betreiber eines Weblogs, thematisch verwandte Inhalte zu gruppieren und für die Leser zugänglich zu machen. Jeder Eintrag wird bei der Eingabe verschlagwortet und einer oder mehreren Kategorien zugeordnet. Im Weblog selbst wird dann eine Liste aller Kategorien angezeigt, so dass die entsprechenden Inhalte per Mausklick abrufbar sind. Ein charakteristisches Merkmal von Weblogs ist eine Abonnierfunktion, so genannte RSS-Feeds, die den Weblog-Leser automatisch über neue Beiträge oder Kommentare informiert. Eine weitere Eigenschaft ist die hohe Anzahl von Verlinkungen zu anderen Internetseiten und Weblogs.

Die Inhalte eines Weblogs entsprechen üblicherweise der persönlichen Meinung des Betreibers, als dass es sich um neutrale und sachliche Informationen handelt. Der Betreiber eines Weblogs bestimmt die Inhalte seines Blogs. Ein Gespräch oder eine Diskussion darüber kann in der Regel nicht entstehen.

3.3.2 mögliche Nutzungskonzepte

Auf einem Weblog lässt sich eine Vielzahl von Nutzungskonzepten abbilden, wie man in der Blogosphäre beobachten kann. Diese lassen sich in observative, partizipative und initiative Nutzungskonzepte gliedern.

Observative Nutzungskonzepte stellen beispielsweise so genannte Watch-Blogs (www.bildblog.de) dar, die eine kritische Betrachtung von Themen und Institutionen verfolgen. Als partizipativ können zum Beispiel Stadtteil-Blogs (www.hauptstadtblog.de) angesehen werden, deren Inhalte, Beiträge und Kommentare der Stadtteilbewohner zu unterschiedlichsten Themen sind. Initiative Nutzungskonzepte sind unter anderem themenspezifische Blogs, wie beispielsweise zu dem Thema Online-Beteiligung (www.demos-monitor.de).

Auch im Kontext internetgestützter Beteiligungsprozesse sind verschiedene Varianten denkbar. So kann ein Weblog als ein Diskussionsforum gestaltet sein, indem das Recht, Beiträge zu schreiben und zu kommentieren, jedem Teilnehmer übertragen wird. Oder in seiner klassischen Funktionsweise zur Abfrage von Meinungen genutzt werden. Ein neues Nutzungskonzept stellt die in Verbindung mit Weblogs häufig genutzten RSS-Feeds in den Mittelpunkt. So könnte ein Weblog nach Beendigung eines Beteiligungsverfahrens zur weiteren Berichterstattung über den Planungsfortschritt genutzt werden und den interessierten Teilnehmer weiterhin auf dem Laufenden halten.

Die Betrachtung des Fallbeispiels zeigte, dass die Anwendung eines Weblogs eine intensive Betreuung mit einer kontinuierlichen Redaktionsarbeit erfordert, um eine gewisse Aktualität der Beiträge zu gewährleisten und ein attraktives Angebot bieten zu können. Das Nutzungskonzept im Fallbeispiel zeigt auch die variable Einsatzmöglichkeit eines Weblogs auf. So können nicht nur der Betreiber des Weblogs, sondern eine Vielzahl von Akteuren, auch Bürger, Beiträge im Blog veröffentlichen. Gerade bei der Anwendung eines neuen Kommunikationstools, wie das Weblog, ist es wichtig, das jeweilige Nutzungskonzept klar zu kommunizieren, da die möglichen Umgangsformen mit der Technologie der Mehrheit der potenziellen Nutzer noch fremd ist und das Nutzungskonzept variabel ist.

Besucher	Beiträge	Kommentare	Teilnehmer
4.000	4	22	16

Abb.4: Nutzungszahlen des Online-Forums des Regionalen Dialogforums zum Flughafenausbau Rhein-Main , seit Juli 2006 (Stand 14.4.2007)

Alle drei Kommunikationstools können in ihrer Anwendung dazu genutzt werden, planungsrelevantes Wissen zu erschließen. Der Unterschied liegt in der Art und Weise, wie dies geschehen kann. Beim Diskussionsforum stehen Funktionen zur Erörterung bestimmter Themen und Fragestellungen im Vordergrund, wohingegen bei der Anwendung eines Wikis das gemeinsame Schreiben eines Textes die zentrale Funktion darstellt und ein Weblog die Funktion zur Verfügung stellt, persönliche Meinungen zu veröffentlichen, zu denen Kommentare verfasst werden können. Es ist also die Frage, welche Funktionsweise(n) für die Beteiligung von Bürgern im entsprechenden Kontext sinnvoll ist.

3.4 Begrifflichkeiten

Bei der Betrachtung der Praxisbeispiele und der Diskussion über internetgestützte Beteiligung fällt auf, dass Begrifflichkeiten im Bezug auf die Kommunikationstools häufig unscharf verwendet werden. Ein inflationärer Gebrauch von bestimmten Begrifflichkeiten wie Forum oder Chat ist festzustellen, da diese Begriffe in den meisten Fällen als erstes mit internetgestützter Kommunikation verbunden werden, ohne genau deren prinzipiellen Funktionsweisen und Anforderungen an deren Gestaltung zu kennen.

Erschwerend kommt hinzu, dass Begriffe wie Wiki oder Weblog den meisten noch nicht bekannt ist und zudem nicht selbsterklärend sind. Obwohl klassische Medien verstärkt über Web 2.0 und dessen Anwendungen berichten, sind Begriffe wie Weblogs oder Wikis bei Nicht-Internetnutzern kaum bekannt (GERHARDS & MENDE 2006: 429). Die bisherigen Internetdienste besaßen eine Entsprechung in der realen Welt. So kann sich jeder etwas unter Online-Banking oder Auktionshäusern wie EBay vorstellen. Bei den neuen Entwicklungen wie RSS-Feeds, Weblogs, Wikis oder Podcasts ist das anders, da sie mit völlig neuen Nutzungsformaten verbunden sind. Thomas Burg, Leiter des Instituts für Neue Medien an der Donau-Universität Krems, spricht in diesem Zusammenhang von einer „digitalen Spaltung zweiter Ordnung“ (SIXTUS 2005).

Aufgrund der Vielfältigkeit von Nutzungsformen eines Kommunikationstools sollten sich die Begrifflichkeiten weniger an der Technologie, sondern an den möglichen Nutzungsformen orientieren. Gerade bei der Anwendung neuer Kommunikationstechnologien wie Wikis und Weblogs ist darauf zu achten, dass Begrifflichkeiten verwendet werden, die deren zugedachte Handlungsoptionen benennen, da dies den Nutzer interessiert und nicht mit welcher Technik die Nutzung ermöglicht wird. Beispielsweise wurde im Online-Dialog zum Kulturforum die Anwendung der Wikis als „gemeinsame Artikel“ benannt. In einem anderen Beispiel bezeichnet man die Kommentare eines Weblogs als „Leserbriefe“.

Zu der Frage, was die Anwendung neuer Kommunikationstechnologien im Kontext räumlicher Planung leisten kann, hat die Untersuchung der Fallbeispiele Aufschluss geben können. Es hat sich gezeigt, dass durch die Anwendung der Tools Kommunikationsräume geschaffen werden können, in denen planungsrelevantes Wissen erschlossen und Lösungsvorschläge zu bestimmten Fragestellungen durch die Teilnehmer formuliert werden. Durch die asynchrone und mehrseitige Kommunikation wird eine zeitlich und räumlich flexible Teilnahme sowie eine parallele Erörterung unterschiedlicher Themen ermöglicht. Die ergänzende Nutzung des Internets als eine Plattform, um mit den Bürgern über Planungsvorhaben in einen Austausch zu treten, kann Planungsprozesse auf eine neue Art und Weise inhaltlich bereichern und unterstützen. Bei Betrachtung der Nutzungszahlen in den Praxisbeispielen wird deutlich, dass weitaus mehr Leute als nur die aktiven Teilnehmer mit internetgestützten Beteiligungsangeboten erreicht werden können (siehe Abb.2, 3, 4). Die im Verhältnis zu der Anzahl der registrierten Teilnehmer gering erscheinenden Beteiligungsergebnisse, sind vor dem Hintergrund zu sehen, dass diese meist von hoher Qualität sind, da sie die Essenz eines Diskussionsprozesses darstellen, in die viele verschiedene Sichtweisen eingeflossen sind. Von den Verantwortlichen in den Praxisbeispielen wurde diese besondere und neue Qualität der Beteiligungsergebnisse bestätigt. Im Gegensatz zu Pro-, Kontra-Einwendungen in formellen Verfahren stellen die Ergebnisse internetgestützter Beteiligungsangebote konstruktive Vorschläge und Ideen dar, die den Planungsprozess bereichern.

Deutlich wurde bei der Untersuchung der Fallbeispiele auch, dass nicht die Anwendung des Kommunikationstools an sich von Bedeutung ist, sondern eine Vielzahl an Komponenten für eine interaktive Toolanwendung entscheidend ist.

4 ANWENDUNGEN KOMPONIEREN – EIN FAZIT

Aus der gewonnenen Erkenntnis, dass sich das angewendete Kommunikationstool in eine Vielzahl von Komponenten einreiht, die zu einer interaktiven Anwendung beitragen, werden die gemeinsamen Grundstrukturen der Projekte für eine interaktive Anwendung der Tools erfasst und systematisch dargestellt.

Als methodische Hilfe dient hierzu ein „morphologischer Kasten“, der von Zwicky (1966) als Problemlösungs- und Forschungsschema entwickelt wurde. Die Methode definiert für eine bestimmte Fragestellung die wichtigsten Komponenten einer Lösung und deren mögliche Ausprägungen. Durch die Zerlegung des Problems in einzelne maßgebliche Einflussfaktoren (Komponenten) und die Beschreibung möglicher Ausprägungen wird eine Vielzahl von Lösungsmöglichkeiten erzeugt und strukturiert dargestellt. Dies ermöglicht sowohl die Abbildung verschiedener Lösungsmöglichkeiten als auch eine Weiterentwicklung im Sinne neuer Lösungsoptionen. (ZWICKY 1966: 52ff., RITTEL 1970: 82ff.).

Die Anwendung eines morphologischen Kastens dient also dem Ziel, die zu einer interaktiven Anwendung relevanten Komponenten der Fallbeispiele in einer vom Einzelfall abstrahierenden übersichtlichen Form darzustellen. Neben den aus den untersuchten Beispielen generierten Elementen werden weitere Bausteine ergänzt. Quellen hierfür sind die Betrachtung weiterer Praxisbeispiele, Aussagen aus Interviews sowie eigene Ergänzungen. Die Übersicht erhebt keinen Anspruch auf Vollständigkeit. Sie ist eher als offenes System zu verstehen, dessen Struktur mit weiteren Inhalten gefüllt werden kann.

Der morphologische Kasten (siehe Abb.5) stellt sich in einer Matrix dar, in der vertikal die kennzeichnenden Komponenten und in den folgenden horizontalen Spalten deren möglichen Ausprägungen angeordnet sind. Die Reihenfolge der Ausprägungen spannt sich von der linken Seite des Kastens ausgehend zwischen sehr interaktiven und wenig bis nicht interaktiven Ausprägungen auf. Nicht in jeder Spalte ist jedoch solch eine Anordnung möglich und zweckdienlich. Die Kombination interaktiver und nicht interaktiver Elemente kann durchaus sinnvoll sein.

Die Ausprägungen konzentrieren sich auf die Anwendung digitaler Medien, auch wenn zur Ausgestaltung der Komponenten in der Praxis auch klassische Medien hinzugezogen werden müssen.

Die Matrix dient dazu, die Bestandteile der in den Praxisbeispielen angewendeten Nutzungskonzepte in eine für die Konzipierung und Gestaltung von interaktiven Anwendungen sinnvolle Ordnung zu bringen. Die Übersicht soll auch im Sinne eines Komponentenbaukastens eine Orientierungshilfe für Planer sein, die ein internetgestütztes Beteiligungsverfahren gestalten möchten.

4.1 Komponentenbaukasten für eine interaktive Anwendung

KOMPONENTEN		AUSPRÄGUNGEN
1 Öffentlichkeitsarbeit	Wie erreicht man potenzielle Teilnehmer?	Verlinkung; Bannerwerbung; Anschreiben per E-Mail
2 Zweck der Anwendung Nutzungsformen	Welche Form von Kommunikation wird ermöglicht?	Vorschläge generieren; Erörterung Themen; Konflikt austragen; Fragen beantworten; Meinung abfragen; Thema bekannt machen Vorschläge formulieren; Bezugnahme; Meinung mitteilen; Potenziale nennen; Hemmnisse nennen; Ärger mitteilen; Zustimmung mitteilen; Ablehnung mitteilen; Fragen stellen; Lesen
3 Codierung der Kommunikation	Mit welchen Mitteln kann kommuniziert werden?	Text; Grafik; Plan; 3D; Foto; Audio; Video
4 Technologie	Auf welcher Grundlage wird Konzept abgebildet?	Wiki; Forum+Wiki; Forum; Weblog
Nutzungskonzept	Welches Nutzungskonzept der Technologie eignet sich?	konkurrierende Wikis; ein gemeinsames Wiki; Themen-Wiki; Forum als Themenfilter für Wikis; Baum-Struktur; Baum/Board; Board-Struktur; Forum; Abfrage; „Berichterstatter"
5 Darstellung der Beiträge	Wie werden Beiträge dargestellt? Was sind Darstellungskriterien?	Reihenfolge: zuletzt kommentiert; chronologisch; meist kommentiert; meist gelesen; zufällige Anzeige; personalisierte Anzeige Kategorien: nach Teilnehmern; nach Schlagworten; Verortung im Plan
6 Motivation der Teilnehmer	Wie bietet man Anreize zur Teilnahme?	Punktesystem; Prämie bei Überschreitung Beitragsmarke; Status durch Teilnehmerbewertung; kein Anreiz bieten
7 Bewertung der Ergebnisse	Wie werden Ergebnisse gewichtet?	Bewertungssystem durch TN; keine Bewertung
8 Rückmeldung	In welcher Form wird eine Rückmeldung gegeben?	Internetseite informiert über Umsetzungsstand; Weblog informiert über Umsetzungsstand (RSS-Feed); persönliche E-Mail von Verwaltung an Teilnehmer

Abb.5: Komponenten und Ausprägungen einer interaktiven Toolanwendung

4.1.1 Komponente 1: Öffentlichkeitsarbeit

Zur Gestaltung einer interaktiven Anwendung bedarf es zunächst Teilnehmer, die Interesse an einem internetgestützten Beteiligungsangebot haben. Um die Aufmerksamkeit auf ein Angebot zur Online-Beteiligung zu lenken und dadurch potenzielle Teilnehmer zu erreichen, müssen Maßnahmen zur Öffentlichkeitsarbeit ergriffen werden. Neben Maßnahmen über die klassischen Medien wie Plakate oder Ankündigungen in der Presse sind Werbemaßnahmen im Internet sinnvoll und vor allen Dingen einfach zu realisieren.

Indem im selben Medium auf das Beteiligungsangebot aufmerksam gemacht wird, sind potenzielle Teilnehmer nur noch einen „Klick" entfernt und die Wahrscheinlichkeit ist hoch, dass sie sich das Angebot anschauen und zu einer Teilnahme entscheiden. Verlinkungen auf der städtischen Internetseite oder themenverwandten Seiten sind eine gute Möglichkeit, potenziell Interessierte direkt im Internet zu erreichen und auf das Angebot aufmerksam zu machen. Zusätzlich ist eine Bannerwerbung in Onlinemedien wie beispielsweise der lokalen Presse denkbar. Wichtig hierbei ist eine prominente Platzierung. Eine weitere Möglichkeit ist per E-Mail gesellschaftliche Gruppen wie Vereine, Verbände oder Initiativen anzuschreiben und zu einer Teilnahme am internetgestützten Beteiligungsangebot einzuladen. Maßnahmen zur Öffentlichkeitsarbeit in klassischen Medien sind darüber hinaus unerlässlich.

4.1.2 Komponente 2: Zweck der Anwendung / Nutzungsformen

Kernfrage bei der Gestaltung eines internetgestützten Beteiligungsangebotes ist, welche Formen von Kommunikation ermöglicht werden sollen. Dabei bestimmt der Zweck der Anwendung die angebotenen Nutzungsformen und beeinflusst dadurch den möglichen Interaktivitätsgrad der Anwendung. So kann eine Anwendung, in der Themen erörtert und Vorschläge zu bestimmten Fragestellungen generiert werden, als potenziell sehr interaktiv bezeichnet werden. Dagegen bietet eine Anwendung, die in einer gesteuerten zweiseitigen Kommunikation Meinungen der Bürger abfragt, potenziell wenig Möglichkeit, interaktiv

genutzt zu werden. Je interaktiver sich eine Anwendung gestaltet, desto mehr mögliche Nutzungsformen können einbezogen werden.

Die Chancen und Grenzen der Anwendung und deren Nutzungsformen sollten klar kommuniziert werden, um Missverständnissen und falschen Hoffnungen entgegenzuwirken.

4.1.3 Komponente 3: Codierung der Kommunikation

Neben Text als Basis-Kommunikationsmittel sind weitere Ausprägungen einer Codierung der Kommunikation möglich. Zusätzliche Ausdrucksmittel sind Fotografien und Grafiken, mit denen im Text formulierte Vorstellungen anschaulich dargestellt werden können. Insbesondere bei einer raumorientierten Diskussion ist eine visuelle Ebene der Kommunikation zum Ausdruck räumlicher Vorstellungen von großer Bedeutung. Die Möglichkeit zu einer räumlichen Verortung von Beiträgen, beispielsweise in einer dreidimensionalen Visualisierung der Planungen oder einem Plan, findet man in aktuellen Praxisbeispielen (z.B. Online-Dialog Kulturforum, Mauerdialog). Denkbar ist auch eine kartenbasierte Beteiligung, wie sie etwa im Projekt zum Interaktiven Landschaftsplan Königslutter realisiert wurde (VON HAAREN et al. 2005: 116). Hier konnten Anmerkungen nicht nur textlich formuliert werden, sondern auch direkt in Karten eingezeichnet werden. Kommunikationsformate wie gesprochener Text (Audio) und bewegte Bilder (Video) sind weitere denkbare Möglichkeiten zur Kommunikation, die bisher noch wenig genutzt wurden. Als ein Beispiel sind hier die gesprochenen Zusammenfassungen zu nennen, die in der Online-Diskussion „Familienfreundliche Stadt Hamburg“ neben den textlichen Zusammenfassungen angeboten wurden. Als Kommunikationsmittel für die Teilnehmer fanden diese Formen noch keine Anwendung. Zu beachten ist, dass für eine multimediale Kommunikation eine entsprechende technische Ausstattung, die die Nutzung datenintensiver Anwendungen erlaubt, und die Kompetenz im Umgang mit Kommunikationsformaten bei den Teilnehmern vorhanden sein muss.

4.1.4 Komponente 4: Technologie / Nutzungskonzept

Die Kommunikationstechnologie ist für sich allein kein Kennzeichen für eine interaktive Anwendung, sondern wird erst durch ein Nutzungskonzept, das auf der Technologie abgebildet wird, zu einer charakteristischen Komponente (vgl. Kap.3). Die Ausprägungen dieser Komponente beschränken sich auf die in der Arbeit betrachteten Kommunikationstechnologien und deren Nutzungskonzepte, auch wenn weitaus mehr Elemente denkbar sind.

In den Praxisbeispielen werden verschiedene Nutzungskonzepte unter Anwendung der Technologien aufgezeigt und ausprobiert. Nutzungskonzepte sind durch den Zweck der Anwendung und die damit verbundenen Nutzungsformen definiert und beschreiben dadurch, wie interaktiv eine Anwendung potenziell sein kann.

4.1.5 Komponente 5: Darstellung der Dialogbeiträge

Die Art und Weise der Beitragsdarstellung kann die interaktive Nutzung der Anwendung beeinflussen. Eine dynamische Beitragsdarstellung, auf die die Teilnehmer Einfluss nehmen können, führt potenziell zu einer interaktiveren Nutzung als eine statische Anzeige wie beispielsweise eine chronologische Darstellung der Beiträge. Mehrere Dimensionen kommen bei der Ausgestaltung dieser Komponente zum Tragen. Technische Voraussetzungen sind zu schaffen, um die in der Verfahrensgestaltung festgelegten Ausprägungen umzusetzen. Durch das Nutzungsverhalten werden diese Ausprägungen ausgestaltet.

Die Reihenfolge der Beiträge kann durch Kriterien wie Aktualität, Quantität und Qualität der Beiträge definiert werden. Als Ausprägungen zum Kriterium Aktualität zählt die Anzeige nach zuletzt kommentierten Beiträgen oder einer chronologischen Beitragsdarstellung. Quantität meint die Darstellung der Beiträge nach Kriterien wie meist kommentierte oder meist gelesene Beiträge. Als qualitative Anzeige der Beiträge ist eine Bewertung durch die Teilnehmer denkbar, die die Reihenfolge der Beiträge bestimmt. Durch den Einfluss der Teilnehmer auf die Reihenfolge der Beitragsdarstellung kann sich eine hohe Dynamik ergeben, die sich durch eine sich veränderte Beitragsdarstellung visuell ausdrückt.

Die Anzeige der Beiträge in einer bestimmten Reihenfolge verleihen den oben stehenden Beiträgen eine hohe Präsenz und Relevanz in der Diskussion. Beiträge auf weniger prominenten Positionen haben es schwerer, wieder in die Diskussion aufgenommen zu werden. Durch den Einfluss der Teilnehmer auf die Reihenfolge der Beiträge entsteht auf der einen Seite ein dynamischer Diskussionsverlauf, auf der anderen

Seite besteht auch die Gefahr der Manipulation. Denkbare Ausprägungen, die diesem Sachverhalt entgegenwirken, wären eine zufällige Anzeige der Beiträge beziehungsweise eine durch den Teilnehmer individuell personalisierbare Beitragsanzeige. In einigen Praxisbeispielen gibt es neben der Anzeige der gesamten Beiträge zusätzlich die Möglichkeit, Beiträge nach bestimmten Kategorien zu betrachten. Hierzu zählt die Ansicht der Beiträge nach Teilnehmern, die Sortierung der Beiträge nach Schlagwörtern oder die Verortung von Beiträgen in einem Plan, was insbesondere bei räumlich konkreten Diskursen sinnvoll ist. Alle genannten Darstellungskriterien strukturieren den Dialog und bieten Orientierung in dem Kommunikationsprozess.

4.1.6 Komponente 6: Motivation der Teilnehmer

Die Teilnahme an einem internetgestützten Beteiligungsverfahren erfordert seitens der Teilnehmer die Bereitschaft, Zeit zu investieren. Auch wenn es eine besondere Eigenschaft von Online-Beteiligung ist, dass sich die Diskussionsteilnehmer im Laufe des Prozesses häufig auswechseln und somit viele Sichtweisen zu einem Thema eingefangen werden können. So sind auch Teilnehmer, die kontinuierlich am Prozess teilnehmen, von großer Bedeutung. Beide Teilnehmertypen kann die Anwendung Anreiz zu einer interaktiven Teilnahme bieten.

Die Anerkennung engagierter Teilnehmer erfolgt maßgeblich über das Prestige innerhalb der Community. So kann ein Punktesystem als Anreiz für die Teilnehmer fungieren. Nach bestimmten Regeln konnten die Teilnehmer der Internetdiskussion zum Leitbild „Wachsende Stadt“ Hamburg durch eine intensive Teilnahme am Diskussionsforum Punkte sammeln. Die fünf Teilnehmer mit den höchsten Punktzahlen wurden auf der Startseite als TOP 5 User angezeigt. Eine ähnliche Möglichkeit ist die Auszeichnung der Teilnehmer bei der Überschreitung einer bestimmten Anzahl von verfassten Beiträgen. Der Status eines Teilnehmers innerhalb einer Anwendung kann außerdem durch die Teilnehmer selbst bestimmt werden. So könnte sich in einer Statusanzeige, beispielsweise fünf Sterne, das Renommee eines Teilnehmers innerhalb der Community ausdrücken. Diese Ausprägungen werden durch mehrere Dimensionen bestimmt. Technische Voraussetzungen sind zu schaffen, um die im Verfahren vorgesehene Ausprägungen umzusetzen. Und letztlich ist das Nutzungsverhalten in der Community als eine weitere bestimmende Dimension zu betrachten.

Auch außerhalb der Community kann eine Anerkennung den Teilnehmern zuteil werden, wie beispielsweise in Form eines Abendessen mit dem Bürgermeister im Falle des Online-Ideenwettbewerbs in Hamburg oder einer Tafel Schokolade im internetgestützten Beteiligungsverfahren „Planung verbindet!“ des Planungsverbands Frankfurt Rhein-Main.

4.1.7 Komponente 7: Bewertung der Ergebnisse

Eine abschließende Gewichtung der Ergebnisse stellt einen Anreiz dar, um für die eigenen Ideen und Vorstellungen im Austausch mit anderen Teilnehmern zu werben und damit zu überzeugen. Dies erfordert eine engagierte Teilnahme. Zu Beginn eines internetgestützten Beteiligungsverfahrens muss klar sein, wie und durch wen die Bewertung der Ergebnisse erfolgt, ob durch Externe oder auch durch die Community. Die Ausprägungen sind im Verfahren festzulegen und auf der Technologie abzubilden. Die Nutzung durch die Teilnehmer ist die maßgebliche Dimension, die diese Ausprägungen ausgestaltet.

Je nachdem was für eine Rolle das internetgestützte Beteiligungsverfahren im gesamten Planungsprozess spielt, ist nicht immer eine Bewertung der Ergebnisse innerhalb der Community notwendig. Die Gewichtung der Ergebnisse ist durch die Teilnehmer sinnvoll, wenn konkrete Ergebnisse vorliegen, die deutlich voneinander abgegrenzt sind. In den Praxisbeispielen hat sich ein Bewertungssystem mit einer einmaligen Punktvergabe (Punkte 0-5) durch die Teilnehmer bewährt.

4.1.8 Komponente 8: Art der Rückmeldung

Eine Rückmeldung zu der Verwertung der Ergebnisse durch die Entscheidungsträger ist für die Gestaltung einer interaktiven Anwendung unerlässlich. Eine Teilnahme an einem internetgestützten Beteiligungsangebot ist für die meisten nur interessant, wenn eine Berücksichtigung seitens der Verwaltung zugesagt wird. Eine weitere Funktion der Rückmeldung ist, Wertschätzung gegenüber den Teilnehmern auszudrücken. Digitale Medien bieten vielseitige Möglichkeiten, eine Rückmeldung an die Teilnehmer zu gestalten. So könnte im Anschluss an das Beteiligungsverfahren eine Internetseite Rückmeldung zu den Ergebnissen geben und über

den weiteren Umsetzungsstand der Planung informieren (siehe http://www.wachsende-stadt.hamburg.de, www.demos-monitor.de). Oder die Verwaltung könnte in einer persönlichen E-Mail an die Teilnehmer über die Verwertung der Ergebnisse informieren und sich für die Teilnahme am Beteiligungsangebot bedanken. Eine neue denkbare Option wäre ein Weblog als Informations- und Kommunikationsplattform zu gestalten, auf der von der Verwaltung Stellung zu den Ergebnissen bezogen und über den weiteren Verlauf der Planung Bericht erstattet wird. Die Kommentarfunktion würde weiterhin eine Meinungsäußerung ermöglichen und mittels RSS-Feed könnte man sich automatisch über Neuigkeiten informieren.

Die Entwicklung technischer Möglichkeiten, die eine Einbeziehung der Internetnutzer ermöglicht, ist zwar bereits weit vorangeschritten, die Nutzung dieser Möglichkeiten steht jedoch noch am Anfang. Die eigentliche Herausforderung liegt dabei nicht auf der technischen Ebene, sondern darin, die vorhandenen Kommunikationstools mit Praktiken von Beteiligungsprozessen in Raum-, Stadt- und Umweltplanung zu vereinen und Nutzer wie Planer für den Umgang neuen Technologien zu qualifizieren. Denn gerade internetgestützte Beteiligungsangebote können eine Schlüsselrolle übernehmen, indem durch sie Teilnehmer im Umgang mit den Kommunikationstools geschult werden und sie in diesem Sinne zu einer Verringerung der digitalen Spaltung beitragen.

5 LITERATURVERZEICHNIS

GERHARDS, M. & MENDES, A. 2006: Vorbehalte und Einstiegsbarrieren gegenüber dem Internet bleiben bestehen. Media Perspektiven 2006(8), 416-430.

KUBICEK, H. 1998: Das Internet 1995-2005. Zwingende Konsequenzen aus unsicheren Analysen. In: LEGGEWIE, C. & MAAR, C. (Hrsg.): Internet & Politik. Von der Zuschauer- zur Beteiligungsdemokratie? Köln: Bollmann, 55-69.

LÜHRS, R. et al. 2004: Online-Diskurse als Instrument politischer Partizipation – Evaluierung der Hamburger Internetdiskussion zum Leitbild „Wachsende Stadt“. Kommunikation@gesellschaft 5/1, Stand: 15.03.2007, http://www.soz.uni-frankfurt.de/K.G/B1_2004_L%FChrs_Albrecht_Hohberg_L%FCbcke.pdf .

RITTEL, H. 1970: Der Planungsprozess als iterativer Vorgang von Varietätserzeugung und Varietätseinschränkung. In: RITTEL, H. (Hrsg.): Planen, Entwerfen, Design. Ausgewählte Schriften zu Theorie und Methodik, Stuttgart: Kohlhammer, 75-92.

SCHÄFER, Y. 2006: Beteiligungsprozesse und digitale Medien. Wikis, Weblogs & Co als neue Formen des Dialogs in der räumlichen Planung? Potenziale – Grenzen – Anwendungsfelder, Diplomarbeit an der Fakultät Architektur und Landschaft, Universität Hannover.

SIXTUS, M. 2005: Die Humanisierung des Netzes. Der Mensch kehrt sein Innerstes nach außen falls er die Software beherrscht. Die Zeit 35/05, Stand: 15.03.2007, http://www.zeit.de/2005/35/C-Humannetz.

VON HAAREN et al. 2005: Interaktiver Landschaftsplan Königslutter. Ergebnisse aus dem E+E-Vorhaben „Interaktiver Landschaftsplan Königslutter am Elm“ des Bundesamtes für Naturschutz, Bonn (Naturschutz und Biologische Vielfalt 24).

ZWICKY, F. 1966: Entdecken, Erfinden, Forschen im morphologischen Weltbild. München: Droemer-Knaur.

🏆 *reviewed paper*

Konfliktbewältigung und Konfliktprävention beim Management landschaftsbezogener Freizeit- und Erholungsaktivitäten

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1 KURZFASSUNG

Bei der Planung und Entwicklung vielfältig genutzter Schutz-, Erholungs- oder Freizeitgebiete müssen mögliche Konflikte von Beginn an einbezogen werden. Je früher in einem Konfliktprozess Maßnahmen zur Konfliktbewältigung einsetzen können, desto eher kann eine Eskalation des Konflikts verhindert oder gestoppt werden. Dafür wird ein Problem- und Konfliktbewusstsein sowie ein Instrumentarium zur Konfliktanalyse und -bewältigung, Identifikation von Konfliktpotentialen und Konfliktprävention benötigt. Im Biosphärenreservat Rhön konnten die zu erwartenden Konflikte um das Mountainbiking durch ein von den potenziellen Konfliktparteien gemeinsam entwickeltes markiertes Mountainbike-Routennetzes verhindert werden. Eine solche kommunikativ-kooperative Form der Konfliktprävention hat Modellcharakter für andere Regionen. Im Biosphärenpark Wienerwald stellt sich die Konfliktsituation durch die Verzahnung der vielfältigen Nutzeransprüche –Mountainbiker, Tourismus, Jäger, Forstwirte und Grundeigentümer – deutlich schwieriger dar. Eine Versachlichung des Konflikts durch die Gegenüberstellung der konkreten Interessengegensätze und Nutzungsansprüche der Konfliktparteien bilden hier die Basis für eine erfolgreiche Konfliktbewältigung.

2 EINFÜHRUNG

Planen ist nicht genug. Bei der Planung und Entwicklung vielfältig genutzter Schutz-, Erholungs- oder Freizeitgebiete müssen die Interessen und Nutzungsansprüche der unterschiedlichen Nutzergruppen sowie mögliche Konflikte von Beginn an einbezogen werden. Während erstere in Planungsprozesse mehr und mehr Eingang finden, erfolgt eine Identifikation potenzieller Konflikte in der Regel nicht. Je früher jedoch in einem Konfliktprozess Maßnahmen zur Konfliktbewältigung eingesetzt werden können, desto eher kann eine Eskalation der Konflikte verhindert oder gestoppt werden. Idealerweise setzt die Konfliktbehandlung bereits auf der Ebene der Konfliktpotentiale ein, d.h. bevor ein Konflikt überhaupt entsteht. Dafür wird ein Problem- und Konfliktbewusstsein sowie ein Instrumentarium zur Identifikation von Konfliktpotentialen und zur Konfliktprävention benötigt.

3 KONFLIKTANALYSE ALS BASIS FÜR KONFLIKTBEWÄLTIGUNG UND -PRÄVENTION

Die Konflikte bestehen nicht nur zwischen Freizeitnutzung und Naturschutz bzw. Gebietsmanagement sowie mit den Eigentümern, sondern auch zwischen verschiedenen Freizeitnutzergruppen. Konflikte werden dabei als Auseinandersetzung zwischen mindestens zwei Subjekten – den Konfliktparteien, die sie austragen – um (mindestens) ein Objekt – den Konfliktgegenstand – angesehen (vgl. MEYER 1997). Ein Konflikt ist somit mehr als ein Interessengegensatz oder ein Spannungsverhältnis. Konflikte sind an Personen gebunden. Sie entwickeln sich durch das wechselseitige Agieren der Konfliktparteien und sind demzufolge auch nicht durch eine Seite allein lösbar. Eine solche sozialwissenschaftliche Konfliktdefinition bildet die Basis für eine erfolgreiche Konfliktbewältigung und effektive Konfliktprävention.

Das Modell des Konfliktprozesses von BERKEL (1997) zeigt den Konflikt als einen Interaktionsprozess, der mit einem auslösenden Ereignis beginnt, mit einem zeitweiligen oder dauerhaften Ergebnis endet und darüber hinaus weiterreichende langfristige Auswirkungen hat (siehe Abb. 1). Seine Anwendung in der Konfliktpraxis vermittelt wichtige Einsichten in die Konfliktentstehung, -austragung und -bewältigung. Kernstück des Modells sind die wechselseitigen auf einander bezogenen Aktivitäten der Konfliktparteien. Ihre Analyse ermöglicht es, den Entwicklungsprozess eines Konflikts und die Ursachen für seine Eskalation zu erklären. Wie handeln die Konfliktparteien und wie nehmen sie die Handlungen der jeweils anderen Seite

wahr? Die Konfliktbewältigung ist aus dieser Sicht ein integrativer Bestandteil der Konfliktaustragung. Sie beginnt mit der Entstehung des Konflikts. Konfliktlösung steht dabei für ein ganzes Spektrum von Interventionsmaßnahmen, die von der Konfliktreduktion, -regelung und -unterdrückung über das Konfliktmanagement und die Konfliktkontrolle bis zur Konfliktvermeidung reicht (vgl. GLASL 1999). So sind beispielsweise Kompromisse meist das Ergebnis eines Verhandlungsprozesses, bei dem die Partner aufeinander zugehen und ein Stück von ihren ursprünglichen Vorstellungen abrücken müssen. Auf diese Weise sind im letzten Jahrzehnt zahlreiche Konflikte zwischen Freizeitnutzern bzw. Freizeitsportverbänden und den Schutzgebietsverwaltungen bewältigt oder abgeschwächt worden.

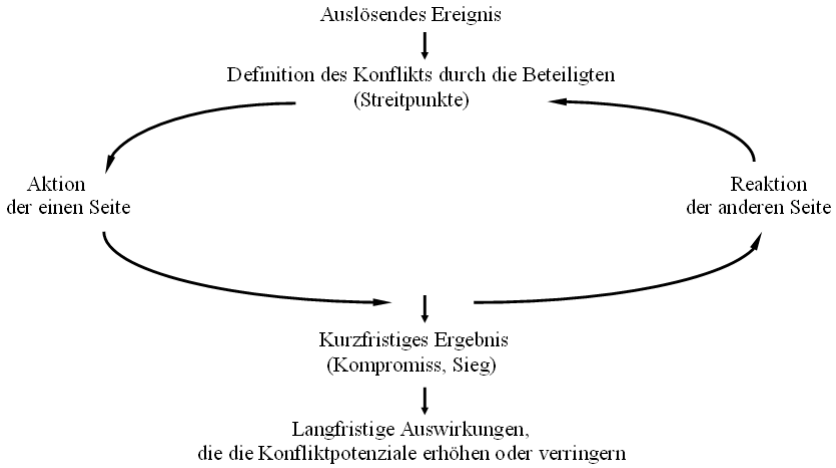

Abb. 1 Konflikt als Prozess (Quelle: BERKEL 1997, S. 40, verändert)

Eine zweite Frage gilt dem auslösenden Ereignis für einen Konflikt. Raumnutzungskonflikte entstehen zum einen dadurch, dass sich eine bereits bestehende Problemsituation objektiv verschärft (z.B. Landschaftsschäden, Diversifizierung der Freizeitsportarten) oder subjektiv stärker wahrgenommen und neu bewertet wird (z.B. durch ein gestiegenes Umweltbewusstsein). Zum anderen werden sie durch Planungen und Projekte ausgelöst, die dann als Eingriff in die Landschaft (z.B. touristische Großvorhaben) oder als Beeinträchtigung der Freizeit- bzw. Erwerbsmöglichkeiten (z.B. Schutzgebiete) angesehen und daher abgelehnt werden. Sowohl Tourismusprojekte als auch Naturschutzprojekte sind ohne die Austragung von Konflikten in der Regel nicht umsetzbar. Im ersten Fall resultiert der Konflikt aus einem Umschlag einer Quantität in eine neue Qualität. Die ”Konflikteröffnung" geht von Ökologen, Naturschutzvertretern oder/und Naturschutzinteressierten aus, die sich mit der bestehenden Situation unzufrieden zeigen und eine Einschränkung oder Einstellung bestimmter Freizeitnutzungen fordern. Dies wiederum führt zum Widerstand der Nutzer, die mit dem Verbot oder der Reglementierung ihrer Freizeitaktivitäten nicht einverstanden sind. Im zweiten Fall löst nicht immer das Projekt selbst den Widerspruch aus, sondern die Art und Weise seines Bekanntwerdens. Zumindest ein Teil der Konflikte bei der Implementierung von Schutz-, Erholungs- und Freizeitgebieten wäre daher vorhersehbar gewesen.

Vor dem eigentlichen Konflikt liegt nur ein Konfliktpotenzial vor, welches aus den (noch) ruhenden Konfliktparteien und dem Konfliktgegenstand besteht (vgl. BERKEL 1997, MEYER 1997). Bezogen auf den Konfliktgegenstand lassen sich durch eine Gegenüberstellung von Landschaftsmerkmalen und Nutzungskomponenten raumstrukturelle Konfliktpotenziale (vgl. ZIENER 2003, S. 66/67) identifizieren:

- Eine Landschaft wird sowohl als schutzwürdig als auch als attraktiv für Erholung und Freizeitgestaltung bewertet (allgemeine Sicht).
- Es besteht ein ungünstiges Verhältnis zwischen der Sensibilität einer Landschaft und der Intensität ihrer Nutzung für Erholung und Freizeitgestaltung (ökologische Sicht).
- Die Raumnutzungsansprüche von Erholungsuchenden und Freizeitnutzern stehen Restriktionen durch den Naturschutz gegenüber (Nutzersicht).

Die drei Gegensatzpaare verdeutlichen unterschiedliche Dimensionen von Konfliktfaktoren. Der Gegensatz von Schutzwürdigkeit und Attraktivität stellt eine allgemeine Sicht und die Basis für Nutzungskonflikte dar. Das Grundproblem landschaftsbezogener Erholung und Freizeitnutzung wird in dem Verhältnis zwischen der Sensibilität einer Landschaft und der Intensität ihrer Nutzung deutlich. Konfliktträchtig ist hierbei nicht die Freizeit- und Erholungsnutzung an sich, sondern ihr Umfang, die räumliche und zeitliche Verteilung und die Art und Weise wie die Freizeitaktivitäten ausgeübt werden. Zwischen der Störwirkung einzelner Freizeitsportler in sehr sensiblen Arealen und der Zerstörung weniger sensibler Landschaften durch eine massentouristische Nutzung existieren zahlreiche Abstufungen. Landschaftsschäden sind aus dieser Sicht ein Anzeichen dafür, dass die Belastbarkeit des Ökosystems überschritten ist, wobei Freizeitnutzung allerdings nicht der alleinige Verursacher ist.

Eine weitere Konfliktkonstellation entsteht, wenn die Nutzungsansprüche von Erholungsuchenden und Freizeitnutzern auf Restriktionen des Naturschutzes bzw. Regelungen des Schutzgebietes treffen, und sie diese als Einschränkung der individuellen Bewegungsfreiheit begreifen. Das so abgeleitete raumstrukturelle Konfliktpotenzial verkörpert die Sicht der Nutzer, wobei allerdings von den Ansprüchen des einzelnen Freizeitnutzers abstrahiert wird und lediglich aktivitäts- bzw. nutzergruppenspezifische Landschafts- und Raumnutzungsansprüche betrachtet werden. Im Unterschied zum Konflikt stellen raumstrukturelle Konfliktpotenziale objektive bzw. objektivierte Eigenschaften der Landschaft und ihrer Nutzung dar, die unabhängig von der subjektiven Wahrnehmung und Bewertung durch die Konfliktbeteiligten existieren. Ihre Erfassung trägt zur Objektivierung der Konfliktanalyse bei und ermöglicht eine Beurteilung der landschaftsbezogenen und raumstrukturellen Wirkungen des Konfliktergebnisses.

Eine zweite Gruppe von Konfliktpotenzialen steht im Zusammenhang mit den Konfliktparteien und kann als personell-situative Konfliktpotenziale bezeic hnet werden. Zu ihnen gehören die vielfach thematisierten Informations-, Kommunikations- und Partizipationsdefizite. Aus einem Konfliktpotenzial muss nicht zwangsläufig ein Konflikt entstehen. Dies ist der Ansatzpunkt für Maßnahmen und Strategien zur Konfliktvermeidung. Eine frühzeitige Erfassung raumstruktureller Konfliktpotenziale trägt dazu bei, Konflikte entweder völlig zu vermeiden oder sie zumindest in Ausmaß und Stärke zu begrenzen. Werden bestehende Problemsituationen wie die Beanspruchung sensibler Landschaften oder die Überlagerung unterschiedlicher Freizeitnutzungen zugleich als Konfliktpotenziale angesehen, dann lassen sich nicht nur frühzeitig Nutzungskonzepte oder Besucherlenkungsmaßnahmen entwickeln. Es können vielmehr in einem kommunikativ-kooperativen Prozess Regelungen und Kompromisse zwischen Interessengruppen geschaffen werden noch bevor ein Konflikt überhaupt ausbricht. Ebenso werden Konflikte, die aus Informations- oder Partizipationsdefiziten entstehen, durch eine frühzeitige Einbeziehung aller Nutzer- und Interessengruppen zwar nicht völlig verhindert, aber dennoch weitgehend reduziert.

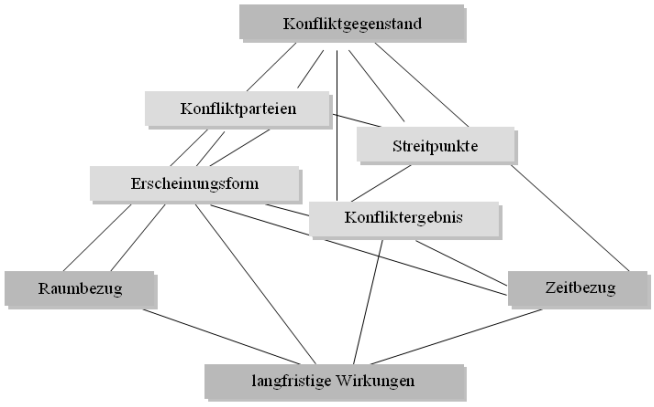

Abb. 2 Konfliktstruktur (Quelle: ZIENER 2003, S. 81, verändert)

Eine zweite Grundlage für die Analyse von Konflikten bildet die Konfliktstruktur (vgl. Abb. 2). Die Struktur eines Konflikts besteht aus den unmittelbaren Konfliktelementen – Konfliktparteien, Streitpunkte, Erscheinungsform des Konflikts, Konfliktergebnis und Konfliktwirkungen (vgl. BERKEL 1997) sowie den geographischen Dimensionen: Inhalt (Konfliktgegenstand), Raum- und Zeitbezug als äußerem Rahmen.

Während die Konfliktlösung im engeren Sinne bei den subjektiven Streitpunkten ansetzt, ist aus Sicht des Gebietsmanagements der objektive Konfliktgegenstand von größerer Bedeutung. Der Konfliktgegenstand wird von den Konfliktparteien unterschiedlich reflektiert, was zu den eigentlichen Streitpunkten führt. Umgekehrt führt ein Rückgriff auf den Konfliktgegenstand bzw. die ursprünglichen Konfliktpotenziale häufig zu einer Objektivierung der individuellen Positionen und Versachlichung der Konfliktaustragung. Ein Konflikt wirkt sich selbstverständlich auch auf die Konfliktparteien und ihre Beziehungen zueinander aus, kann zu einer Verhärtung der Fronten oder zu mehr Verständnis gegenüber den Interessen und Ansprüchen der anderen Seite führen (vgl. ZIENER 2003). Zu diesen Wirkungen gehören auch die bei der Austragung und Bewältigung des Konflikts gewonnenen Erfahrungen, nicht nur der am Konflikt Beteiligten, sondern auch der Zuschauer oder Beobachter. Bei ihrer Anwendung in anderen Konflikten sollte aber immer der Kontext der Konfliktsituation und des Konfliktprozesses berücksichtigt werden. Unter dem Aspekt des Managements landschaftsbezogener Erholungs- und Freizeitaktivitäten wurden die langfristigen Wirkungen des Konflikts, z.B. räumliche und zeitliche Reglementierungen der Freizeit- und Erholungsnutzungen, jedoch in den Konfliktrahmen eingeordnet.

Im Folgenden wird an zwei Beispielen zum einen die Analyse von Konfliktpotenzialen und eine Konfliktprävention (Mountainbike-Routennetz im Biosphärenreservat Rhön) und zum anderen die Analyse und Bewältigung aktueller Konflikte (Mountainbiking im Biosphärenpark Wienerwald) dargestellt.

Biosphärenreservate sind international anerkannte großflächige Schutz- und Entwicklungsgebiete, in denen gemeinsam mit den hier lebenden und wirtschaftenden Menschen Modelle für nachhaltige Entwicklung geschaffen werden sollen. In Österreich werden die Biosphärenreservate einheitlich als Biosphärenparks bezeichnet. Entsprechend der Sevilla-Strategie sollen Biosphärenreservate drei grundlegende Funktionen erfüllen:

- Schutzfunktion: Erhaltung von Landschaften, Ökosystemen und Arten sowie der biologischen und kulturellen Vielfalt,
- Entwicklungsfunktion: Förderung einer soziokulturell und ökologisch nachhaltigen wirtschaftlichen und menschlichen Entwicklung, bei der die verschiedenen Nutzer- und Interessengruppen in alle Entscheidungsprozesse einbezogen werden,
- Logistische Funktion: Forschung, Monitoring und Umweltbildung mit dem Schwerpunkt Mensch-Umwelt-Beziehung und nachhaltige Entwicklung (nach Sevilla-Strategie, UNESCO 1996, verändert).

4 ANALYSE VON KONFLIKTPOTENZIALEN UND KONFLIKTPRÄVENTION AM BEISPIEL DES BIOSPHÄRENRESERVATS RHÖN

Das Mountainbike-Routennetz für das Biosphärenreservat Rhön kann in mehrfacher Hinsicht als Fortschritt bei der Bewältigung von Konflikten um Freizeitaktivitäten in sensiblen, aber auch mehrfach genutzten Landschaften angesehen werden. In dem 1991 von der UNESCO anerkannten länderübergreifenden Biosphärenreservat Rhön wurden seit Mitte der 1990er Jahre große Anstrengungen unternommen, die zunächst gravierenden Konflikte um den Skisport und den Flugsport zu bewältigen. Beide Freizeitsportarten haben erhebliche Auswirkungen auf die sensiblen Lebensräume in den höheren Lagen der Rhön, darunter insbesondere die Hochmoore und die Lebensräume des Birkhuhns. In den Jahren 1993 bis 1996 wurden im Rahmen des Modellprojekts zum Skilanglauf in der Hohen Rhön eine Optimierung des Loipennetzes unter Berücksichtigung naturschutzfachlicher Ziele vorgenommen und Konfliktpunkte beseitigt. Durch ein Netz markierter und gespurter Loipen sowie eine gesamtregionale Loipenkarte der hessischen, bayerischen und thüringischen Rhön wurde zugleich das Wintersportangebot verbessert. Die Konflikte haben sich auf die Verstöße einzelner gegen das Loipengebot verlagert. Im Flugsport (Segelflug, Paragliding, Drachenflug) haben das Luftsportgutachten, in dem Konflikte mit dem Naturschutz aufgezeigt und Empfehlungen für eine naturverträgliche Ausübung des Flugsports gegeben worden sind, und die Arbeit der projektbegleitenden Arbeitsgruppe (ab 1995) zu einer deutlichen Entschärfung der Konfliktsituation geführt.

Die Entscheidungsträger in den Biosphärenreservatsverwaltungen, den Naturschutz- und Freizeitsportverbänden waren somit bereits sensibilisiert als sich Ende der 1990er Jahre ein Konfliktpotenzial im Bereich des Mountainbikings abzeichnete. Die zunehmende Zahl von Mountainbikern

würde nicht nur zu Konflikten mit dem Naturschutz, sondern auch mit den Wanderern führen. Sie besaßen zudem bereits Erfahrungen in der Durchführung von konfliktbezogenen Moderationsprozessen und Arbeitsgruppentätigkeiten. Für das Mountainbiking bestand somit die große Chance einer gemeinsamen Konfliktprävention mit den Radsportverbänden und allen anderen Beteiligten. Ziel war es, gemeinsam ein markiertes Mountainbike-Routennetz zu erstellen. Die Biosphärenreservatsverwaltung war bestrebt, den zu erwartenden Mountainbike-Konflikt möglichst frühzeitig einer allseits befriedigenden Lösung zuzuführen, wobei ein besonderes Augenmerk auf das Naturschutzgebiet Lange Rhön gerichtet wurde. In der Langen Rhön hatte die Sperrung von Wegen für die Freizeit- und Erholungsnutzung bereits zu erheblichen Konflikten mit den Wanderern geführt. Für das Mountainbiking war die Lange Rhön bislang generell gesperrt. Die Radsportverbände waren daran interessiert, das im Naturschutzgebiet Lange Rhön bestehende generelle Mountainbiking-Verbot durch eine Freigabe einzelner Routen zu lockern, um so die Rhön queren zu können. In dieser Hinsicht entwickelte sich ebenfalls ein Konflikt. Und schließlich kann eine wachsende Zahl von Mountainbikern zur Gefährdung von Wanderern, Spaziergängern und nicht zuletzt der Mountainbiker selbst führen.

Initiator des Erarbeitungsprozesses war die bayerische Verwaltungsstelle des Biosphärenreservats, die gemeinsam mit dem Verein Naturpark und Biosphärenreservat Bayerische Rhön (Managementzentrum des Biosphärenreservat Rhön in Oberelsbach) auch die Moderation übernahm. Nach einer ersten Kontaktaufnahme mit den Radfahrverbänden ist die Vereinbarung „FAIRständnis" zwischen dem Rhönklub, den Rhöner Kreisverbänden des Allgemeinen Deutschen Fahrrad Clubs (ADFC) und dem Bayerischen Radsport-Verband, Bezirk Unterfranken (März 1999) das erste Ergebnis. Unter dem Kerngedanken „Miteinander statt gegeneinander – harmonisieren statt Natur ruinieren" wurden 7 Regeln formuliert, die nicht nur das Verständnis zwischen Wanderern und Mountainbikern erhöhen sollen, sondern auch den Schutz der Natur beinhalten (vgl. Rhönspiegel 6/1999 und Homepage des Verein Naturpark und Biosphärenreservat Bayerische Rhön).

In einem zweiten Schritt wurde ein Mountainbike-Routennetz für das Biosphärenreservat Rhön entwickelt und beschildert. Hervorzuheben ist, dass dieses umsetzungsorientierte Projekt in eigener Regie durch eine Arbeitsgruppe aus ADFC (Konzepterstellung), Bayerischem Radsportverband, Rhönklub, Biosphärenreservat Rhön (GIS, Moderation) und Verein Naturpark und Biosphärenreservat Bayerische Rhön sowie der Wildland GmbH, einer Initiative des Landesjagdverbandes Bayern e.V., durchgeführt wurde. Einbezogen waren auch die Höhere Naturschutzbehörde in Würzburg (Befreiung zur Befahrung bestimmter Routen im Naturschutzgebiet), die Waldbesitzer und Jagdverbände. Die Beschilderung der insgesamt ca. 325 km langen Mountainbikerouten im bayerischen Teil des Biosphärenreservat Rhön übernahm der Verein Naturpark und Biosphärenreservat Bayerische Rhön (vgl. Rhönspiegel 6/1999, 10/2000 und 12/2000).

Das Mountainbike-Routennetz für das Biosphärenreservat Rhön stellt eine echte Win-Win-Situation dar. Für die Mountainbiker ist ein attraktives Routenangebot geschaffen worden, das aktiv beworben wird (z.B. Faltblätter, Mountainbike-Karten und -Literatur, Informationen auf Homepages). Die angestrebte Querung der Hohen Rhön ist nun ebenfalls möglich. Im Naturschutzgebiet Lange Rhön sind die markierten Mountainbikerouten mit einem Wegegebot verknüpft. Michael Geier, Leiter der Bayerischen Verwaltungsstelle des Biosphärenreservats Rhön, sieht in dem Mountainbike-Wegenetz für die Lange Rhön „eine für alle Seiten – den Naturschutz, die Jagd, den Wanderer und den Radfahrer – akzeptable und zufrieden stellende Grundlage für ein gutes Miteinander in dieser sensiblen Region" (vgl. Rhön-Spiegel 10/2000). Der Allgemeine Deutsche Fahrrad Club bietet in Zusammenarbeit mit der Volkshochschule Rhön und Grabfeld und dem Verein Naturpark und Biosphärenreservat Bayerische Rhön eine mehrtägige Ausbildung zum Mountainbike-Guide als Natur- und Landschaftsführer an. So wurde mit den ausgewiesenen Mountainbikerouten im Biosphärenreservat Rhön einerseits ein sanftes Lenkungskonzept umgesetzt, das angebotsorientiert und nicht durch Verbotsschilder wirkt, und zugleich das Konfliktpotenzial Mountainbiker – Wanderer deutlich reduziert. Andererseits trägt das geregelte Mountainbike-Angebot im Biosphärenreservat zur Entwicklung eines (weiteren) Segments innerhalb eines nachhaltigen Tourismus in der Rhön und damit zur touristischen Wertschöpfung bei. Eine solche kommunikativ-kooperative Form der Konfliktprävention in einem äußerst konfliktträchtigen Freizeitbereich hat Modellcharakter für andere Regionen.

5 ANALYSE UND BEWÄLTIGUNG AKTUELLER KONFLIKTE AM BEISPIEL DES BIOSPHÄRENPARKS WIENERWALD

Der österreichische Wald und somit auch der Biosphärenpark Wienerwald ist nach dem Forstgesetz von 1975 nur für bestimmte Erholungsaktivitäten freigegeben, das Befahren von Wäldern war und ist dabei per Gesetz nicht vorgesehen. Das Mountainbiking, in den frühen 1970er Jahren entstanden, doch als Sportart für die breite Bevölkerung je nach Region erst in den 1990er Jahren durchgesetzt, wird zu einem hohen Anteil in Forstgebieten durchgeführt. Im Wienerwald wurde daher dem Druck der Sportler seitens der Grundeigentümer nachgegeben, nicht zuletzt deshalb, weil das Mountainbiking auch als ein Hoffnungsträger für die Tourismus- und Regionalentwicklung gesehen wird. Zwei verschiedene Zielgruppen werden somit angesprochen – einerseits die lokale Bevölkerung und andererseits Gäste der Region. Das Mountainbiking ist an ein Wegegebot für markierte Mountainbikerouten geknüpft und zusätzlich mittels zeitlichen – tages- und jahreszeitlichen – Beschränkungen begrenzt. Die Mountainbikingrouten und die zeitlichen Beschränkungen wurden zwischen Tourismusorganisationen, z.T. unter Hinzuziehung von Fachexperten des Mountainbikings, und den Grundeigentümern ausgehandelt und anschließend von den Grundeigentümern freigegeben. Interessierte und betroffene Gemeinden zahlen an die Grundeigentümer Entgelt pro Kilometer Mountainbikeroute – so trägt z.B. die Gemeinde Wien einen Teil des Routenentgeltes, obwohl die Mountainbikestrecken nicht unmittelbar auf dem Gemeindegebiet liegen. Es kann somit ein gewisses Problembewusstsein konstatiert werden – hätten die Grundeigentümer die Routen nicht zur Verfügung gestellt, so wären die Radsportler sicher weiterhin illegal in den Wäldern unterwegs gewesen. Nur wurde bei der Implementierung der Routen und der zeitlichen Beschränkungen übersehen, dass beide etliche Konfliktpotentiale beinhalten, was zu Konflikten zwischen Mountainbikern auf der einen Seite sowie Jägern und Grundeigentümern auf der anderen Seite geführt hat. Diese Konflikte werden zum einen direkt vor Ort ausgetragen, wenn Mountainbiker auf Jäger treffen (z.B. durch Wortgefechte, Abmahnungen, bei denen teilweise die Kompetenzen überschritten werden). Zum anderen kommt es bei themenbezogenen Veranstaltungen zu Diskursen zwischen Vertretern des Tourismus und des Mountainbikings einerseits und den Jägern sowie den Grundeigentümern andererseits.

Im Rahmen des MAB Projektes der Österreichischen Akademie der Wissenschaften „Integration of Sustainable Management of Wildlife Resources and Wildlife Habitats in a Participatory, Cross-sectoral Concept for Sustainable Landuse in the Biosphere Reserve Wienerwald" unter der Projektleitung von A. Univ. Prof. DI. Dr. Friedrich Reimoser, Veterinärmedizinische Universität Wien, und der Mitwirkung des Umweltbundesamtes Wien und der Universität für Bodenkultur (vgl. http://www.oeaw.ac.at/deutsch/forschung/programme/mab.html) wurde u.a. eine Befragung von Mountainbikern durchgeführt. Diese hat gezeigt, dass die markierten Routen in manchen Fällen nicht den gesuchten Herausforderungen der Mountainbiker bzw. den Vorstellungen, die sie von ihrer Sportart haben, entsprechen und die zeitlichen Beschränkungen den Ansprüchen dieser Nutzergruppe entgegenstehen. Bei der Diskussion der Befragungsergebnisse wird auf tabellarische und grafische Darstellungen verzichtet, da das Projekt ist derzeit noch nicht abgeschlossen. Durch weitere vertiefende Auswertungen wird es noch zu einer Präzisierung der Daten kommen.

Die Zielgebietsbefragung von Erholungsuchenden und Freizeitnutzern fand an mehreren Werk- und Wochenendtagen des Sommers 2006 in der gesamten Region Biosphärenpark Wienerwald statt. Der Fragebogen wurde in einem interaktiven Erarbeitungsprozess durch das interdisziplinäre Forscherteam, Stakeholdervertreter, Grundeigentümer und Fachexperten aus der Region entwickelt. Die Auswahl der Befragungsstandorte resultierte auf den Ergebnissen von Experteninterviews, wobei es einerseits galt, alle Freizeitnutzergruppen zu erreichen und andererseits Gebiete mit unterschiedlichen Nutzungsintensitäten einzubeziehen. Zusätzlich wurden die Fragebögen auf nutzergruppenspezifische Internetseiten gestellt, so dass vor allem bei der Nutzergruppe der Mountainbiker ein höherer Stichprobenumfang erreicht werden konnte. Insgesamt konnten 993 Erholungsuchende und Freizeitnutzer, darunter 136 Mountainbiker, befragt werden.

In der Stichprobe der Mountainbiker ist der überwiegende Teil der Befragten männlich und zwischen 15 und 45 Jahre alt. Die befragten Mountainbiker kommen zu einem hohen Anteil aus Wien, haben größtenteils Abitur und die Hälfte von ihnen sind Akademiker. In der erlaubten Jahreszeit (März bis Oktober) ist der überwiegende Teil der befragten Personen mindestens einmal die Woche und zwei Drittel sogar mehrmals die Woche unterwegs. Außerhalb der erlaubten Jahreszeit (November bis Februar) sind immerhin noch mehr

als ein Drittel mindestens einmal pro Woche unterwegs. Dabei liegt an Werktagen der zeitliche Schwerpunkt am Nachmittag und Abend, am Wochenende dagegen eher am Vormittag und am Nachmittag. Vor dem Hintergrund der erlaubten Aufenthaltszeit bis 17.00 bzw. 19.00 Uhr wird deutlich, dass etliche Mountainbiker sowohl außerhalb der erlaubten Tages- als auch Jahreszeit im Wienerwald unterwegs sind.

Die Befragung hat darüber hinaus gezeigt, dass die Kenntnis der Regelungen sehr gut ist, nahezu ebenso viele Befragte aber mit diesen Regelungen nicht einverstanden sind. Der überwiegende Teil der befragten Mountainbiker gab an, dass sie über zeitliche Regelungen zur Benutzung der Forstgebiete informiert sind, und fast alle wissen, dass es ausgewiesene Mountainbikerouten gibt. Aber nur ein Fünftel der befragten Mountainbiker ist mit den zeitlichen Regelungen einverstanden, über die Hälfte sind nicht einverstanden und einem geringen Teil sind die zeitliche Regelungen egal. Zwei Drittel der befragten Mountainbiker verlassen nach eigenen Angaben die ausgewiesenen Mountainbikerouten und die meisten von ihnen tun dies, obwohl sie wissen, dass das Verlassen der Wege starke Störungen für die Wildtiere zur Folge hat. Als Gründe für das Verlassen der Wege wurden u.a. Interesse, Neugierde, Abwechslung, Suche nach anspruchsvolleren, reizvolleren, schöneren Mountainbikestrecken, zu wenig offizielle Mountainbikewege, Ausweichen auf andere Wege bei zu hohen Besucherfrequenzen, fehlende Verbindungen zwischen Mountainbikestrecken, freie Wegewahl, gänzliche Bewegungsfreiheit, genannt. Und schließlich beurteilten gut ein Viertel der Mountainbiker das Gesprächsklima mit den Jägern anhand einer dreistufigen Skala als „unangenehm“, wobei sie als Gründe für das negative Gesprächsklima nicht so sehr die eigenen Verstöße, sondern eher den Umgangston nannten.

Die Versachlichung des Konfliktes zwischen Mountainbikern und Jägern bzw. Grundeigentümern besteht zunächst darin, die Interessengegensätze und Nutzungsansprüche der Konfliktparteien gegenüber zustellen. Anhand der Befragungsergebnisse konnten die Stimmungsbilder, die sich im Rahmen von Projektplattformen sowie Experteninterviews zum Thema Konflikte und Synergien zwischen den Nutzergruppen im Wienerwald herauskristallisierten, verifiziert werden. Die Vorwürfe der Jäger, Forstwirte und Grundeigentümer, dass Mountainbiker sich nicht an die zeitlichen und räumlichen Vorschriften halten, gehen konform mit den Aussagen der Mountainbiker. Die Befragung deckt aber zugleich als Ursache für diese Verstöße das hohe Maß an Unzufriedenheit mit den Regeln auf. Das Wissen um die verursachten Störungen und der hohe Bildungsgrad dieser Nutzergruppe sind offensichtlich kein Hinderungsgrund.

Festzuhalten ist, dass in dem seinerzeitigen Aushandlungsprozess die Interessen der Jäger und Grundeigentümer sichtlich überwogen haben, während die Nutzungsansprüche der Mountainbiker, und dabei insbesondere der Freizeitsportler aus der Region, nur unzureichend berücksichtigt worden sind. Das einst durchaus kooperativ angelegte Konfliktmanagement hat zu keinem allseits akzeptierten und nachhaltigen Konfliktergebnis geführt, so dass der Konflikt sehr rasch wieder aufbrach. Dies ist sicher auch vor dem Hintergrund eines weiteren Anstiegs der Zahl von Mountainbikern, einer besseren technischen Ausstattung, besserer Fahrtechniken sowie einer zunehmenden Arbeitszeitflexibilisierung zu sehen. Durch die Verstöße gegen die derzeitigen Beschränkungen setzen sich die Mountainbiker jedoch permanent ins Unrecht. Es besteht außerdem die Gefahr, dass sich die Fronten verhärten und der Konflikt verstärkt wird.

Eine Konfliktbewältigung im Biosphärenpark Wienerwald muss aus Sicht der Autorinnen auf zwei Ebenen erfolgen. Im Rahmen eines kommunikativ-kooperativen Konfliktmanagements sind in einem zweiten Diskussions- und Verhandlungsprozess die zeitlichen und räumlichen Beschränkungen zu überdenken. Um den Interessen der Mountainbiker besser zu entsprechen, müssten etwa die Zeiten (z.B. auf einzelnen Routen) ausgeweitet und ein differenziertes Strecken- und Flächenangebot (Downhill Parks) geschaffen werden. Ein solcher Diskussionsprozess, in dem die verschiedenen Interessen und Nutzungsansprüche dargelegt werden, hat bereits begonnen. Für ein erfolgreiches Konfliktmanagement im Biosphärenpark Wienerwald ist darüber hinaus eine verstärkte zielgruppenspezifische Information und Aufklärung erforderlich. Dabei müssen den Mountainbikern insbesondere die Störwirkungen, die sie abseits der vorgegebenen Routen und in den Dämmerungszeiten verursachen, sowie deren Folgen für Wildtiere, die Jagd und die Landschaft bewusst und erlebbar gemacht werden. Die derzeitigen und wie aus der Befragung ersichtlich weitgehend bekannten Fairplay-Regeln (Mountainbike Niederösterreich) erreichen nicht die gewünschte Wirkung in Hinblick auf Selbstevaluation und Selbstbindung.

6 RESULTAT

Die beiden Beispiele zeigen wie unterschiedlich die Problem- und Konfliktlagen um eine Freizeitaktivität sein können. In der Rhön, einer ländlich peripheren Region mit nicht so hohen Touristenzahlen bestand das zentrale Problem in der Erschließung des Biosphärenreservats für das Mountainbiking. Aufgrund der Konflikterfahrung der beteiligten Interessenvertreter und Entscheidungsträger konnte mit der gemeinsamen Entwicklung eines markierten Mountainbike-Routennetzes eine erfolgreiche Konfliktprävention betrieben werden. Im Biosphärenpark Wienerwald stellt sich die Konfliktsituation deutlich schwieriger dar. Zum einen handelt es sich um einen großstadtnahen Erholungs- und Freizeitraum mit verschiedenen Nutzergruppen und Nutzungsansprüchen und stellenweise hohen Nutzungsintensitäten, zum anderen um einen ebenfalls intensiv forst- und jagdwirtschaftlich genutzten Raum, unabhängig von der hohen Bedeutung des Gebietes als wildökologischer Korridor. Durch die Verzahnung der vielfältigen Nutzeransprüche und eine nur indirekte Erreichbarkeit einzelner Nutzergruppen ist ein Gebietsmanagement vor eine große Herausforderung gestellt.

Im Hinblick auf den Konfliktprozess hat die frühzeitige Erfassung der Konfliktpotenziale um das Mountainbiking in der Rhön eine so frühe Intervention ermöglicht, dass ein Konflikt nicht wirklich stattgefunden hat. Die positiven Wirkungen für alle Beteiligten sowie die Natur und Landschaft sind das Ergebnis eines gemeinsamen Problemlösungsprozesses unter Umgehung einer Konfliktaustragung. Im Wienerwald wird dagegen der Konfliktprozess erneut durchlaufen, weil das seinerzeitige Konfliktergebnis zwischen Tourismus und Grundeigentümern sowie Jägern nicht oder nicht mehr befriedigt. Dabei sind bei den aktuellen Konfliktbewältigungsaktivitäten die Langzeitwirkungen früherer Aushandlungsprozesse zu berücksichtigen.

Die Konfliktstruktur dient als Basis für die Konfliktdiagnose, insbesondere zur Abbildung des Beziehungsgefüges zwischen dem Konfliktgegenstand, den Konfliktparteien und den Streitpunkten. Während im Biosphärenreservat Rhön die Bündelung mehrerer Streitpunkte zu einem Gesamtergebnis geführt hat, geht es im Biosphärenpark Wienerwald vorrangig um einen Rückbezug von den Streitpunkten zum Konfliktgegenstand und dem ursprünglichen Konfliktpotenzial. Das schließt die Interessen der Konfliktparteien ebenso ein wie die Auswirkungen auf die Wildtiere. Stärker als in der Rhön wird im Wienerwald die Konfliktlösung durch die raum-zeitlichen Bezüge des Konfliktgegenstandes bestimmt. Und schließlich birgt die Erscheinungsform dieses Konflikts die Gefahr einer weiteren Eskalation, was eine Beilegung dringend erforderlich macht.

7 LITERATUR

BERKEL, Karl (1997): Konflikttraining. Konflikte verstehen, analysieren, bewältigen, Heidelberg (Arbeitshefte für Führungspsychologie, Band 15).

GLASL, Friedrich (1999): Konfliktmanagement: Ein Handbuch für Führungskräfte, Beraterinnen und Berater, Bern/Stuttgart.

MEYER, Bertold (1997): Formen der Konfliktregelung: Eine Einführung mit Quellen, Opladen (Friedens- und Konfliktforschung, Band 3).

UNESCO (Hrsg.) (1996): Biosphärenreservate. Die Sevilla-Strategie und die Internationalen Leitlinien für das Weltnetz. - Bundesamt für Naturschutz, Bonn.

ZIENER, Karen (2003): Das Konfliktfeld Erholungsnutzung – Naturschutz in Nationalparken und Biosphärenreservaten, Aachen, Habilitationsschrift, 460 Seiten).

”FAIRständnis in der Rhön”. In: Rhön-Spiegel 6/1999.

„Willkommen auf dem MTB-Wegenetz: ”FAIRständnis in der Rhön” – Miteinander statt gegeneinander“. In: Rhön-Spiegel 10/2000.

„Mit dem Mountainbike im Land der offenen Fernen: Ausgewählte Touren durch das BR Rhön“. In: Rhön-Spiegel 12/2000.

Verein Naturpark und Biosphärenreservat Rhön e.V.: http://www.naturpark-rhoen.de/main/Freizeit/ee_Mountainbiking/cc_Verhaltensregeln, 8.3.2007.

Moutainbike Niederösterreich: http://www.mbike.at/mbike/noe/, 15.3.2007.

Regionalwissenschaft und Filmkunst: eine Begegnung in der Steiermark

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Die Schwierigkeit den Zusammenhang zwischen Individuen und einer Wirtschaftsregion fassbar zu machen, beschäftigen Wissenschaft und Kunst. Allgemeines und Individuelles werden in dieser filmischen Arbeit konturiert. Regionalwissenschaft wird durch einen Animationsfilm allgemein zugänglich gemacht, formt ein umfassendes Bild der Lebenswirklichkeit in einem Landstrich und macht diesen damit als Ganzes erfahrbar, verstehbar und reflektierbar.

Der Animationsfilm, ein Projekt im Auftrag des Amtes der Steiermärkischen Landesregierung, Abteilung 16 – Landes- und Gemeindeentwicklung (überörtliche Raumplanung), wurde im Rahmen der Ausstellung „Umbruch-Aufbruch“ in Eisenerz im Herbst 2006 gezeigt.

1 DIE RAHMENBEDINGUNGEN

1.1 Demographischer Umbruch

Europa sieht sich in dem kommenden Jahrzehnten mit einem starken demografischen Wandel konfrontiert. Ein Übergang von einer jungen wachsenden Gesellschaft zu einer älteren tendenziell schrumpfenden Gesellschaft wird prognostiziert. Gründe dafür sind in den sinkenden Geburtenraten und steigenden Lebenserwartungen zu suchen.

Auch in Österreich sind ähnliche Tendenzen beobachtbar: obwohl die Gesamtzahl der Bevölkerung in den nächsten Jahrzehnten bis 2031 wächst, verändert sich die Altersstruktur parallel dazu Teils dramatisch. Zahl und Anteil jüngerer Altersgruppen sinken während die ältere Bevölkerung zahlen- und anteilsmäßig stark an Gewicht gewinnt.

Regional verteilt zählen vor allem Suburbanisierungsbereiche und Westösterreich zu den „Gewinnern“ mit dynamischen Bevölkerungswachstum. In peripheren Regionen und Stadtgebieten lassen sich dagegen Großteils sogar schrumpfende Bevölkerungszahlen erkennen.

In der Steiermark ist die Zahl der Einwohner in den vergangenen Jahrzehnten kontinuierlich zurückgegangen, die anhaltende negative Entwicklung in den Industriebezirken sowie in der Landeshauptstadt Graz ist der Grund dafür. Bis 2031 wird für die Steiermark lt. ÖROK ein anhaltender Bevölkerungsrückgang erwartet.

Der stärkste Bevölkerungsrückgang aller steirischen Bezirke war in der letzten Dekade in Leoben zu beobachten. Von Bevölkerungsrückgängen besonders stark betroffen waren in erster Linie die peripheren Gemeinden entlang der Eisenstraße im Norden des Bezirks, unter anderem auch Eisenerz. Für den Bezirk Leoben werden künftig noch weitere Bevölkerungsrückgänge prognostiziert. Dem Österreich weiten Trend folgend wird sich auch in den nächsten Jahren die Altersstruktur von den jüngeren Altersgruppen zu den älteren Altersgruppen verschieben.

Die Auswirkungen des in manchen Regionen dramatischen demographischen Umbruchs sind vielfältig: komplexe, und teilweise tief greifende, gesellschaftliche Veränderungen werden angestoßen. Ansprüche an Infrastruktur, wie der technischen Ver- und Entsorgung, der Verkehrsinfrastruktur sowie der Daseinsvorsorge verändern sich. Die Raumplanung ist angehalten Antworten und Konzepte dafür zu finden.

1.2 Ausstellung "Umbruch-Aufbruch"

Die Ausstellung regt an, über kritische Auswirkungen der Globalisierung aber auch über positive Elemente dieses Strukturwandels nachzudenken. In diesem Spannungsbogen, von Herausforderungen und Möglichkeiten, setzt unsere Gestaltung an. Aufgrund der Komplexität des Themas wurden einfach verständliche Begriffe und Bilder entwickelt, die sich wie ein „roter Faden“ durch die Ausstellung ziehen. Mit diesen Parametern lassen sich die gebotenen Informationen verknüpfen – verbinden – merken. Zugleich wurde die Themenabfolge inhaltlich inszeniert. Der Besucher taucht zuerst allgemein in das Gesamtthema ein, trifft auf weltweite Phänomene von Veränderungen und wird in der Folge mit österreichischen und

regionalen Entwicklungen konfrontiert. Am Ende kann er sich aktiv Ideen und Konzepte holen und beim Ausgang ist Raum für eigene Gedanken.

2 DAS FILMKONZEPT

2.1 Der Weg zum Drehbuch

Schon nach den ersten Überlegungen zu einem Drehbuch wurde klar, dass eine Möglichkeit gefunden werden musste um sich physisch bewegende Ausstellungsbesucher mental, und in zweiter Linie auch physisch, an die dargestellten Inhalte der Projektion zu binden, sozusagen einen Konnex von der Projektion zum Besucher herstellen. Auch musste davon ausgegangen werden, dass Ausstellungsbesucher zu jedem beliebigen Zeitpunkt den Ausstellungsraum betreten und in die Projektion „einsteigen“ wollen. Daher erschien es wichtig die Arbeit modular aufzubauen und somit mehrere, in zeitlich kurzen Intervallen aufeinander folgende, Einstiegspunkte dem Besucher anzubieten. Das breite regionalwissenschaftliche Themenspektrum in sinnvolle in sich abgeschlossene Module zu strukturieren war daher nahe liegend.

Wie kann jedoch eine persönliche Verbindung von teilweise abstrakten regionalwissenschaftlichen Inhalten zum Besucher, meist ohne wissenschaftlichem Hintergrund, hergestellt werden?

Es wurde die Idee geboren den Film Geschichten über Menschen erzählen zu lassen. Auf diese Weise soll es dem Ausstellungsbesucher erleichtert werden sich mit dem Dargestellten zu identifizieren, einen Bezug zum Inhalt herzustellen und ihm zu folgen.

Zu jedem thematischen Modul wurde ein passender Charakter gefunden. Vor Ort - sechs Orte wurden nach regionalen Strukturtypen, von der industriell geprägten Region über den suburbanen bis zum ländlichen Raum, gewählt - wurden Bewohner gefunden die Teile aus ihrem Leben, aus ihrem Alltag schilderten. In diesen Erzählungen spiegelten sich Facetten bzw. Entwicklungen der unterschiedlichen regionalen Entwicklungen wider.

2.2 Regionale Strukturtypen und deren Charaktere

Eingangs zu jedem Kapitel wird ein kurzes Portrait - Bevölkerungszahl, Bevölkerungsentwicklung und Altersstruktur - zu jedem Ort (Strukturtyp) gezeigt.

2.2.1 Suburbanisierung / Margit

Margit (30), ausgebildete Gärtnerin und Floristin, ist eine Verkäuferin in einem kleinen Blumenladen in Graz. Gemeinsam mit ihrem Mann und 2 Kindern bewohnt sie ein Einfamilienhaus in Lieboch, auf dem Grund der Schwiegereltern. Sie und ihr Mann pendeln täglich mit 2 PKWs zur ihren Arbeitsorten. Die Kinder können während der Arbeitszeiten in Nachmittagsbetreuungen in Lieboch untergebracht werden. Oder es passt die Schwiegermutter auf sie auf, was aber in letzter Zeit immer schwieriger wird da die Schwiegermutter auch nicht mehr die Jüngste ist und in absehbarer Zeit selbst Pflege in Anspruch benötigen wird. Deshalb hofft Margit, dass die Nachmittagsbetreuung in Lieboch auch bleibt. Sonst würde die Situation - Arbeiten, Pendeln, Familie - schwieriger werden. Obwohl sie schon gerne im Grünen wohnen, vor allem ist das gut für die Kinder, weil sie hat auch gute Erinnerungen an ihre Kindheit im Grünen. Und die Einkäufe können meistens gleich am Heimweg von der Arbeit gemacht werden, was wiederum auch ganz praktisch ist.

Untermalt wird das Interview mit Darstellungen der zunehmenden Flächeninanspruchnahme im Grazer Umland.

2.2.2 Urbane Umwelt / Klaus

Klaus (40), hat Maschinenbau studiert und ist jetzt als freiberuflicher Berater in Graz tätig. Er schätzt den urbanen Raum, möchte aber auf grüne Lebensqualität nicht verzichten und bevorzugt daher auch einen Wohnstandort am Stadtrand. Ein paar Minuten Fahrtzeit in die Innenstadt werden gerne in Kauf genommen, wenn im Gegenzug dafür die Ruhe einer Grünlage genossen werden kann. Klaus ist begeisterter Nutzer öffentlicher Verkehrsinfrastruktur, gesteht aber ein, dass in seinem Beruf oft sehr kurzfristig flexible Mobilität gefordert wird, die er als Fahrgast des öffentlichen Verkehrs oft nicht bieten könnte.

Im Film wird dazu eine Gegenüberstellung des Modal-Splits von Graz und Graz-Umland gezeigt.

2.2.3 Ländlicher Raum / Franz

Franz (45) ist ein Landwirt aus Oberzeiring. Er berichtet vom Paradigmenwechsel, von alten Zeiten und seinem Zugang zur Landwirtschaft. Als ein Hof mit einem gut funktionierenden Mischeinkommen - Milchbetrieb, Viehverkauf, Forstwirtschaft - noch eine zukunftsträchtige Existenzgrundlage war. Ohne jegliche Romantik, mit der der ländliche Raum nur allzu gerne in Verbindung gebracht wird, beschreibt er seinen Zugang zur Landwirtschaft als einen rein ökonomischen. Mit Beginn der 1980er Jahre setzte verstärkt der Trend zur Mechanisierung ein und die Landwirtschaft wurde effizienter. Daran angepasst begann er seine frei gewordenen Arbeitskapazitäten zu nutzen und sich ein zweites Standbein neben der Landwirtschaft aufzubauen. Auch für ihn als Landwirt wurde seit dieser Zeit die Dienstleistungsgesellschaft spürbarer.

Dazu wird die Bedeutung der Landwirtschaft in der Steiermärkischen Regionalstruktur über das Ausmaß der landwirtschaftlich genutzten Flächen im Bundesland und die Bedeutung dieses Sektors am steirischen Arbeitsmarkt (Agrarquote) illustriert.

2.2.4 Qualifizierung und Internationalisierung / Eva

Eva (23) hat nach der HBLA Matura ihre Heimatgemeinde Eichkögl verlassen um in Wien an der Wirtschaftsuniversität internationale Betriebswirtschaftslehre zu studieren. Obwohl sie immer wieder gerne für ruhige ausgedehnte Spaziergänge nach Hause in die Steiermark kommt, gefällt ihr die Großstadt Wien auch sehr gut. Vor allem das kulturelle Angebot und die mit der Größe einhergehende Anonymität haben es ihr angetan. Ihr fachliches Hauptinteresse liegt im Bereich des Marketings und der Werbung kombiniert mit Fremdsprachen, deshalb habe sie auch dieses Studium gewählt. Nach Abschluss würde sie Auslandserfahrung einem Job in Österreich vorziehen. Russisch lernen käme auch noch in Frage, denn sie sieht die Öffnung der europäischen Märkte gegen unsere östlichen Nachbarn als wichtige persönliche Zukunftschance.

Das Bildungsniveau, die Bildungsinfrastruktur und Außenbeziehung der Steiermark werden während dieser Erzählung dargestellt.

2.2.5 Strukturwandel und demografische Entwicklung / Erich

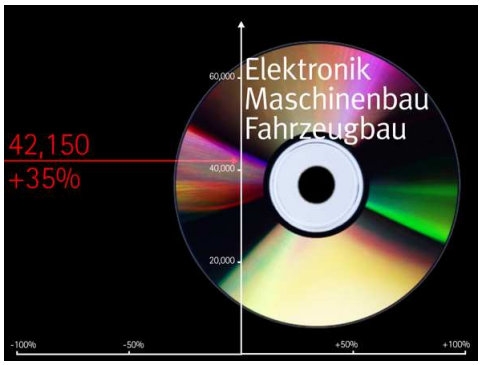
Erich (70) hat in seiner Jugend noch den Beruf des Bergmanns in der Bergwerkschule in Eisenerz gelernt. Sein Leben ist durch eine enge Beziehung zum Erzberg geprägt. Zu Beginn seiner Arbeit als Bergmann wurde noch in mühsamer und gefährlicher händischer Bergwerksarbeit damals das Erz in der Grube abgebaut. Dann kamen die Maschinen, die die Arbeit erleichterten, aber auch Bergmänner ersetzten. Rationalisierungen waren die Folge, zu unrentabel wurde der Abbau am Erzberg. Er schildert die stufenweisen Schließungen der Grube, erinnert sich an ins Leben gerufene Stiftungen um ehemalige Bergmänner umzuschulen. Er sieht die Überalterung seiner Gemeinde selbst, meint er, und wie die Bevölkerung immer weniger wird. Zu viele Gebäude stehen inzwischen leer die den Genossenschaften nur mehr Kosten verursachen. Der Rückbau wie er jetzt geplant ist, scheint unvermeidlich.

Parallel zu dieser Erzählung bauen sich nacheinander Karten und Diagramme zu Bevölkerungsentwicklung und Altersstruktur in der Steiermark auf.

2.2.6 Strukturwandel und Arbeitswelt / Herta

Herta (48) lebt und arbeitet in Krieglach. Sie ist gelernte Köchin, war eine Zeit lang im Tourismus tätig und mit ihrer Heirat wurde sie Hausfrau. Nach der einvernehmlichen Scheidung von ihrem Ehemann war sie plötzlich wieder auf sich alleine gestellt und musste eine Arbeitsstelle suchen. Bei einem kleinen Industriebetrieb wurde sie fündig und arbeitet seitdem im Schichtbetrieb an einer Biegemaschine. Inzwischen ist Herta ein wichtiger Bestandteil des Betriebs. Ohne sie kommt es zu Problemen in der Produktion. Deshalb gibt es auch kaum Urlaub für Herta. Zumindest ein paar Tage hofft sie sich dieses Jahr herausschlagen zu können. Wirtschaftlich geht es jetzt überhaupt wieder besser. Aber sie erinnert sich auch an Zeiten wo nicht klar war ob der Betrieb am nächsten Tag noch aufsperren wird. Produktionsbedingt wird der Betrieb Krieglach bald verlassen und nach Ternitz abwandern. Herta möchte Arbeitslosigkeit um jeden Preis vermeiden und wird mitziehen, ungern wie sie sagt. Wohnhaft bleibt sie aber in Krieglach. Dann wird jeden Tag gependelt, mit dem Auto, weil rechtzeitig zu ihrer Frühschicht kein Zug in dieser Gegend fährt.

Auf einem animierten Diagramm werden dazu Veränderung der Wirtschaftsstruktur und Beschäftigung in der Steiermark seit 1981 verdeutlicht.



3 DER FILM

3.1 Leitmotiv

Information wird erst durch Gestaltung versteh- und erfahrbar gemacht. Gestalten bedeutet in diesem Zusammenhang den Dingen eine ihrem Wesen entsprechende Form zu verschaffen. Ihre Erscheinung und ihr Gehalt werden so zu einer Einheit. Diesem Diktum entsprechend verlangt außergewöhnliche Information auch eine besondere Form. Da der Analphabetismus im Bereich des Lesens von regionalwissenschaftlicher Information weit verbreitet, nicht problematisiert und daher mittelfristig eine Tatsache ist, musste eine gestalterische Übersetzung erfolgen.

Dieser Anspruch diente der vorliegenden Arbeit als Leitmotiv und Antrieb.

3.2 Wahl des Mediums Film und seine Vorteile gegenüber anderen Medienarten

Film und damit auch Animationsfilm haben einige allgemeine Vorteile in der Vermittlung von Information aber zusätzlich auch spezielle Eigenschaften, die in diesem Fall der Vermittlung von Regionalwissenschaftlichem dienen.

Die allgemeinen Vorteile beziehen sich besonders auf die Einführung der vierten Dimension in Form der Zeit im Film und die besonderen Möglichkeiten des Animationsfilms von der physischen Welt zu abstrahieren und damit gestalterische Absichten auch in Bereichen des nicht Gegenständlichen zu realisieren.

Besonders die filmische Aufarbeitung von Kartenmaterial birgt eine Vielfalt an Möglichkeiten, deren Entdeckung künstlerisches noch nicht ausgereizt wurde. Im Animationsfilm kann der Blick des Zuschauers ausgehend vom ursprünglichen Kartenmaterial gelenkt werden, sodass die statische Karte Ausgangspunkt einer dynamischen Entdeckungsreise in die Region wird. Animationselemente erlauben dabei die Einführung einer klaren Bildsprache entlang der Zeitachse.

Die filmische Gestaltung im Kontext einer Ausstellung verlangt darüber hinaus eine verständnisvolle Herangehensweise an die Situation des Zuschauers, die eine andere ist als die in einem Kinofilm. Die Betrachter kommen und gehen zeitversetzt, wodurch ein jederzeitiges Einsteigen in das Filmerlebnis gewährleistet sein muss. Durch eine Gestaltung des Films als Aneinanderfügung von Einzelteilen die sowohl für sich genommen als auch in Summe Sinn ergibt, wird dieser Notwendigkeit Rechnung getragen. Der

Animationsfilm zerlegt somit die inhärente Information in mundgerechte Stücke, sodass sich der Betrachter zurücklehnen und geniessen kann. Ist er satt, dann zieht er weiter. Das klassische Ende verliert so seine zentrale Bedeutung und wird in einem mäandernden Zuschauerstrom aufgelöst.

Der Animationsfilm schöpft die Möglichkeiten den Zuschauer abzuholen sehr weit aus. Die Eintrittsbarrieren für den Betrachter sind niedrig und es wird genug geboten um den Zuschauer interessiert zu halten. Durch diese emotionale Hintertür kann der Film seine eigentliche regionalwissenschaftliche Botschaft in den Kopf der Passanten einschleusen. Der Animationsfilm kann sich dabei die ihm eigenen Möglichkeiten des bildsprachlichen Humors besonders zunutze machen.

Die digitale Verfilmung eröffnet dann nach ihrem Einsatz auf einer Ausstellung weite Möglichkeiten zur fortgeführten Verbreitung beispielsweise über das Internet.

Die oben beschriebenen Charakteristika lassen sich besonders vor dem Spiegel anderer Medienarten besonders gut erkennen. Gedruckte Information wie man sie in Foldern oder Broschüren findet verlangt vom Rezipienten ein deutlich höheres Mass an anfänglichem Interesse. Der Leser muss hier den sprichwörtlichen ersten Schritt tun.

Ähnliches gilt für statische grafische Information wie sie auf Plakaten zu finden ist. Hier ergibt sich für den Betrachter die zusätzliche Schwierigkeit, dass er der benutzten grafischen Sprache nicht mächtig ist, was ihn ebenfalls von einer weiteren Beschäftigung abhält.

3.3 Idee und Aufbau des Films

Die konkrete Arbeit vermittelt ihren Gehalt durch den Einbezug spezifischer Menschen und ihrer Schicksale. Dies wird durch Interviews im Film als Audiospur realisiert. Dazu kontrastierend vermittelt die Videospur, in einer den Sprecher bestätigenden Art und Weise, allgemeine Daten zur Region. Aus dieser Wechselwirkung von Bild und Ton wird die Interdependenz zwischen individuellem Leben und allgemeinen Determinanten und umgekehrt klar herausgearbeitet.

Die Gestaltung des Films orientiert sich dabei an der kurzen Aufmerksamkeitsspanne eines Besuchers bezüglich eines Films im Kontext einer Ausstellung. Die durchschnittlichen fünf Minuten Sehzeit tragen wesentlich zum gestalterischen Konzept des Animationsfilms bei. Demzufolge werden sechs Lebenswege vor dem Hintergrund allgemeiner diese bestimmenden Fakten gezeigt. Diese sechs Biographien laufen in einer "Endlosschleife" während der Dauer der Ausstellung. Der Betrachter ist dadurch in seiner Verweildauer flexibel und kann Biographien auch mehrmals in Augenschein nehmen und so tiefer eindringen.

Zur leichteren Verstehbarkeit werden graphische Elemente eingeführt und leitmotivisch wiederholt oder variiert. Einfache Elemente werden flächig aufgelöst und Muster formieren sich zu thematischen Bildern.

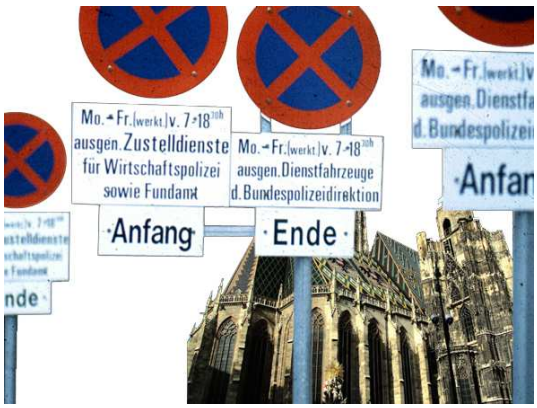
Die filmischen Übergänge kommen ohne harte Schnitte aus um einen jederzeitigen sanften Einstieg zu gewährleisten.

Der Film wird im Kontext der Ausstellung auf einen flachen Tisch projiziert und der Zuschauer so in eine erhöhte Position gebracht. Die Arbeit wird ihm gleichsam serviert. Diese spezielle Form der Projektion erhöht so nochmals die Aufmerksamkeit des Besuchers um diesen in ihren Bann zu ziehen.

4 ZUSAMMENFASSUNG

Regionalwissenschaftliche Analysen und Studien werden meist gedruckt und gebunden, beinhalten komplizierte Indikatordefinitionen und sind gespickt mit zahlreichen Eckdaten, Regionstabellen und komplexen mehrschichtigen Kartendarstellungen. Zweifellos ideal geeignet für Fachpublikum, dass über fundiertes Hintergrundwissen verfügt und dieses über bestimmte Regionen und Fragestellungen erweitern möchte.

Verstehen von Zusammenhängen bildet die Grundlage für Akzeptanz. Mit dem Animationsfilm hält die Regionalwissenschaft ein äußerst mächtiges Medium in Händen. Über Audio, Grafik, Text und Animation können komplexe Inhalte ansprechend verpackt und plastisch einem „Laienpublikum“ näher gebracht werden. Synergien zwischen Wissenschaft und Kunst lassen sich optimal nutzen indem Wissensvermittlung mit anspruchsvoller Unterhaltung gepaart wird.



5 QUELLENVERZEICHNIS

Amt der Steiermärkischen Landesregierung (A16): Rauminformationssystem Steiermark Regionsprofil Leoben, Graz 2006.
ARGE Nussmüller, Resch, Rosegger: Umbruch-Aufruch, Ausstellungskonzept, Eisenerz 2006.
Eurostat: Europe in figures - Eurostat yearbook 2006-07, Luxembourg 2006.
ÖROK: ÖROK-Prognosen 2001-2031, Teil 1: Bevölkerung und Arbeitskräfte nach Regionen und Bezirken Österreichs (Aktualisierung 2006), ÖROK-Schriftenreihe 166/I, Wien 2006.

🏆 *reviewed paper*

Kreuzberg an die Spree – Stadt an die Spree

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Das Kreuzberger Spreequartier ist einer der wichtigsten Umstrukturierungsräume Berlins in Wasserlage. Über zielgerichtete öffentliche Initialprojekte sowie einen moderierten Stadtumbauprozess soll ein nachhaltiger Strukturwandel eingeleitet werden. Ziel ist, das Kreuzberger Spreeufer zu einem gesamtstädtisch bedeutenden Stadtquartier zu entwickeln.

Das 100 ha große Gebiet 'Kreuzberg – Spreeufer' wurde Ende 2005 auf der Basis einer Voruntersuchung mit Machbarkeitsstudie durch Beschluss des Berliner Senats als eines von fünf Gebieten im Programm Stadtumbau West nach § 171b BauGB festgelegt. Im Vorfeld dieses Beschlusses wurden die Machbarkeitsstudien der in Konkurrenz stehenden potenziellen Stadtumbauräume im Weststeil der Stadt durch ein von der Senatorin für Stadtentwicklung gebildetes Expertengremium beurteilt. Aufgrund des eindeutigen Votums des Expertengremiums für das Konzept für das Gebiet 'Kreuzberg – Spreeufer' hat der Berliner Senat bereits aus Programm-Mitteln 2005 insgesamt 3,1 Mio. EUR für Initialmaßnahmen zur Verfügung gestellt.

Um mit der Umsetzung des Programms zügig beginnen und bereits 2006 erste Ergebnisse erreichen zu können, wurde das im Gebiet ansässige Büro Herwarth + Holz, das bereits in intensiver Zusammenarbeit mit der Abteilung Stadtentwicklung des Bezirksamtes die Machbarkeitsstudie erarbeitet hat, mit dem Stadtumbaumanagement beauftragt.

Wie stellt(e) sich die Ausgangssituation dar? Welche gravierende Mängel, aber auch erhebliche Entwicklungspotenziale für die Gesamtstadt und den Ortsteil Kreuzberg bestehen, die eine Aufnahme in das Stadtumbauprogramm rechtfertigen.

1 AUSGANGSSITUATION

Mit der Wiedervereinigung Berlins wurde die dreifache Grenzlage des Kreuzberger Spreequartiers zu Ost-Berlin – zu Mitte, Friedrichshain und Treptow – aufgehoben und das 2 km lange Spreeufer Kreuzbergs aus der Randlage in das Vorfeld des historischen Stadtzentrums gerückt. Die Fusion mit Friedrichshain zu einem neuen Großbezirk sowie ambitionierte Planungen für den Spreeraum in Reaktion auf die neuen stadträumlichen Qualitäten waren die konsequenten Folgen. Doch während im näheren Umfeld – in Mitte, Friedrichshain und Treptow – Zeichen des Wandels und Umbruchs unübersehbar sind, verharrt(e) das Kreuzberger Spreeufer insbesondere im nordöstlichen Bereich – also der Innenstadt zugewandt – mit stadtrandähnlichen Lager- und Logistiknutzungen in Stagnation. Sie stehen als unpassierbare Barriere zwischen den Wohnquartieren des südlich gelegenen Wrangelkiezes und der Stadtspree.

Tendenzen einer Aufwärtsentwicklung sind einzig im südöstlichen Bereich, in der typischen Kreuzberger Mischung aus traditionellem Geschossgewerbe und gründerzeitlicher Wohnbebauung festzustellen. Auch seitens der öffentlichen Hand wurden – mit Ausnahme der Rekonstruktion der Oberbaumbrücke; Calatrava war hier der verantwortliche Ingenieur – keine impulsgebenden Investitionen vorgenommen.

Im Ergebnis der Untersuchungen wurde eine Reihe von vor allem kriegs- und teilungsbedingten Problemen herausgearbeitet, die zu einer der Lagegunst unangemessenen Entwicklungsblockade führten, die ihrerseits die lokal ansässige Ökonomie in ihrer Entfaltung schwächt und für ansiedlungsinteressierte Unternehmen, Investoren und Bauherren keine Zugkraft bewirkt.

2 DAS PROGRAMM

Das für das Kreuzberger Spreequartier entwickelte Leitbild formuliert konsequent die Formel seines Umbaus:

Kreuzberg an die Spree - Stadt an die Spree.

Das Leitbild

... ist eine Metapher für die gesamtstädtische Bedeutung des Entwicklungsraumes.

... es rückt das einmalige Potenzial des Kreuzberger Spreeraums ins Bewusstsein und animiert, die Wasserlage als Potenzial der weiteren Stadt- wie Stadtteilentwicklung zu nutzen.

... es fordert auf, den Stadtteil an seinen prominenten Freiraum heranzuführen, ihn zur Spree zu öffnen, ihn mit dieser zu vernetzen.

... es steht für den Paradigmenwechsel von einem Spreeraum für wenige (gewerbliche Nutzer) zu einem Spreeraum für alle.

... es setzt bei der Entwicklung des Kreuzberger Spreequartiers auf endogene wie exogene Potenziale.

... es verdeutlicht, dass die Vielschichtigkeit des Stadtteils auf die Entwicklungsflächen am Spreeufer übertragen werden soll, dass Nutzungsenklaven ohne Bezug zum Quartier vermieden werden.

... es vermittelt Dynamik, das Beenden von Stillstand, das Einleiten von Wandel.

Im Leitbildplan sind die Ziele und vorgeschlagenen Maßnahmen für den Stadtumbau- bzw. Neuordnungsprozess im Sinne einer konkreten räumlichen Vision abgebildet. Die Bebauungschiffren stehen in Einklang mit der angestrebten Nachnutzung der Umstrukturierungsräume nördlich der Magistrale Köpenicker Straße / Schlesische Straße sowie den Notwendigkeiten zur Stadtreparatur südlich der Magistrale.

Konkretisiert wird das Leitbild in einem '8 Punkte-Programm', dem Bündel von Schlüssel-, Ergänzungs- und Folgeprojekten zugeordnet sind.

1. Urbanisierung des Kreuzberger Spreeufers als Entree der Innenstadt, als Visitenkarte Kreuzbergs zum Wasser

Einige Grundstücke des Spreegürtels nehmen aufgrund ihrer nicht mehr angemessenen gewerblichen Nutzung eine Schlüsselstellung für den Stadtumbau des Spreeufers ein. Die betriebsverträgliche Verlagerung größerer Betriebe auf andere Standorte möglichst innerhalb des Bezirks, die Beräumung nicht erhaltenswerter Bausubstanz und die Qualifizierung der Umstrukturierungsflächen für stadtentwicklungspolitisch attraktive neue Nutzungen bilden ein wesentliches Maßnahmenbündel von hoher Priorität.

Die beräumten Flächen stellen im Kontext der Entwicklungen im Umfeld des Untersuchungsgebietes ein Portfolio hochwertiger Grundstücke zwischen dem Spreeufer und der Magistrale Köpenicker Straße / Schlesische Straße dar, die von Interesse sowohl für lokal als auch überregional orientierte Unternehmen sind.

Darüber hinaus sind insbesondere die unmittelbaren Wasserlagen prädestiniert für freifinanziertes hochwertiges ggf. autoarmes Wohnen.

Grundsätzlich ist davon auszugehen, dass die anstehenden Betriebsverlagerungen und Maßnahmen zur Grundstücksneuordnung aus den Grundstückserlösen finanziert werden können.

2. Vernetzung der Kreuzberger und Friedrichshainer Spreeufer als Teile eines prosperierenden Wirtschaftsraums

Die Oberbaumbrücke ist heute die einzige direkte Verbindung zwischen den beiden Ortsteilen des fusionierten Bezirks Friedrichshain-Kreuzberg. Während der Abstand der einzelnen Brücken im historischen Innenstadtbereich zwischen 250 und 600 m liegt, beträgt dieser zwischen der Schillingbrücke als nächster Brücke im Bezirk Mitte und der Oberbaumbrücke mehr als 1,3 km - eine äußerst unstädtische Dimension. Angesichts der geplanten urbanen Verdichtungen auf Kreuzberger Seite und Friedrichshainer Seite ist der Bau von Brücken zur Verflechtung der Spreeufer über kurze Wege im Individualverkehr wie im ÖPNV und zur Herbeiführung von Synergien bei der Entwicklung beider Uferseiten von besonderer Bedeutung.

3. Öffnung und Erschließung des Spreeraums für den Stadtteil / für die Stadt

Mit einem geschlossenen Wegenetz aus Uferpromenaden, Steganlagen sowie Straßen und Wegen, die aus dem Quartier über die Magistralen (Köpenicker Straße und Schlesische Straße) an das Wasser heranführen, wird der geschlossene Spreegürtel 'perforiert' und die Spreelage sowohl von der Wasserseite als auch aus dem Stadtteil heraus erlebbar gemacht. Die Durchwegung und Öffnung des Spreegürtels ist ein weiteres Initial für seine Urbanisierung und Vitalisierung.

Durch die Überlagerung der Nord-Süderschließung mit der Schaffung von begleitenden Grünanlagen als 'grüne Fenster' zur Spree entstehen attraktive Vorzonen und 'Adressen' für eine Neubebauung wie für die bestehenden historischen Gebäude. Im Bereich von Wohnnutzungen wird hierdurch u.a. die Nordlage der Spree kompensiert.

Wesentliche Schlüsselprojekte sind u.a. eine Uferpromenade in der Kombination wasserseitiger Stege und landseitiger Uferwege sowie 'Spreebalkone' als Aussichtsplattformen und markante 'Wassermarken' in der Spree.

4. Entwicklung der Hauptverkehrsachse Köpenicker Straße – Schlesische Straße als Magistrale mit differenzierter Aufenthalts- und Nutzungsqualität

Die Hauptverkehrsachse zeigt sich zur Zeit sowohl in ihrer städtebaulichen Struktur wie auch in ihrem Nutzungsgefüge mit einem deutlichen Nordwest-Südost-Gefälle.

Mit der Entwicklung der Achse als 'Magistrale' soll der Wandel von einer trennenden Hauptverkehrsstraße zu einem Straßenraum mit Aufenthaltsqualität und hoher Nutzungsdichte eingeleitet werden. Die Aufwertung der Straßenräume schafft darüber hinaus Lagequalitäten für weitere Investitionen im Einzelhandels- und Dienstleistungsangebot.

Zu den umzusetzenden Maßnahmen gehört die Aufwertung der Straßenräume insbesondere für Radfahrer (eigenständige Fahrstreifen) und Fußgänger (Querungshilfen) und die Neuordnung des ruhenden Verkehrs.

5. Aufwertung des Bereichs am U-Bahnhof Schlesisches Tor als Quartiersmittelpunkt und Kristallisationsort

Der Bereich um den U-Bahnhof Schlesisches Tor ist trotz seiner funktionalen und gestalterischen Mängel bereits heute als Mittelpunkt des Quartiers zu sehen. Nicht in Einklang hiermit steht die unzureichende Verflechtung seiner besonderen Potenziale.

Die geplante Wiederbelebung des Gröbenufers als wichtiger Ort der Erholung, der Gastronomie aber auch der Verknüpfung des schienengebundenen ÖPNV mit einem wassergebundenen ÖPNV nimmt eine Schlüsselrolle im Aufwertungsprozess ein.

Die Wiedernutzbarmachung des Gröbenufers für die Fahrgastschifffahrt sowie die ev. Einrichtung von Wassertaxen wird den heute abgelegenen Bereich lokal und gesamtstädtisch in den Fokus rücken, wodurch das Ufer sowohl einen Bekanntheits- als und einen Besucher-zuwachs erfährt. Beides sind Voraussetzungen für Investitionen in seinem Umfeld.

6. Weiterentwicklung der Quartiersachse Wrangelstraße als Standort der Nahversorgung, Stärkung des Wohnumfeldes in ihrem Verflechtungsbereich

Diesem Programmziel sind keine unmittelbaren Schlüsselprojekte des Stadtumbaus zugeordnet. Die Aufwertung der Wrangelstraße und der angrenzenden Straßen erfolgt in enger Abstimmung mit den Projekten des Quartiersmanagements im Rahmen des Bund-Länder-Programms 'Soziale Stadt'; in das der Wrangelkiez als benachteiligter Stadtteil bereits vor 6 Jahren aufgenommen wurde. Ziel ist, die Wrangelstraße als Geschäftsstraße funktional und gestalterisch zu stärken. Die Profilierung einer alten Markthalle, ihre Sicherung und ihr Ausbau als Nahversorgungsschwerpunkt für das gesamte südöstliche Kreuzberg ist dabei ein weiterer wichtiger Schritt.

7. Etablierung einer neuen kreativen 'Kreuzberger Mischung'

Auch diesem Programmziel sind keine Schlüsselprojekte zugeordnet. Im Zuge eines Stadtumbauprozesses sind mit Unterstützung der lokalen Akteure über die Steuerung und Moderation von Prozessen:

- Anreize und Angebote für innovative Startup-Firmen zu schaffen
- Nischen in den Altbaubeständen für Zuzüge aus der kreativen Szene zu sichern
- kleinteilige Angebote für Wohnen und Arbeiten im Altbau wie im Neubau zu entwickeln

- die Einzelhandelsversorgung (insb. an der Köpenicker Straße / Schlesischen Straße) zu verbessern.

8. Aufbau eines Entwicklungsnetzwerks zur Begleitung des Stadtumbaus / Öffentlichkeitsarbeit

Im Rahmen der Erarbeitung der Machbarkeitsstudie wurde über die intensive Einbindung der lokalen Akteure ein wichtiger Schritt zum Aufbau eines begleitenden Entwicklungsnetzwerkes getan. Die (gesicherte) Beteiligung der lokal Handelnden sowie der Eigentümer und Unternehmen im Gebiet legte den Grundstein für den begonnenen Stadtumbauprozess und für eine effiziente Kommunikation der geplanten Projekte und Maßnahmen. Gemeinsames Ziel ist, das Kreuzberger Spreequartier zu einem attraktiven und dynamischen Wirtschafts- und Stadtraum mit Ausstrahlung nach Mitte, Friedrichshain und Treptow aber auch in den Wrangelkiez selbst zu entwickeln.

3 FAZIT

Im Fazit ist die eingeleitete Umstrukturierung für das Kreuzberger Spreeufer einem Lösen von Knoten gleichzusetzen, mit dem Ziel, das Spreebord in den dynamischeren Entwicklungsprozess seines Umfeldes zu integrieren, wovon in Wechselwirkung auch dieses wieder entscheidend profitiert.

Mit der Förderung im Stadtumbauprogramm ist die einmalige Chance verbunden, den stadträumlich und verwaltungstechnisch zusammenhängenden beidseitigen Spreeraum zu verzahnen und als Foyer der historischen Stadtmitte zu profilieren.

Der Stadtumbau wird hierbei nicht als langwieriger Prozess, sondern als kurzfristig eingesetzter Motor einer sich verselbstständigenden Entwicklung gesehen. In die skizzierten Schlüsselmaßnahmen werden bis 2010 insgesamt 9 Mio. EUR investiert. Hinzu kommen etwa 10 Mio. EUR über andere Förderprogramme (z.B. aus der Gemeinschaftsaufgabe für den Brückenbau). Wir gehen davon aus, dass damit private Folgeinvestitionen in Höhe von 300 Mio. angestoßen werden können.

Leitbildplan "Kreuzberg an die Spree – Stadt an die Spree"

Blick von der Schillingbrücke nach Südosten Richtung Oberbaumbrücke

Verbauter Weg entlang der Spree mit den Resten des Widerlagers der Brommybrücke

Viktoriaspeicher

'verwaistes' Gröbenufer

Blick vom Kreuzberger Spreeufer Richtung Nordwesten zum Stadtzentrum (Mitte)

🏆 *reviewed paper*

Entwicklungsperspektiven für die Lebensqualitäten Wohnen und Freiraumnutzung in den Städten Bonn und Dresden

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1 ZIELSETZUNG UND METHODIK DER FORSCHUNG

Die besonderen Lebensqualitäten Wohnen und Freiraumnutzung konnten im IÖR-Forschungsprojekt „Freiräume und Wohnungsbestände als Potenziale für den Stadtumbau“ bezogen auf ausgewählte Nutzergruppen und die konkreten Bedingungen in differenzierten Stadtgebietstypen der Städte Bonn und Dresden identifiziert werden in Verbindung mit Verhaltensweisen und Wünschen nach Veränderun-gen. Dieser Beitrag vermittelt diese Verhaltensweisen in Bezug zur Wahrnehmung durch die Wohnbevölkerungsgruppen einschließlich konkreter Wünsche nach Veränderungen. Die perspektivischen An-sätze für eine bedarfsgerechte Aufwertung der Lebensqualitäten Wohnen und Freiraumnutzung bezie-hen sich auf Stadtgebietstypen und die Stadtentwicklung.

Den Forschungen lagen Arbeitshypothesen zugrunde, denen die Auswahl der Fallbeispiele und Me-thoden nachgeordnet wurde. Im Einzelnen wurde davon ausgegangen, dass sich a) die Bedingungen für den Stadtumbau in einzelnen Stadtgebietstypen unterscheiden, b) die Verhaltensweisen und Bedar-fe bezüglich Wohnen und Freiraumnutzung nach Familienstand, Bildungs- und Tätigkeitsmerkmalen unterscheiden und c) bei Beachtung des kleinräumigen Bestandes und der differenzierten Bevölke-rungsbedarfe die Umwelt- und Lebensqualität erhöht werden können. Gegenstand der Forschungen sind ausgewählte teilstädtische Räume, die differenzierte Stadtgebietstypen in Großstädten repräsen-tieren. Um die Situation in den betrachteten Stadtgebieten einzuschätzen und Hinweise zur Nutzung und gewünschten zukünftigen Entwicklung der Freiflächen und der Wohnungsbestände in diesen Räumen zu gewinnen, wurde jeweils eine Befragung in Dresden und in einer strukturell ähnlichen Stadt in den Altbundesländern durchgeführt. Deshalb stand ganz am Anfang des Projektes die Frage, welche Stadt in den Altbundesländern die größte strukturelle Ähnlichkeit zu Dresden hat. Anhand einer mathematischen Optimierungsaufgabe konnte festgestellt werden, dass unter 116 kreisfreien Städten die Stadt Bonn die größte Ähnlichkeit zu Dresden bezüglich der folgenden 12 Merkmale ausweist (Thinh 2007):

- Anteil der Siedlungs- und Verkehrsfläche an der Stadtfläche [%],
- Anteil der Freiraumfläche an der Stadtfläche [%],
- Erholungsfläche (31.12.96) [m² je Einwohner],
- Freiraumausstattung [m² Freiraumfläche je Einwohner],
- Öko-Wert der Stadt [-],
- Versiegelungsgrad [%],
- Bevölkerungsdichte [Einwohner je km² Stadtfläche],
- Siedlungsdichte [Einwohner je ha Siedlungs- u. Verkehrsfläche],
- Arbeitslosenquote IV. Quartal 1996 [%],
- Bodenpreis in Form von Kaufwerten für baureifes Land [€/m²],
- Bruttowertschöpfung [€ je m² Siedlungs- u. Verkehrsfläche] und
- Bruttowertschöpfung [€ je m² Stadtfläche].

Diese Kenngrößen charakterisieren das ökologische und das ökonomische Leistungsvermögen einer Stadt. Sowohl Dresden als auch Bonn sind ehemalige Residenzstädte und Städte am Fluss.

In beiden Städten wurden für die Befragungen und Bestandsbewertungen der Wohnbebauung und Freiraumausstattung Stadtgebietstypen ausgewählt, aus denen sich Städte zusammensetzen.

Gebietstyp	Gebietsname	Kurzbeschreibung

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Zentrum	Dresden-Innere Altstadt	Kerngebiet; gemischte Baualtersstruktur; Wohnen, Gewerbe, Kultur und Einzelhandel
	Bonn-Stadtzentrum	
Gründerzeit	Dresden-Pieschen	Innerstädtisch; Bebauung aus den Jahren 1870 bis 1918; geschlossene und offene Blockrandbebauung, durch Neubau geschlossene Baulücken,
	Bonn-Südstadt	
1950/60er Jahre	Dresden-Seevorstadt	Innerstädtisch; Bebauung der 1950er und 1960er Jahre; überwiegend drei - bis sechsgeschossige Zeilenbebauung,
	Bonn-Reutersiedlung	
Großsiedlung	Dresden-Prohlis	Randstädtisch; Baualtersgruppe 1970 bis 1989; überwiegend sechsgeschossig; industrielle Bauweise
	Bonn-Tannenbusch	
1980er Jahre	Dresden-Räcknitzhöhe	
Villenbebauung	Dresden-Blasewitz	Randstädtisch; Baualtersgruppe 1890 bis 1930, Nachverdichtung durch Neubau; überwiegend zweigeschossige Einzelhausbebauung (Villen)
	Bonn-Bad Godesberg	
Eigenheimsiedlung	Dresden-Dölzschen	Randstädtisch; gemischte Baualtersstruktur; ein- bis zweigeschossige Reihen- und Doppelhausbebauung sowie freistehende Einfamilienhäuser, teilweise auch kleinere Mehrfamilienhäuser
	Bonn-Ippendorf	

Tab. 1: Übersicht der Untersuchungsgebiete mit Kurzbeschreibung (Quelle: Banse et al. 2005)

Im Rahmen der augenscheinlichen Bestandsaufnahme und Bewertung mittels Erhebungsbögen wurden die Anzahl und das Baualter der Wohngebäude und Wohnungen, die Zahl der leer stehenden Wohnungen sowie infrastrukturelle Einrichtungen, neben der Art, Größe, Gestaltung und den Nutzungsmöglichkeiten der Freiräume, erfasst. Die Bestandsaufnahme zu den Wohnungen war gleichzeitig Grundlage für die Auswahl der zu befragenden Bewohner (Stichprobenziehung). Die Dresdner Grundgesamtheit bestandt aus 7 400 bewohnten Wohnungen. Im Fall Bonn sind es 7 370 Wohnungen. Die Umfänge der Grundgesamtheiten sind fast gleich. Die Befragung ergab einen Rück-lauf von insgesamt 1 178 auswertbaren Fragebögen, aus Bonn 504, das entspricht 6,8 % der bewohn-ten Wohnungen, aus Dresden 674 auswertbare Fragebögen, das entspricht 9,1 % der bewohnten Woh-nungen. Die vom Forscherteam vermuteten Merkmale der Lebensqualität, bezogen auf das Wohnen und die Freiraumnutzung, wurden in den Fragebogen aufgenommen. Die Antworten der Befragten signalisieren, inwieweit diese Annahmen zutreffen.

Es ist wichtig, die Altersstrukturen der Befragten (1. Person) und der Personen im Haushalt des Befragten zu analysieren. Den Gipfel der Verteilung bildet für den Fall Dresden die Gruppe „30 bis 49 Jahre“, die Verteilung für Bonn hat zwei Gipfel, nämlich „30 bis 49 Jahre“ und „60 bis 79 Jahre“. Die Altersstrukturen der befragten Personen in Dresden können bis zu einem gewissen Grad als ähnlich zu denen in Bonn betrachtet werden. Bezüglich der mathematisch-statistischen Auswertung wurden Häu-figkeitsverteilungen und deskriptive Statistiken, die Kontingenzanalyse, die multinominale logistische Regression und die multivariable Cluster- und Diskriminanzanalyse genutzt (Thinh 2007). Neben der Altersstruktur wurden für Auswertungen die typischen Konstellationen des Zusammenlebens in Haus-halten genutzt. Da sich die Ansprüche an die Wohnung und Freiraum in Abhängigkeit von der jeweili-gen Lebenssituation der Befragten verändern, wurde eine differenziertere Betrachtung der Haushalts-strukturen nach Lebensphasen vorgenommen. Unterschieden werden die Haushaltstypen Junge Wohngemeinschaften, Junge Haushalte mit offener Familienplanung (ein oder zwei Personen unter 35 Jahre), Alleinerziehende, Familienhaushalte in der Expansionsphase (mindestens ein Kind unter 6 Jahre), Familienhaushalte in der Konsolidierungsphase (mindestens ein Kind 6 bis 18 Jahre), Famili-enhaushalte in der abgeschlossenen Familienphase (alle Kinder über 18 Jahre), Erwerbshaushalte (ein oder zwei Personen zwischen 35 und 59Jahre), Rentnerhaushalte (ein oder zwei Personen über 60 Jahre).

2 VERHALTENSWEISEN UND WÜNSCHE AUSGEWÄHLTER NUTZERGRUPPEN

Nachfolgend werden Verhaltensweisen, Nutzungs- und Veränderungsbedarfe am Beispiel der Freiräume vorgestellt. Ergänzt werden diese empirischen Forschungsergebnisse durch die Merkmalspräferenzen bezüglich des Wohnens. Verhaltensweisen und Wünsche werden von Wahrnehmungsmustern dominiert, die u. a. von den gegebenen Bedingungen des Wohnens sowie des näheren und weiteren Wohnumfeldes und seiner Gestaltung beeinflusst werden. Generell wird die menschliche Wahrnehmung des Raumes von gruppenspezifischen und individuellen Besonderheiten beeinflusst. Gruppenspezifisch werden beispielsweise Nutzungsinteressen vertreten, soziokulturelle Aspekte wahrgenommen und Vertrautheiten mit speziellen Räumen geschaffen. Der Wahrnehmungsprozess ist als Transformationsprozess zu denken, in dem Informationen nach „der Persönlichkeitsstruktur des Einzelnen und dem situativen Kontext ausgewählt und akzentuiert werden“ (Augenstein 2002, 71). Demzufolge liefert er kein exaktes objektives Abbild des Raumes. Loidl definierte 1981 drei Wahrnehmungsfilter, denen er a) die physiologischen Aspekte der Wahrnehmung durch die Sinnesorgane (Sehen, Hören, Riechen, Fühlen, Schmecken) zuordnete, b) die individualpsychologischen Aspekte wie Geschlecht, Orte, Erfahrungen in der Kindheit und c) die soziokulturellen Aspekte der Wahrnehmung. Friedrich (2001) betont die Bedeutung der Lebensphasen für die Wahrnehmung. Diese Lebensphasen korrespondieren aufgrund sich ändernder Nutzungsmuster, zu Wünschen und Bedarfen nach Veränderung beispielsweise der Ausstattung der städtischen Räume. Nachfolgende Grafik (Abb. 1) veranschaulicht die Veränderungen der menschlichen Aktionsradien bzw. des wahrgenommenen Umfeldes im Lebensverlauf.

Während sich der Aktionsradius in der Kindheit sehr ortsgebunden und überschaubar darstellt, dabei aber die grundlegenden Werte vermittelt und Vertrautheit schafft, erweitert sich der Aktionsradius bei heranwachsenden Jugendlichen auf das gesamte Wohngebiet und die Stadt. Während des Berufslebens erweitert sich die Wahrnehmung und aktive Nutzung auf den Ballungsraum oder die Region. Dagegen wählen ältere Menschen gezielt den Wohnstandort und das Wohnumfeld, das ihrem Wertmaßstab entspricht. An diesem wieder verkleinerten Aktionsradius werden nun die Lebenserfahrungen und die relevanten Bedarfe präzisiert. Diese Kenntnisse zur Wahrnehmung sind essentiell für das Verständnis von Bedarfen und Verhaltensweisen von Bevölkerungsgruppen. Bedarfe und Verhaltensweisen der Bevölkerung sind als zeitnahe Anforderungen an Lebensqualitäten aufzufassen.

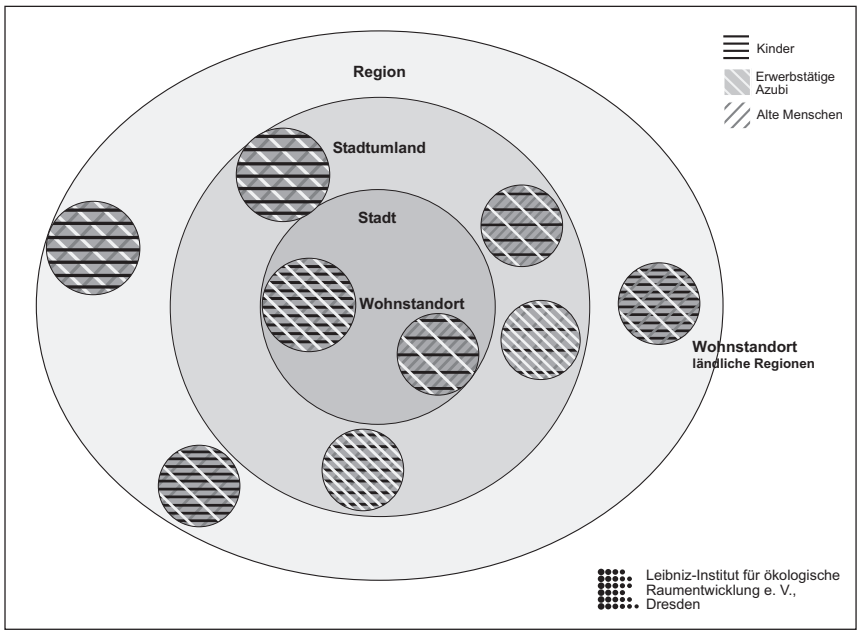

Abb. 1: Räumliche Wahrnehmungs- und Nutzungsmuster von Bevölkerungsgruppen im stadtregionalen Kontext (Quelle: Roch/Bäther)

2.1.1 Nutzungsmuster der Freiräume

Die bevorzugten Nutzungsformen der Grünflächen bezogen auf die Haushaltstypen wurden aus den Antworten auf die Frage nach den Gründen für die Wichtigkeit der Grünflächen abgeleitet (Abb. 2).

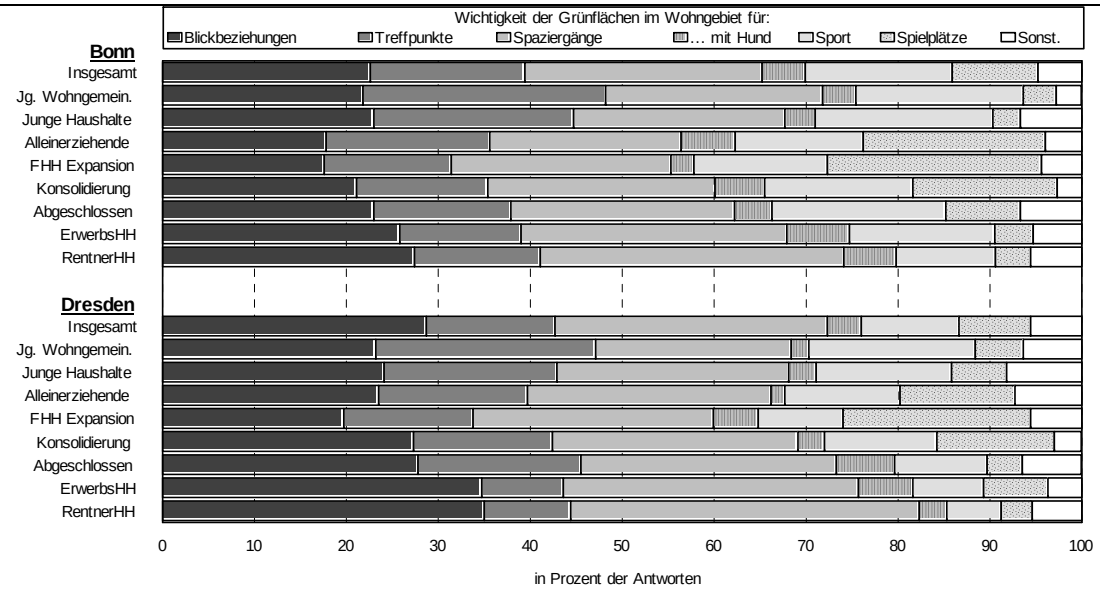

Abb. 2: Gründe für die Wichtigkeit von Grünflächen nach Haushaltstypen.
(Quelle: Möbius, M., Befragung 2003/04)

Es dominieren Spaziergänge vor Blickbeziehungen, Treffpunkten im Freien, Sport, Spiel und dem Ausführen des Hundes. Besonders wichtig sind Spaziergänge und Blickbeziehungen für Rentnerhaus-halte, Erwerbshaushalte und für Haushalte mit abgeschlossener Familienphase. Hinsichtlich des Zeit-einsatzes für die differenzierten Nutzungsformen, der aus den eigenen Befragungen nicht abgeleitet werden kann, sind Studien über die Zeitverteilung (Borchers 1997) und Inhalte der Familienberichte der Bundesregierung aufschlussreich. In der Expansionsphase der Familien wird die „Zeit im Freien“ vermutlich zu einem annähernd gleich großen Anteil wie „auf dem Spielplatz“ verbracht. Dabei beste-hen Unterschiede in den Nennungen zwischen den Stadtgebietstypen und den Städten Bonn und Dres-den. Spielplätze sind den befragten Haushalten in der Expansionsphase in den Gründerzeitgebieten zu 53 % wichtig, in den Villengebieten sogar zu 91 %. Diese Ergebnisse korrespondieren mit den Unter-suchungen von Bonacker in Berlin (2000). Die Wichtigkeit der Spielplätze relativiert sich bereits in der Konsolidierungsphase, in der die Kinder schon selbstständig agieren. Zum Spielen tritt die sportli-che Betätigung. Auch Blickbeziehungen werden in dieser Lebensphase wieder wichtiger und häufiger. Junge Wohngemeinschaften, junge Haushalte und Alleinerziehende, aber auch Haushalte mit abge-schlossener Familienphase nutzen nach eigenen Beobachtungen und Gesprächen mit Bewohnern die Grünflächen gern als Treffpunkt und für sportliche Betätigungen, nahezu gleich auf mit Spaziergängen und der Wertschätzung von Blicken ins Grüne. Die Treffpunkte im Freien und die sportliche Betäti-gung spielen für Erwerbshaushalte und Rentnerhaushalte eine untergeordnete Rolle. Vermutlich trifft man sich häufiger in den Wohnungen, in der Stadt oder in Ausflugsgaststätten. Die Wichtigkeit von Grünflächen wird weniger begründet mit Spaziergängen mit Hunden. Bezogen auf die Haushaltstypen werden Spaziergänge mit Hunden in den Grünflächen am häufigsten von Erwerbshaushalten beider Städte und von den Dresdner Familienhaushalten in der abgeschlossenen Familienphase genannt.

Abb. 3: Großsiedlung Bonn-Tannenbusch

Abb. 4: Gebiet der 1980er Jahre Dresden-

(Foto: Roch)

Räcknitzhöhe – Spiel- und Sportplatz
(Foto: Roch)

2.1.2 Bewertungen der Stadtgebietstypen

Den Großsiedlungen Bonn-Tannenbusch und Dresden-Prohlis sowie dem kleinen Plattenbaugebiet der 1980er Jahre Dresden-Räcknitzhöhe haften trotz des großzügigen Grüns innerhalb der Wohngebiete Defizite angenehmer Individualität für kleinere Nutzergruppen an. Für Kleinkinder fehlt die Sicherheit auf dem Spielplatz. Es ist Aufsicht erforderlich, die gerade für Alleinerziehende schwierig zu leisten ist. Jugendgruppen bemängeln, dass die sparsam eingefügten Sitzplätze vorwiegend von älteren Men-schen genutzt werden. Für Nutzungsbedarfe der Jugendlichen bestehen ungenügende Angebote. Im Zusammenleben der Angehörigen verschiedener Lebensphasen kommt es zwangsläufig zu unterschiedlichen Nutzungsinteressen (Geißler 1991) und auch zu gegenseitigen Störungen. Am unproblematischsten erscheint das Zusammenleben älterer Menschen und junger Familien, deren Lebens-rhythmen und Bedürfnisse nach Ruhe sich ergänzen. Relativ kurzfristig ändern sich die Nutzungsan-sprüche der Familien in der Expansions- und Konsolidierungsphase. Darin sind die Ursachen für Un-zufriedenheit mit den gegebenen Bedingungen zu sehen. Nach der Nutzung von Spielplätzen, des Ra-sens und der Wege im Wohngebiet mit ersten Versuchen des Fahrradfahrens werden Ansprüche an sportliche Betätigung wichtig. Der Aufenthalt im Freien nach der Schule wird interessant. Der Akti-onsradius dehnt sich längst auf das Stadtgebiet aus (Abb. 1). Ältere Menschen stört der Lärm von Ju-gendlichen, kleine Kinder fürchten deren Übermut oder böswillige Angriffe. Eigene Gespräche mit unterschiedlichen Nutzergruppen lassen vermuten, dass eine Aufsicht für Kleinkinder sinnvoll ist. Auch über transparente Abgrenzungen sollte nachgedacht werden, beispielsweise temporär nutzbar, aber eingepasst in das gestalterische Gesamtkonzept. Haushalte mit abgeschlossener Familienphase und Rentner wünschen sich in den Großsiedlungen mehr Blumenschmuck, um bewusst die Jahreszei-ten miterleben und die Schönheiten der Natur betrachten zu können. In Bonn-Tannenbusch betrifft das nach eigenen Befragungsergebnissen 3 von 12 Rentnerhaushalten, in Dresden-Prohlis 6 von 23 Rent-nerhaushalten und in Dresden-Räcknitzhöhe 4 von 18 Rentnerhaushalten. Die hohen Pflegeaufwände und Kosten (Grunert 1964) für die Anschaffung und Erneuerung der Einjahrespflanzungen oder Stau-denbeete müssten allerdings durch einen pfleglichen Umgang damit durch Bewohner respektiert werden.

Abb. 5: Eigenheimsiedlung Bonn-Ippendorf (Foto: Roch)

Abb. 6: Eigenheimsiedlung Dresden-Dölzschen (Foto: Roch)

Die Befragungsergebnisse zu den Einfamilienhaussiedlungen Dresden-Dölzschen und Bonn-Ippendorf weisen eine hohe Zufriedenheit nach. Diese resultiert zu einem starken Maße aus dem Wohnen im Grünen, das man nach den individuellen Wünschen gestalten und umgestalten kann. Das Einfamilien-haus passt sich leicht an die sich wandelnden Nutzungsansprüche im Lebensverlauf an. Für junge Fa-milien ist der Blick aus dem Küchenfenster zum Sandkasten möglich, Spielgeräte und ein Planschbe-cken sind Standard, ausreichend Grünfläche vorausgesetzt. Später sind Roller, Rollschuhe, Win-tersportgeräte, Fahrräder u. a. m. unterzubringen. Auf dem Rasen wird Ball gespielt, Tischtennisplat-ten werden installiert, Hängematten angebracht und Essplätze im Freien genutzt. Der Sandkasten weicht dem Grillplatz. In der abgeschlossenen Familienphase wird nach eigenen Beobachtungen häu-fig neben dem Gärtnern das Betrachten wichtiger. Neben den Spaziergängen erlangen sportliche und therapeutische Betätigungen zur Erhaltung der Fitness an Bedeutung. Im Gegensatz zum halböffentli-chen Freiraum in den Großsiedlungen, in den Gebieten der 1950/60er Jahre und in den Gründerzeitge-bieten besteht im sichtgeschützten Freiraum des Einfamilienhauses für sportliche Übungen kaum eine Hemmschwelle. Rentnerhaushalte reduzieren den Aufwand an Pflege und setzen Prioritäten, um nicht fremde Hilfe in Anspruch nehmen zu müssen. Die bewusste Wahrnehmung des Tagesverlaufs und des Wechsels der Jahreszeiten wird häufig wichtiger als die vielfältigen Aktivitäten in den vorangegange-nen Lebensphasen. Die Rasenfläche, Gehölze bzw. bevorzugte Solitärs, Vogelkästen und Blumen bilden den Mikrokosmos, in den die Lebenserfahrungen hineininterpretiert werden können. Für die Anpassung des Freiraums an die sich ändernden Ansprüche der Lebensphasen fühlen sich die Hausbe-sitzer selbst verantwortlich. Nutzungskonflikte treten nur eingeschränkt oder temporär auf, u. a. mit Nachbarn.

Abb. 7 und 8: Neuere Villenbebauung und historischer Bestand in Dresden-Blasewitz (Fotos: Roch)

Die Freiraumbedingungen in den Villengebieten Dresden-Blasewitz und Bonn-Bad Godesberg sind sehr überzeugend (Roch/Chang 2007). Die große Zufriedenheit der Bewohner von Villen erscheint demzufolge ebenso verständlich wie der meistgenannte Wunsch aller Befragten, im Villengebiet zu wohnen (Banse/Möbius 2007), und der hohe Preis, der für die Bedürfnisbefriedigung zu zahlen ist. Vergleichbar zum Einfamilienhaus kann man in diesen Gärten sämtliche für die Lebensphase wichti-gen Funktionen für Spiel, Sport, Aufenthalt im Freien und Freilauf des Hundes einordnen, ohne dass es den Gesamteindruck des Villenparks stört. Für Spaziergänger stellt dieses Ensemble von Architek-tur und Natur ein Erlebnis dar.

Abb. 9: Gebiet der 1950/60er Jahre Bonn-Reutersiedlung (Foto: Roch)

Abb. 10: Gebiet der 1950/60er Jahre Dresden-Seevorstadt (Foto: Roch)

In den Gebieten der 1950/60er Jahre Dresden-Seevorstadt und Bonn-Reutersiedlung ist die Zufrie-denheit mit dem Wohnumfeld, das den Freiraum einschließt, mit 78 % relativ hoch. In Bonn entspricht dieser Wert dem Befragungsdurchschnitt mit einem hohen Anteil der sehr Zufriedenen. In Dresden liegt der Wert über dem Befragungsdurchschnitt. Für die Freiraumgestaltung in der Seevorstadt wer-den über Spiel- und Sportplätze hinaus mehr Sitzplätze und Möglichkeiten zum Betrachten gewünscht, u. a. mehr Blumenschmuck. Diese Wünsche korrespondieren mit den Bedarfen der dominanten Nut-zergruppen in der Lebensphase „Rentnerhaushalt“ neben jungen Haushalten und einem geringen An-teil Familien. Die Pflege von Blumenschmuckanlagen zum Betrachten könnte unter dieser Konstella-tion der Bevölkerungsstruktur relativ konfliktfrei verlaufen. Die Realisierung der geäußerten Wünsche nach Sitzplätzen und Sportanlagen könnte die Lebensqualität in diesen Wohngebieten steigern.

Abb. 11: Gründerzeitgebiet Bonn-Südstadt (Foto: Chang)

Abb. 12: Gründerzeitgebiet Dresden-Pieschen (Foto: Roch)

In den Gründerzeitgebieten Dresden-Pieschen und Bonn-Südstadt ist das Meinungsbild der Bevölke-rung bezüglich der Zufriedenheit mit den Freiraumbedingungen geteilt. Während das Bonner Gebiet über eine hohe Lagegunst verfügt (Roch/Chang 2007), ist die Unzufriedenheit der Pieschener Bürger mit dem Wohnumfeld nachvollziehbar. Besonders kritisiert werden Schmutz und Unordnung im Wohngebiet, weniger die kleinen und unzureichenden Grünflächen. Immerhin würden ca. 42 % der Befragten die Grünflächen verändern. Die räumlichen Bedingungen, die objektiv nicht gegeben sind, müssten allerdings dazu eine Voraussetzung bieten. In Pieschen besteht das Potenzial eher in der groß-räumigen Vernetzung neben individuellen Lösungen im direkten Umfeld. In Bonn ist die Hälfte der Befragten mit den Grünflächen zufrieden und sieht keinen Bedarf zur Veränderung (Abb. 13). Aller-dings nutzen diese Befragten häufig die nahe gelegenen städtischen Freiräume.

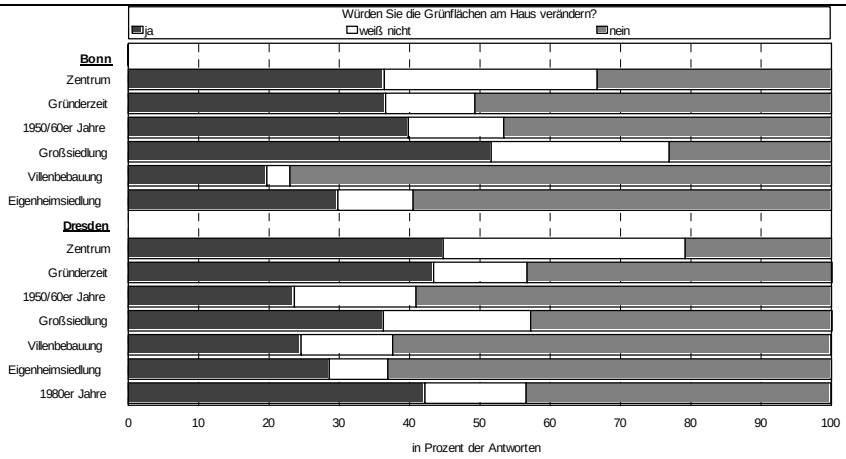

Abb. 13: Würden Sie die Grünflächen am Haus verändern? (nach Gebieten)
(Quelle: Möbius, M., Befragung 2003/04)

Die Zentrumsgebiete beider Städte weisen bezüglich der Freiraumangebote die größten Defizite auf. Von der Mehrzahl der Bewohner wird die Urbanität als besondere Lebensqualität hoch geschätzt. Al-lerdings werden Freiräume, Spiel- und Sportplätze auch vermisst. Die Wünsche nach Veränderung der Grünflächen sind im Dresdner Zentrumsbereich am höchsten, gefolgt vom Gründerzeitgebiet und der Großsiedlung. In Bonn dominieren die Veränderungswünsche in der Großsiedlung und im Gebiet der 1950er/1960er Jahre an dritter Stelle, gleichauf mit dem Gründerzeitgebiet (Abb. 13).

Abb. 14: Dresden Brühlsche Terrasse mit Blick auf die Hofkirche (Foto: Roch)

Abb. 15: Bonn Markt (Foto: Roch)

Über alle Stadtgebiete hinweg veranschaulicht die Abb. 16 für Bonn und Dresden den Realisierungs-grad der Bevölkerungswünsche für die Freiraumbedingungen. Auf die Frage „Wie wichtig oder un-wichtig sind Ihnen die folgenden Dinge?“ meinen über 80 %, dass ein grünes Wohngebiet „sehr wich-tig bzw. wichtig“ ist. Der Realisierungsgrad weist gefühlte Defizite über 30 % auf, bezogen auf das grüne Wohngebiet. Die fußläufige Erreichbarkeit der Grünanlagen und Parks wird von der Bonner Bevölkerung etwas positiver eingeschätzt als von der Dresdner Bevölkerung mit fast 20 % Vollzugs-defizit. Für die Stadtentwicklung lässt sich aus diesem Tatbestand ein relevanter Handlungsbedarf ableiten.

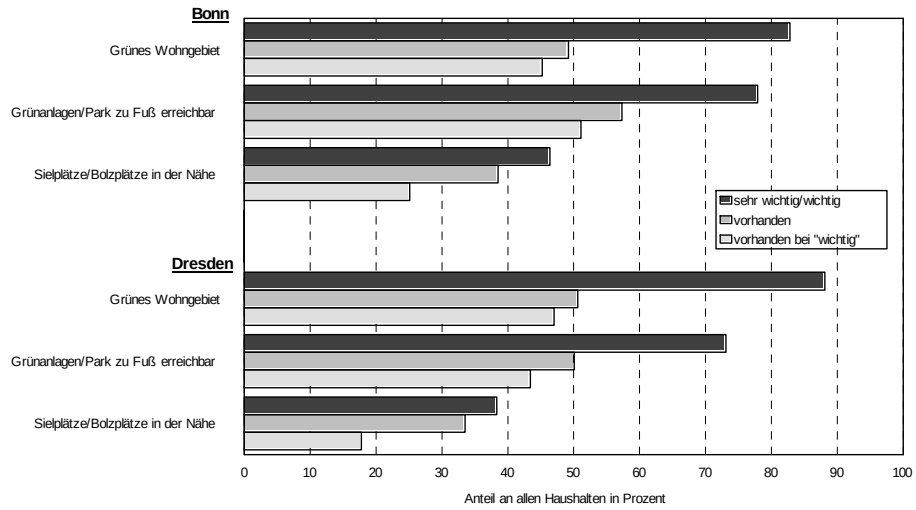

Abb. 16: Wichtigkeit von Grünbereichen (Quelle: Möbius, M., Befragung 2003/04)

Eine gute Übereinstimmung gibt es zwischen dem Wunsch nach Spiel- und Bolzplätzen in der Nähe und der Wahrnehmung ihrer tatsächlichen Existenz. Die Nutzungsbedarfe von Spiel- und Bolzplätzen beziehen sich auf eine zeitlich begrenzte Lebensphase. Sie sind deshalb seltener wichtig im Vergleich zum grünen Wohngebiet und der Erreichbarkeit von Parkanlagen und anderen nachgefragten Freiräu-men. Die Antwort auf die Zufriedenheit mit den Grünflächen am Haus erschließt sich über die Frage „Würden Sie die Grünflächen am Haus verändern?“ Die Antworten unterscheiden sich neben den Haushaltstypen auch zwischen den Städten (Abb. 17).

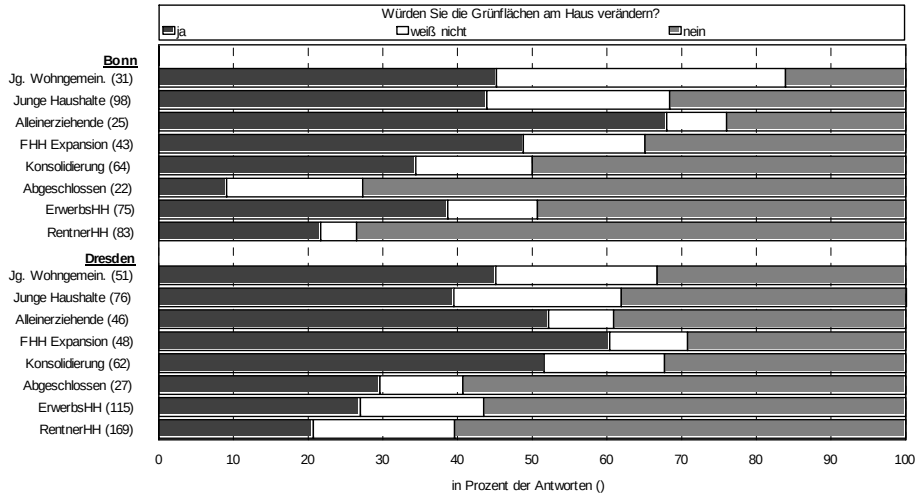

Abb. 17: Würden Sie die Grünflächen am Haus verändern? (Nach Haushaltstypen)
(Quelle: Möbius, M., Befragung 2003/04)

Veränderungsbedarfe an den Grünflächen am Haus verneinen Rentner und Haushalte mit abgeschlos-sener Familienphase besonders überzeugend in Bonn mit jeweils über 70 %. In Dresden äußern die Rentnerhaushalte am seltensten Änderungswünsche bezüglich der Grünflächen am Haus. Ebenfalls wenig Veränderungsbedarf haben neben den Haushalten mit abgeschlossener Familienphase die Er-werbshaushalte. Zu den bereits erklärten Zusammenhängen mit den unterschiedlichen Nutzungsmus-tern tritt hinzu, dass zurzeit in Dresden von einer großen Auswahl der Wohnungen und ihres spezifi-schen Umfeldes ausgegangen werden kann. Mit Abschluss der Familienphase verändern Bürger ihre Wünsche zur Wohnsituation für die folgende Lebensphase. Gezielt wird eine kleinere Wohnung in der bevorzugten Lage gewählt, die mit der Ausstattung des Freiraumes und dem Mietpreis den Vorstel-lungen entspricht. Es kann demzufolge davon ausgegangen werden, dass die überwiegend gezielt ge-wählten Wunschbedingungen Ursache für die Zufriedenheit sind. Wie erwartet sind es die Familien mit kleinen Kindern, mit Schulkindern und die Alleinerziehenden, die Veränderungswünsche an den Grünflächen am Haus anmelden. In Dresden sind es vorrangig die Familien mit Kleinkindern. Die Haushalte in der Konsolidierungsphase liegen gleich auf mit den Alleinerziehenden bezüglich der Veränderungswünsche. In Bonn sind es vorrangig die

Alleinerziehenden, die die Grünflächen am Haus verändern würden. Junge Haushalte und junge Wohngemeinschaften sind eher gespalten in ih-rem Meinungsbild. Bezogen auf die ausgewählten Wohngebietstypen ergibt sich ebenfalls das erwar-tete Bild aus der Bestandsbewertung und aus den Antworten auf offene Fragen. Am seltensten wird Veränderungsbedarf in den Villengebieten – in Bonn mit Abstand – und den Eigenheimsiedlungen angemeldet. Während in Dresden die Bewohner des Zentrums und des Gründerzeitgebietes mehrheit-lich „verändern" wollen, sind es in Bonn nur die Bewohner der Großsiedlung und eingeschränkt des Zentrums bei Beachtung der Stimmen, die nicht verändern wollen. Diese Ergebnisse sprechen vehe-ment für eine stärkere Beachtung der Ansprüche der Bedarfsgruppen und für ein Angebot differenzier-ter Bedingungen der Freiraumausstattung in den Stadtgebieten.

2.1.3 Merkmalspräferenzen der Bewohner bezogen auf das Wohnen

Bezüglich der Qualität der Wohnbedingungen, als ein Indikator für Lebensqualität, ist in beiden Städten festzustellen, dass die Zufriedenheit mit der Wohnung sehr hoch ist. 80 % der Befragten in Dresden und 75 % der Befragten in Bonn gaben an, mit ihrer Wohnung sehr zufrieden bzw. zufrieden zu sein. Bei einem insgesamt hohen Anteil gut ausgestatteter Wohnungen in gutem baulichen Zustand der Gebäude bedeutet das, dass Zustand und Ausstattung der Wohnungen durch Sanierung und Modernisierung in den vergangenen Jahren insbesondere in Dresden deutlich verbessert wurden und weitestgehend den Ansprüchen der Bewohner entsprechen. Ein Entwicklungsbedarf ist nur bei einem geringen Anteil einfach ausgestatteter Wohnungen zu erkennen. In beiden Städten ist ein mittlerer Zusammenhang von Zufriedenheit mit der Wohnung und Qualität der Wohnungsausstattung nachweisbar. Die Zufriedenheit mit dem Wohnumfeld ist in Bonn in fast allen Stadtgebieten ähnlich hoch wie die Zufriedenheit mit der Wohnung. Anders in Dresden, wo die Qualität des Wohnumfeldes in einigen Gebieten sehr kritisch gesehen wird. Das betrifft in erster Linie das Zentrum, das Gebiet aus der Gründerzeit und die Großsiedlung. Dort äußert lediglich die Hälfte der Befragten eine Zufriedenheit mit dem Wohnumfeld. Villengebiete und Einfamilienhausgebiete werden sehr positiv bewertet, bei einem hohen Anteil der sehr Zufriedenen in beiden Städten.

Sowohl in Bonn, als auch in Dresden sind Befragte ohne Kinder deutlich zufriedener mit Wohnung und Wohnumfeld, als Befragte mit Kindern. Besonders bei den Alleinerziehenden ist die Zufriedenheit mit der Wohnung sehr häufig gering. Nach den Alleinerziehenden äußern die Familien in der Expansionsphase die geringste Zufriedenheit mit der Wohnung, und insgesamt sind diese Haushalte am wenigsten mit dem Wohnumfeld zufrieden. Die Rentnerhaushalte, die insgesamt eine hohe Zufriedenheit mit der Wohnung äußern, sind ebenfalls mit dem Wohnumfeld weniger zufrieden. Eine hohe Zufriedenheit mit dem Wohnumfeld äußern Befragte ohne Kinder und mit erwachsenen Kindern im Bonner Gründerzeitgebiet, die geringste die Rentnerhaushalte und Familien in den Großsiedlungen. Im Ergebnis der differenzierten Zufriedenheiten mit Wohnung und Wohnumfeld in Abhängigkeit vom Haushaltstyp zeigt sich Veränderungsbedarf in erster Linie bei den Familien, die nur zu 50 % der Befragten in Dresden und 54 % in Bonn ihre Wohnsituation insgesamt als zufriedenstellend ansehen. Im Vergleich dazu sind 75 % der Befragten ohne Kinder in Dresden und 65 % in Bonn mit Wohnung und Wohnumfeld zufrieden.

Im Zusammenhang mit der Zufriedenheit mit Wohnung und Wohnumfeld sind Wohnpräferenzen zu sehen, die zeigen, was den Einzelnen an ihrer Wohnsituation wichtig ist und was insbesondere bei der Entwicklung der Stadtgebiete beachtet werden sollte. Die Präferenzen wurden über eine Bewertung der Wichtigkeit einzelner Merkmale der Wohnung und des Wohnumfeldes in den drei Kategorien „sehr wichtig", „wichtig" und „unwichtig" in der Befragung ermittelt. So konnte eine grundsätzliche Vergleichbarkeit der Präferenzen der Bewohner in den beiden Städten Bonn und Dresden festgestellt werden. Das unterstreicht die Ergebnisse bisheriger Untersuchungen, die gezeigt haben, dass in Deutschland für Ost und West im siedlungsstrukturellen Vergleich „außerordentlich übereinstimmen-de Muster hinsichtlich der Lebensbedingungen, die man an seinem Wohnort für wichtig hält" beo-bachtet werden können (Böltken/Meyer 2002, 1). In der Befragung berücksichtigt wurden sieben wohnungsbezogene Merkmale und 17 Merkmale des Wohnumfeldes. Dabei wurde das Wohnumfeld weniger als der Wohnnahbereich, der sich unmittelbar an die Wohnung anschließt, betrachtet, sondern im weiteren Sinne als das Wohngebiet bzw. das Stadtgebiet mit seinen spezifischen Qualitäten. Einbe-zogen wurden strukturelle Merkmale des Wohnumfeldes und Distanzkriterien sowie die Bedeutung der Nachbarschaftsbeziehungen und der Generationenmischung.

Der Anteil der Befragten, die eine Bewertung mit sehr wichtig angegeben haben, liegt bei den einzelnen Merkmalen zwischen 5 % und 70 % (Abb. 18). Trotz der grundsätzlichen Vergleichbarkeit der Aussagen über alle Befragten waren Unterschiede festzustellen nach Alter und Haushaltstyp, und zwischen Mietern und Eigentümern. In beiden Städten ist älteren Befragten eine Vielzahl von Merkmalen häufiger sehr wichtig als jüngeren Befragten. Wird neben dem Alter der familiäre Hintergrund der Befragten einbezogen, zeigen sich spezifische Ansprüche an Wohnung und Wohnumfeld. Für die 18- bis 35-Jährigen, die in jungen Haushalten und in Wohngemeinschaften leben, hat die optimale Größe der Wohnung und die geringe Miete eine höhere Wichtigkeit als Anderen, ebenso die gute Anbindung an öffentliche Verkehrsmittel (Abb. 19). Deutlich wichtiger sind ihnen, Grünanlagen und kulturelle Angebote in der Nähe sowie ein abwechslungsreiches Wohnumfeld. Eine ähnliche Prioritätensetzung gilt für Befragte aus Erwerbshaushalten, bei denen allerdings die geringe Miete weniger Bedeutung hat. Garage und eigener Garten sind diesen wichtiger.

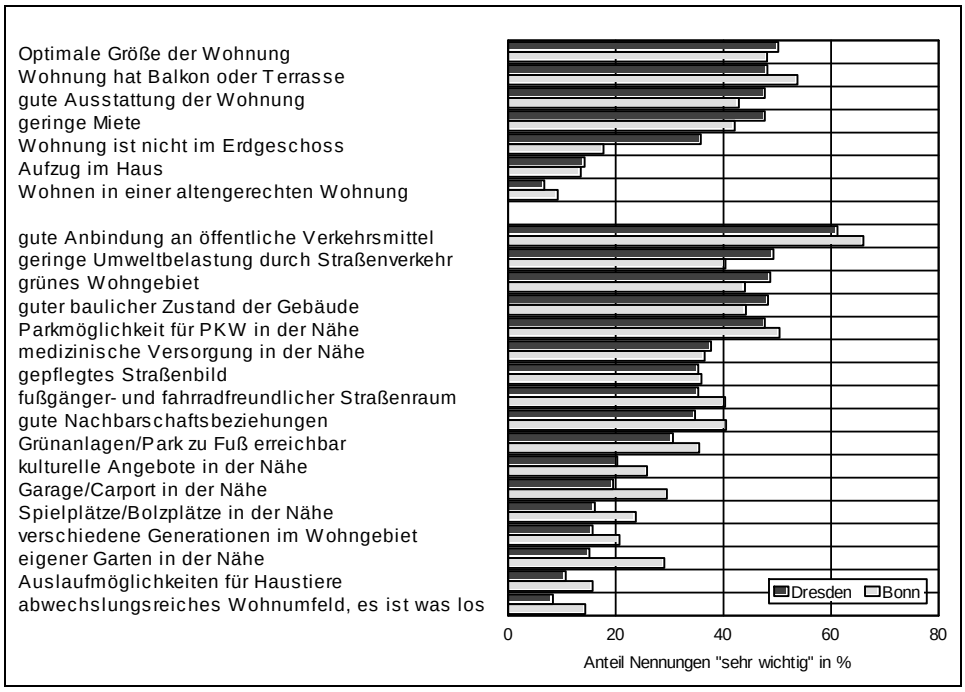

Abb. 18: Wichtigkeit einzelner Merkmale der Wohnung und des Wohnumfeldes in Dresden und Bonn (Quelle: Eigene Darstellung, Befragung 2003/04).

Befragte in Familienhaushalten nennen die optimale Größe und Austattung der Wohnung häufiger und, ähnlich wie den Rentnerhaushalten ist ihnen das grüne Wohngebiet sehr wichtig. Spezifische Bewertungen zeigen sich in Abhängigkeit vom Alter der Kinder. Während Befragte mit jüngeren Kindern sich besonders an deren Bedürfnissen orientieren, sind die Ansprüche der Familien in der abgeschlossenen Familienphase denen von Erwerbshaushalten ähnlicher. In der Konsolidierungsphase setzen die Befragten vergleichbare Schwerpunkte wie die Alleinerziehenden. Insbesondere die gute Anbindung an öffentliche Verkehrsmittel ist für sie besonders wichtig. Für Familien in der Expansionsphase, die häufiger auf die Nutzung des näheren Wohnumfeldes angewiesen sind, hat der Grünbezug im Gebiet eine hohe Bedeutung. Das Grün im Wohngebiet und Spielplätze/Bolzplätze in der Nähe werden von diesen öfter als sehr wichtig und wichtig beurteilt als der eigene Garten in der Nähe. Das deutet darauf hin, dass der eigene Garten am Haus nicht unbedingt ein entscheidendes Kriterium für die Wahl des Wohnstandortes von Familien sein muss. Für das Wohnen der Familien in der Stadt erscheint es wichtig, neben der guten Erschließung durch öffentliche Verkehrsmittel und den Parkmöglichkeiten für PKW, Grünanlagen und Parks sowie Spiel- und Bolzplätze in der Nähe der Wohnung nutzen zu können.

Den älteren Rentnerhaushalten ist wichtiger als Anderen, dass die Wohnung gut ausgestattet ist und dass sie nicht im Erdgeschoss liegt, was auf das erhöhte Sicherheitsbedürfnis im Alter hindeutet. Darüber hinaus ist auch ein Aufzug im Haus für 20 % bis 40 % der über 75-Jährigen sehr wichtig. Allerdings trifft das in erster Linie auf mehrgeschossige Gebäudestrukturen wie das Dresdner Stadtzentrum, das Gebiet der 1950/60er Jahre mit einem höheren Anteil älterer Bewohner und die Großsiedlungen zu. In diesen Gebieten ist der Aufzug vielen Älteren sehr wichtig. Das Wohnen in einer altengerechten Wohnung wird insgesamt selten als

sehr wichtig bezeichnet. Von den über 75-Jährigen allerdings etwas öfter. Für fast 30 % dieser Älteren ist eine altengerechte Wohnung sehr wichtig. Bei der Wichtigkeit der Merkmale des Wohnumfeldes bzw. des Stadtgebietes zeigen sich die spezifischen Ansprüche der Älteren noch deutlicher als bei der Wohnung. So wird mit steigendem Alter die gute Anbindung an den öffentlichen Nahverkehr immer wichtiger, gefolgt von der medizinischen Versorgung in der Nähe, dem grünen Wohngebiet und der geringen Umweltbelastung durch den Straßenverkehr. Ebenso werden von den Älteren gute Nachbarschaftsbeziehungen und verschiedene Generationen im Wohngebiet häufiger als sehr wichtig bezeichnet, als von den anderen Altersgruppen.

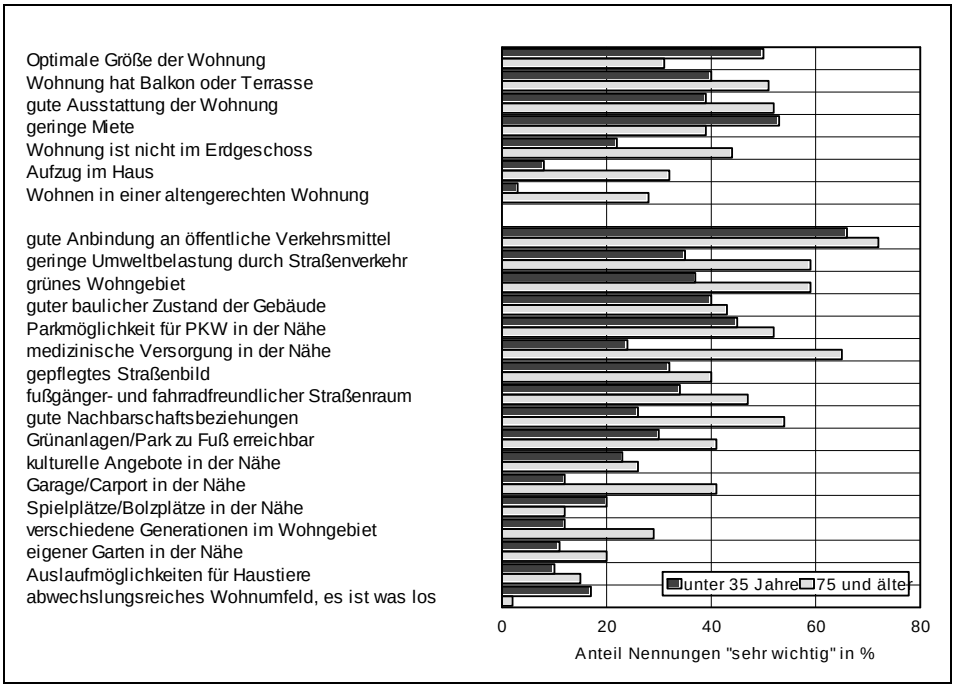

Abb. 19: Wichtigkeit einzelner Merkmale der Wohnung und des Wohnumfeldes für jüngere und ältere Befragte in Dresden und Bonn (Quelle: Eigene Darstellung, Befragung 2003/04)

Neben Alter und Haushaltstyp konnten Unterschiede in den Ansprüchen an die Wohnsituation in Abhängigkeit davon festgestellt werden, ob die Befragten zur Miete wohnen oder als Eigentümer die Wohnung selbst nutzen. So messen die Eigentümer den Merkmalen der Wohnung wie Größe und Ausstattung eine größere Bedeutung zu als die Mieter. Noch deutlicher werden die Unterschiede bei einzelnen Merkmalen des Wohnumfeldes. Merkmale wie Grünausstattung, Bauzustand und gepflegtes Straßenbild sowie gute Nachbarschaftsbeziehungen sind den Eigentümern wichtiger als den Mietern. Besonders auffällig sind die differenzierten Bewertungen der Wichtigkeit des eigenen Gartens in der Nähe. Während lediglich 8 % der befragten Mieter in Dresden bzw. 17 % in Bonn den eigenen Garten in der Nähe als sehr wichtig ansehen, sind es bei den Eigentümern 55 % bzw. 58 %. All diese Ergebnisse verdeutlichen die Notwendigkeit, die Umgestaltung der Wohnungsbestände und des Wohnumfeldes in den Stadtgebieten an den Präferenzen der spezifischen Nutzergruppen zu orientieren, um so von diesen bevorzugte Situationen bei hoher Zufriedenheit mit Wohnung und Wohnumfeld zu schaffen. Nur so ist es möglich, die Bewohnerstruktur zu stabilisieren bzw. die Gebiete für gewünschte Zuzüge attraktiv zu machen.

3 PERSPEKTIVEN FÜR EINE BEDARFSGERECHTE AUFWERTUNG DER LEBENSQUALITÄTEN WOHNEN UND FREIRAUMNUTZUNG IM RAHMEN DER STADTENTWICKLUNG

Die Untersuchungen zeigten anschaulich, dass und wie sich die Bedingungen für das Wohnen und die Freiraumnutzung je nach Stadtgebietstyp unterscheiden (Arbeitshypothese a). Vor diesem Hintergrund konnten aus den gruppenspezifischen Verhaltensweisen und Wünschen der Befragten Anforderungen an die

Weiterentwicklung der bestehenden Situation abgeleitet werden. Diese unterscheiden sich nach Haushaltstypen (Arbeitshypothese b), die mit den Lebenslagen korrespondieren und sich in einigen Fällen kombinieren lassen. Vor diesem Hintergrund werden drei Umbaustrategien zur Aufwertung städtischer Umwelt-, Standort- und Lebensbedingungen empfohlen, nämlich die generalisierte, ge-samträumliche Aufwertung und die detaillierte, bedarfsgerechte Aufwertung im kleinräumigen Be-stand als Profilierung der jeweiligen Typen neben der Vernetzung differenzierter Profiltypen, der Frei-räume, Straßen und Wege (s. u.). Diese Vorgehensweisen lassen sich sinnvoll ergänzen.

1. Beim gesamträumlichen Vorgehen bietet es sich an, im Rahmen der Weiterentwicklung der Ziel-konzepte für die Stadtentwicklung die Anteile der einzelnen Stadtgebietstypen am Bestand zu ermit-teln. Dazu sollten Leerstand, Bauzustand, Baualter, Freiräume und Nachfrage in Beziehung gesetzt werden. Überangebote sowie die zurzeit nicht zu befriedigende Nachfrage sollten auf die Stadtgebiets-typen bezogen werden. Es ist möglich, die Interessenten für die jeweiligen Stadtgebietstypen den defi-nierten Haushaltstypen zuzuordnen, um die Anforderungen an das Wohnen und die Freiraumnutzung weiter zu konkretisieren. Entsprechend sollte die bevorzugte Lage innerhalb der Stadt mit ihrem star-ken Einfluss auf die Zufriedenheit zugeordnet werden. Parallel dazu gilt es, die Prognosen der Bevöl-kerungsentwicklung auf die Entwicklung der Haushaltstypen umzulegen. Daneben sollten der erwarte-te soziale Status der Haushalte und die Einkommensentwicklung in Beziehung zur Prognose der Wert-schöpfung abgeschätzt werden. Durch diese Abgleiche lassen sich Überangebote an Wohnungen bzw. an Wohngebieten identifizieren, die für Rückbau- und Aufwertungsmaßnahmen innerhalb der jeweili-gen Stadtgebietstypen in Frage kommen. Ebenso könnten die zurzeit nicht zu befriedigenden Nachfra-gen durch Umbaumaßnahmen kompensiert werden. Die Charakteristika und Qualitätsmerkmale des jeweiligen nachgefragten Stadtgebietstyps könnten ergänzt bzw. ausgeprägt werden. Neben diesem Umbau im Bestand sind auch Erweitern oder Neubau auf geeigneten Brachflächen denkbar.

2. Kleinräumig betrachtet sprechen die Untersuchungsergebnisse explizit für eine bedarfsgerechte Aufwertung im Bestand in den Großsiedlungen Bonns und Dresdens, im Gründerzeitgebiet Dresdens, im Gebiet der 1950/60er Jahre Bonns und eingeschränkt in Dresden sowie in den Zentrumsgebieten beider Städte. Die Ansatzpunkte für die kleinräumige Aufwertung zur „Stärkung der Stärken“ des jeweiligen Stadtgebietstyps beziehen sich auf die Freiraumgestaltung, die Nachrüstung von Funkti-onsbereichen in Freiräumen und auf die Verbesserung der Einbindung oder Anbindung an das städti-sche Verkehrs- und Wegenetz mit den erforderlichen Sicherheitsvorkehrungen für Kinder, ältere und behinderte Menschen. Bezogen auf die Aufwertung der Freiräume gilt es insbesondere in den Grün-derzeitgebieten, im Zentrum und den Eigenheimgebieten, die Standards für Spielanlagen einzuhalten, die zu. A. mit 15 m2 Flächenbedarf für jeden Spielenden errechnet wurden (Roch/Chang 2007) und nach Präsenz der Altersgruppen gestaffelt sind. Für diese Kompensation aufgespürter Defizite spre-chen zum einen die Bedeutung des näheren Wohnumfeldes bezogen auf die Entwicklung der Folgege-neration (vgl. oben Wahrnehmung) und zum anderen die Auswirkungen des spielerischen Lernens auf künftige Befähigungen zur Arbeit und gesellschaftlichem Tun. Ansätze für eine Wohnungs- und Wohnumfeldaufwertung sind gebietsspezifisch zu entwickeln und an den potenziellen Nachfragern zu orientieren. So erscheint in Zentrumsgebieten wie im Fall von Bonn die Verbesserung der Wohnungs-qualitäten notwendig, die bei einem hohen Anteil privater Eigentümer häufiger über individuelle Maßnahmen realisierbar ist. Im Dresdner Zentrum wird, neben der Verbesserung der Bestandsqualitä-ten, eine weitere Verdichtung durch Neubau gut ausgestatteter Wohnungen erwartet. Der noch vor-handene größere Anteil einfacher Wohnungen in beiden Zentrumsgebieten wird allerdings durch die niedrigeren Mieten als Potenzial für Nachfrager erkannt, denen eine geringe Miete besonders wichtig ist und die eine einfache Ausstattung der Wohnung akzeptieren. Vorrangig sind das im Zentrum junge Haushalte und Wohngemeinschaften. Eine weitere bauliche Aufwertung, verbunden mit steigenden Mietpreisen, kann zum Wegzug dieser Bevölkerungsgruppen beitragen. Sowohl in Dresden als auch in Bonn äußern mehr als 80 % der in den Zentrumsgebieten befragten Bewohner eine positive Meinung zum „Wohnen im Stadtzentrum“. Dagegen wollen Befragte der anderen Gebiete wesentlich seltener gern im Zentrum wohnen. Es gilt demzufolge, diese Bevölkerungsgruppen als Befürworter urbaner Lebensweisen im Zentrum zu halten einerseits zur Belebung und andererseits zur Einschrän-kung/Vorsorge vor Leerständen im Wohnungssektor und toter Innenstädte. Im Dresdner Gründerzeit-gebiet zeigt sich eine in Gründerzeitgebieten ostdeutscher Städte häufiger anzutreffende Situation. Trotz umfangreicher Baumaßnahmen in den vergangenen Jahren sind weiterhin Sanierungsbedarfe

zu erkennen, unter den spezifisch ostdeutschen Bedingungen eines hohen Wohnungsleerstandes in die-sem Gebietstyp. Sanierung und Rückbau werden an Bedeutung gewinnen. Möglichkeiten für die Auf-wertung bietet das Wohnumfeld, das von den Bewohnern sehr kritisch bewertet wurde. Unter der Per-spektive einer zunehmend älteren Bevölkerung wird hierin der entscheidende Faktor für die Nutzung solcher Gebiete gesehen. Dabei stehen neben der infrastrukturellen Aufwertung und Versorgung der ökologische Umbau mit Beseitigung ruinöser Gebäude, Rückbau versiegelter Flächen, Fassadenbe-grünung und Begrünung von Brachflächen im Blickpunkt. Für den Gebietstyp Großsiedlung ist die Verbesserung von Zustand und Ausstattung im Wohnungsbestand anzustreben neben der Aufwertung des Wohnumfeldes und der Freiräume (siehe oben). Andererseits sind die kommunikativen Verhal-tensweisen stark ausgeprägt und als Potenzial zu bewerten. Demzufolge sollten Aufwertungen behut-sam vorgenommen werden. Notwendige Veränderungen in den Großsiedlungen sollten immer im Zusammenhang mit den Einkommenssituationen der Haushalte gesehen werden. In der Bonner Groß-siedlung ist den meisten befragten Haushalten eine geringe Miete sehr wichtig. Die Mietbelastungen sind größtenteils hoch. Mehr als ein Drittel der befragten Haushalte gibt für die Gesamtmiete mindes-tens die Hälfte des Haushaltsnettoeinkommens aus. In den Gebieten der 1950/60er Jahre zeigen sich die für ost- bzw. westdeutsche Städte typischen Bestandssituationen. Das Dresdner Gebiet wurde im Unterschied zum Bonner Referenzbeispiel Mitte der 1990er Jahre komplett saniert. Dieser Tatbestand und die Vorteile der Lagegunst lassen nur wenige Wünsche bei der Gestaltung der Freiräume und We-ge offen (Roch/Chang 2007). Anders in Bonn, wo vorwiegend bauliche Mängel im Wohnungsbestand festgestellt werden. Umbaubedarf besteht offensichtlich insbesondere beim Grundriss der Wohnungen und dort aufgrund der geringen Wohnflächen und Wohnraumgrößen. Ein Drittel der Bewohner sind Familien, die auf kleinen Wohnflächen wohnen. Die Villengebiete werden von den Befragten und den Begutachtungen sehr positiv beurteilt. Gründe sind die gute Qualität der Wohnungen, des Wohnens im eigenen Haus und im Park bzw. parkähnliche Gärten (Roch/Chang 2007). Erkennbare Aufwertungs-bedarfe sind im Wohnumfeld zu sehen. Sie beziehen sich auf verkehrsberuhigende Maßnahmen und Defizite an Einrichtungen der Versorgung, Betreuung und Freizeitgestaltung. Insbesondere in Eigen-heimsiedlungen, in denen ebenfalls die Zufriedenheit mit den Wohn- und Freiraumbedingungen auch aufgrund der Eigenverantwortlichkeit durch den hohen Anteil an Privateigentum dominiert, sind die o. g. Versorgungsbedarfe zu kompensieren. Zu berücksichtigen ist auch der relativ hohe Anteil älterer Bewohner in Bonn-Ippendorf, die häufig seit des Erstbezuges in der Nachkriegszeit in ihren Häusern leben und deren Mobilität abnimmt. In Dresden-Dölzschen wurde der Generationenwechsel in den reichlicher bemessenen Grundstücken aus der Vorkriegszeit größtenteils vollzogen. Die Versorgungs-defizite werden durch die Verkehrsanbindung größtenteils kompensiert.

Die dargestellten Strategien der 1. gesamträumlichen Entwicklung zur Sicherung und Stärkung rele-vanter Merkmale der Lebensqualität und 2. Profilierung durch kleinräumige bedarfsgerechte Aufwer-tungsmaßnahmen sollten ergänzt werden durch 3. die zielstrebige Förderung der Vernetzungsbezie-hungen innerhalb der Stadt. Damit werden die Zugänge zu spezifischen Qualitäten der differenzierten Stadtgebietstypen als Qualitätsprofile angesprochen und der Austausch ihrer Leistungen als Förderung von Partizipation. Diese Vernetzung betrifft im wörtlichen Sinne die Verbindung der klein- und groß-flächigen Freiräume durch Wege, Flüsse, Alleen und Mehrfachnutzung des städtischen Freiraumsys-tems für ökologische Leistungen, definierte Schutzziele und Naherholung einschließlich aktiver Betä-tigungen. Dazu vergleichbar sollte das städtische Verkehrs- und Wegenetz so weiterentwickelt wer-den, dass durch die gute Einbindung der Wohngebiete Nachteile der Lagegunst und des Zugangs zu hochwertigen Versorgungsleistungen kompensiert werden können. Diese strategischen Vorgehenswei-sen lassen nachfolgende Vorteile erwarten:

Durch das Angebot differenzierter Qualitäten kann die Stadt mehrere Adressaten ansprechen und auf eine Vielfalt guter städtebaulicher Lösungen verweisen. Die Umwelt-, Standort- und Lebensqualität der Stadt wird von diesen Besonderheiten gestützt, sollte aber mehr sein als „die Summe ihrer Teile“. Es kommt deshalb darauf an, das strategische Konzept der Stadtentwicklung so anzulegen, dass alle Stadtgebiete vom Zentrumsbereich und vom Austausch untereinander profitieren. Damit multiplizie-ren sich die aktiven und passiven Nutzungsmöglichkeiten, beispielsweise von Infrastruktureinrichtun-gen, Freiräumen und Freizeitangeboten. Städtisches Leben in vielfältigen Facetten wird attraktiver. Es bieten sich Räume an, die verstärkt von Menschen vergleichbarer Lebenslagen gern genutzt werden als relevante Merkmale von Lebensqualität. Die Standortqualität mit ihrer Anziehungskraft bzw. stabi-lisierenden Wirkung auf die

Unternehmensentwicklung steigt. Die Nutzungsmöglichkeiten sollten aktiviert werden u. a. durch attraktive und adressatenorientierte Informationen, eine entsprechende Organisation des öffentlichen Nahverkehrs und die Durchführung bzw. Unterstützung lokaler und zentraler Events.

Das erweiterte städtische Freiraumsystem könnte der Bevölkerung die Teilhabe am öffentlichen Leben generell erleichtern. Stärker als bisher sollten Mehrfachnutzungen angestrebt werden. Die Forderung nach einer verbesserten Einbindung der Wohngebiete in das städtische Verkehrs- und Wegenetz rich-tet sich auf die Erhöhung von Sicherheitsstandards für Fußgänger, Radfahrer oder Rollstuhlfahrer. Gerade Kinder, ältere und behinderte Menschen sollten die Möglichkeit haben, sicher an ihre Ziele zu gelangen. Für Fuß- und Radwege eignen sich Grünverbindungen im Freiraumsystem, wobei die Fuß-wege möglichst von den Radwegen getrennt angelegt werden und das gesamte Stadtgebiet erschließen sollten. Wege mit Verweilangeboten sollten stärker so gestaltet werden, dass sich Menschen begegnen und dabei passive und aktive Kontakte aufnehmen können.

4 LITERATUR

Augenstein, I. (2002): Die Ästhetik der Landschaft. Ein Bewertungsverfahren für die planerische Umweltvorsorge. Berliner Beiträge zur Ökologie 3. Berlin.

Baeseler, H.; Karg, H.; Brückner, A. (1989): Freiflächensystem der Stadt. Grundsätze und Empfehlungen. Bauakademie der DDR, Institut für Städtebau und Architektur. Berlin.

Banse, J.; Möbius, M. (2007): Bewohnerstrukturen und Nutzerpräferenzen in Bonn und Dresden. In: Roch, I..; Banse, J.; Leimbrock, H. (Hrsg.) (2007): Freiraum- und Wohnqualitäten – Potenziale für den städtischen Umbau. Tagungsband. Dresden (im Erscheinen)

Böltken, F; Meyer, K. (2002): Prioritäten und Defizite in Ost- und Westdeutschland. In: Informationen aus der Forschung des BBR, Nr.2/April 2002, 1-2

Bonacker, M. (2000): Bürgerumfrage „Qualität und Nutzung öffentlicher Grünanlagen in Berlin“. Gutachten im Auftrag der Senatsverwaltung für Stadtentwicklung, Berlin. Hamburg und Berlin.

Borchers, A. (1997): Die Sandwich-Generation. Ihre zeitlichen und finanziellen Leistungen und Belastungen. Frank-furt/Main.

Friedrich, K. (2001): Altengerechte Wohnungsumgebungen. In: Flade, A.; Limbourg, M.; Schlag, B. (Hrsg.): Mobilität älte-rer Menschen. Opladen, 155-166.

Geißler, C (1991): Die Bevölkerungsentwicklung: Anforderungen der Generation an das Leben und Wohnen in der Stadt. In: Ganser, K.; Hesse, J. J.; Zöpel, Ch. (Hrsg.): Die Zukunft der Städte. Baden-Baden.

Grunert, Ch. (1964): Gartenblumen von A bis Z. Radebeul.

Loidl, H. J. (1981): Landschaftsbildanalyse – Ästhetik in der Landschaftsgestaltung? In: Landschaft und Stadt, Heft 1, 7-19.

Roch, C. S. (2005): Städtische Wohnquartiere im Umbruch und Kommunikation älterer Menschen. Vergleichende Untersu-chung zur Nutzung von Freiräumen in ausgewählten Stadtquartieren von Bonn und Dresden. Diplomarbeit an der TU Dresden.

Roch, I. (2007): Das Potenzial Freiraum in der Wahrnehmung. In: Roch, I.; Banse, J.; Leimbrock, H. (Hrsg.) (2007): Frei-raum- und Wohnqualitäten – Potenziale für den städtischen Umbau. Tagungsband. Dresden (im Erscheinen)

Roch, I.; Banse, J.; Leimbrock, H. (2007): Fazit und Ausblick. In: Roch, I.; Banse, J.; Leimbrock, H. (Hrsg.) (2007): Frei-raum- und Wohnqualitäten – Potenziale für den städtischen Umbau. Tagungsband. Dresden (im Erscheinen)

Roch, I.; Chang, J. (2007): Ausgangsbedingungen und Ansatzmöglichkeiten für die Entwicklung der Freiräume in Bonn und Dresden. In: Roch, I.; Banse, J.; Leimbrock, H. (Hrsg.) (2007): Freiraum- und Wohnqualitäten – Potenziale für den städ-tischen Umbau. Tagungsband. Dresden (im Erscheinen)

Thinh, N. X. (2007): Die Befragungen in Bonn und Dresden und das methodische Vorgehen bei der mathematisch-statistischen Auswertung. In: Roch, I.; Banse, J.; Leimbrock, H. (Hrsg.) (2007): Freiraum- und Wohnqualitäten – Poten-ziale für den städtischen Umbau. Tagungsband. Dresden (im Erscheinen

IST Vienna Region – Verkehrsmanagement für die österreichische „Ost-Region“

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1 DAS IST „ITS VIENNA REGION“

Das Projekt ITS Vienna Region ist im VOR (Verkehrsverbund Ostregion) eingebettet, vorerst auf 3 Jahre ausgelegt und baut auf dem 2002 in Wien gestarteten Projekt „VEMA – Verkehrsmanagement“ auf. Der international etablierte Begriff „ITS“ steht für „Intelligent Transport Systems“ und umfasst das weite Feld der Verkehrstelematik und –information. Wien, Niederösterreich und Burgenland investieren als Projektpartner bis 2009 rund 5 Millionen Euro in den Aufbau von Verkehrsdaten-Pool und Verkehrslagebild. Für die erste Ausbaustufe wurde zudem eine Förderung durch das BMVIT-Programm „I2“ in der Höhe von rund 700.000 Euro genehmigt.

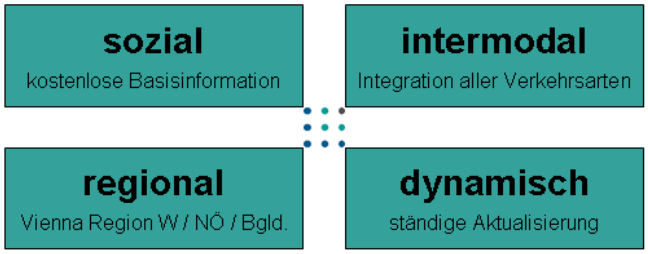

Abbildung 2: Eckpunkte des ITS Vienna Region Verkehrslagebildes

2 ZWECK UND ZIELE DES PROJEKTS „ITS VIENNA REGION“

Durch eine aktuelle und rechtzeitige Verkehrsinformation kann die begrenzte Infrastruktur wesentlich effizienter genutzt werden. Da alle Verkehrsarten berücksichtigt sind, wird zum Beispiel der Umstieg vom Auto auf Öffentliche Verkehrsmittel einfacher und komfortabler. Und nicht zuletzt trägt eine optimale Verkehrsinformation und -steuerung auch zu mehr Sicherheit im Straßenverkehr bei und kann auch beim Katastrophenschutz eine zentrale Rolle spielen. Einige konkrete Ziele sind:

Verbesserung des Modal Split zugunsten des Umweltverbundes (ÖPNV, Fußgängerinnen und Fußgänger, Radfahrerinnen und Radfahrer) durch

- flächendeckende Grundversorgung mit Verkehrsinformationen – unter dem Gesichtspunkt der Nachfragesteuerung,
- Optimierung der Verkehrssteuerung durch die einzelnen Verkehrsträger (Partner),
- Verbesserung der Strategiekoordinierung der Partner,
- dynamisches intermodales Routing für alle Verkehrsteilnehmer,
- intelligente ÖV-Erschließung der Fläche.
- Bündelung des Schnellverkehrs auf leistungsfähigen, umweltgerechten Korridoren
- Unterstützung von fundierten verkehrspolitischen Entscheidungen durch mehr Wissen über den Verkehr und seine Wirkungen

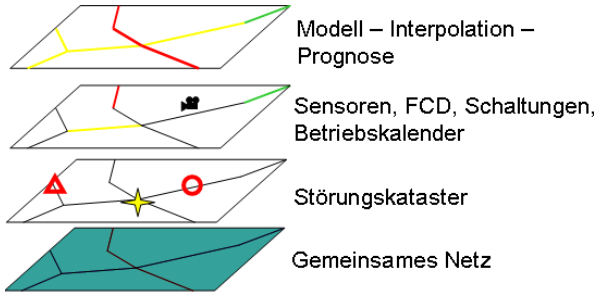

Abbildung 3: Aufbau des Verkehrslagebildes

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3 DAS MACHT „ITS VIENNA REGION“

Bis 2009 baut „ITS Vienna Region“ einen Verkehrsdaten-Pool für die Vienna Region (Wien, Niederösterreich und Burgenland) auf. Dabei werden alle Verkehrsträger, wie etwa ÖBB, Wiener Linien oder auch die ASFINAG, eingebunden. 2007 wird mit einem kompakten Pilotgebiet begonnen, 2008 sollen bereits alle für die Fußball-EM relevanten Verkehrsdaten zur Verfügung stehen. Dabei werden alle Verkehrsarten - Öffentlicher Verkehr, Autos, Radverkehr, Fußgänger - gleichermaßen integriert, der Datenpool ist somit „intermodal“. Die Verkehrsdaten werden ständig aktualisiert und bilden so die Basis für ein dynamisches Verkehrslagebild.

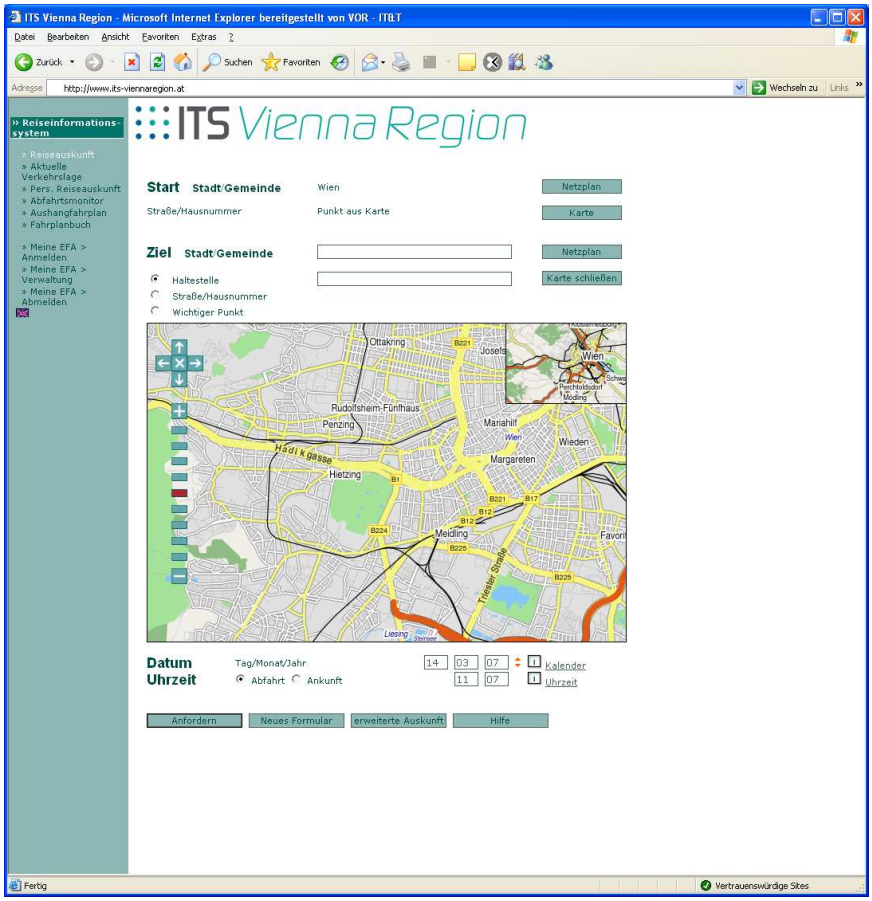


Abbildung 4: ITS-Fahrplanauskunft

Darüber hinaus wird „ITS Vienna Region“ aber auch verschiedene Services entwickeln, die dann alle Verkehrsteilnehmer und Projektpartner nutzen können. So soll bereits im Laufe des nächsten Jahres ein Verkehrslagebild im Internet zur Verfügung stehen. Dieses Verkehrslagebild besteht aus

- einem gemeinsamen Verkehrsbezugssystem (= Graphen)
- gemeinsamen Verkehrsnachfrage- und –angebotsdaten (Datenpool der Störungen, Maßnahmen, Messwerte)
- gemeinsamen Modellen zur Vervollständigung, Prognose und Evaluierung der Verkehrsentwicklungen und
- einem daraus aufzubauenden Verkehrsdatenarchiv der Vienna Region.

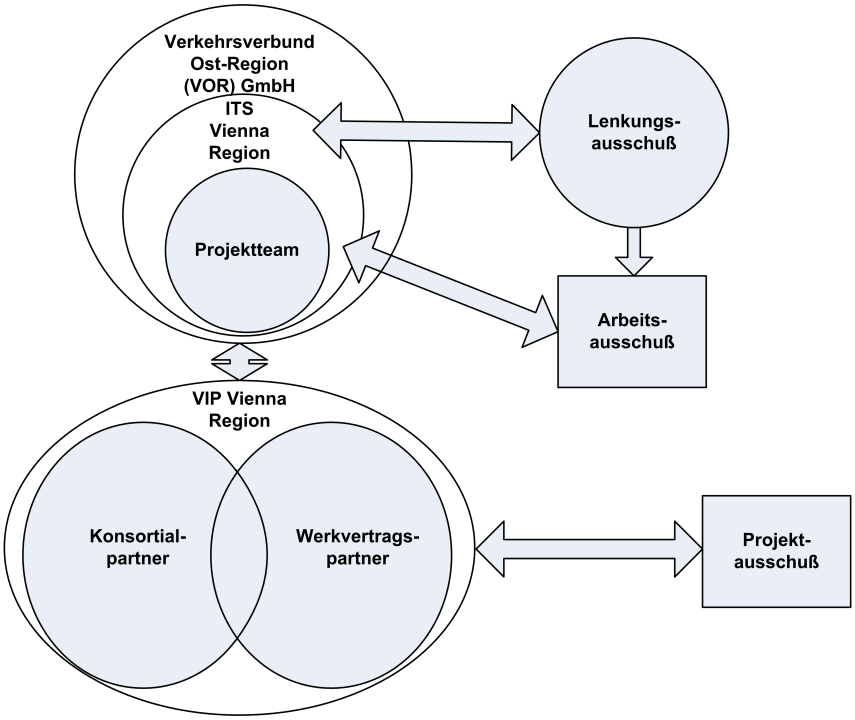
Beim Aufbau des dynamischen Verkehrslagebildes übernimmt ITS Vienna Region folgende Aufgaben, wobei die dezentrale Steuerungs-Hoheit der einzelnen Verkehrsträger unangetastet bleibt:

- Sammlung, Verwaltung und Aufbereitung der verkehrsrelevanten Informationen in der Region.
- Verdichtung sowie Bereitstellung dieser Daten und der daraus gewonnenen Informationen zur Betriebsoptimierung.
- Bereitstellung einer Grundversorgung der Bevölkerung mit kostenlosen Verkehrsinformationen.

- Aufbau eines Verkehrsdatenarchivs als Basis für die Verkehrsplanung, das Verkehrsmonitoring und die Festlegung und Evaluierung von Verkehrsmaßnahmen.

4 ORGANISATIONSSTRUKTUR DES PROJEKTS „ITS VIENNA REGION“

Das Projekt ITS Vienna Region ist als autonomes Projekt in die Struktur der VOR GmbH (Verkehrsverbund Ostregion) eingebettet und unterliegt der Kontrolle durch den ITS-Lenkungsausschuss. Aufgabe des ITS-Lenkungsausschusses ist die Kontrolle, Steuerung und Überwachung des Projektes sowie die Information der Generalversammlung des VOR im ITS-Jahresbericht. Für die inhaltliche Projektarbeit wird vom ITS-Lenkungsausschuss ein ITS-Arbeitsausschuss eingesetzt, welcher in regelmäßigen Abständen (ein bis zweimal pro Monat) tagt.



ITS Vienna Region
Intelligent Transport Systems

Abbildung 4 und Photos zu IST Vienna Region (Photos © MA 46 der Stadt Wien)

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KORS - Verkehrsreduktion durch KOmpakte RaumStrukturen

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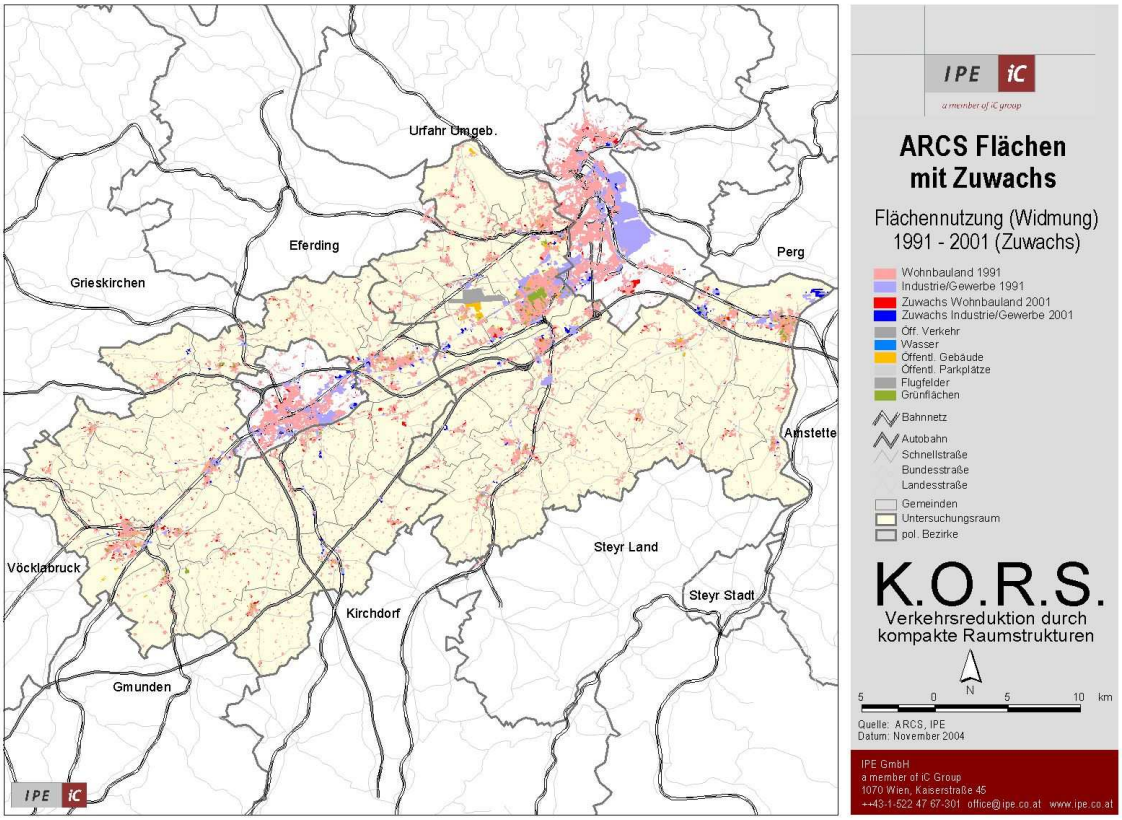
1 EINLEITUNG

Die zunehmende räumliche Trennung der drei Grunddaseinsfunktionen Wohnen, Arbeiten und Freizeit resultiert in einem immer stärker wachsenden Verkehrsaufkommen. Immer weniger Menschen können ihrer Arbeit am Wohnort nachgehen. Überregionale Freizeiteinrichtungen haben einen Einzugsbereich, der weit über eine einzelne Region ausgeht.

Die durch die fortschreitende Zersiedelung entstehenden dispersen Raumstrukturen gehören mit zu den wichtigsten Verursachern der gegenwärtigen Verkehrsentwicklung, welche durch einen allgemeinen Anstieg des Verkehrsvolumens und einer Verlagerung vom Öffentlichen Verkehr (ÖV) hin zum motorisierten Individualverkehr (MIV) gekennzeichnet ist.



Graphik 1: Zuwachs an Wohnbauland, Industrie und Gewerbe 1991 bis 2001 im Untersuchungsraum

Die Raumordnung verfügt über eine Reihe von Instrumentarien, deren Zweck die Verhinderung der Zersiedelung des Raumes ist. Die Entwicklung der vergangenen Jahrzehnte legt jedoch den Schluss nahe, dass diese Instrumente nur unzureichend greifen. Trotz prinzipieller Kenntnis der verkehrserzeugenden Wirkung disperser Raumstrukturen erfolgt die Siedlungsentwicklung nach wie vor in erheblichem Maße abseits bestehender Siedlungen und somit meist auch abseits vorhandener Öffentlicher Verkehrsmittel. Die Folge ist ein ist ein erhöhtes Verkehrsaufkommen auf der Straße und ein Bedeutungsverlust der traditionellen Ortszentren. Da die Aufnahmekapazität der Straßen weitgehend erreicht ist und Kapazitätsausweitungen in größerem Umfang nicht mehr möglich sind, stellt diese Entwicklung neben einem Ärgernis für die Betroffenen und einer Belastung für die Umwelt auch zunehmend eine Belastung für die Standortqualität und damit für die wirtschaftliche Prosperität der Regionen dar.

Die Entwicklung des Verkehrsaufkommens wird jedoch neben der Siedlungsentwicklung auch in hohem Maß von gesellschaftlichen Makrotrends wie demographischer Entwicklung, Wohlstandsentwicklung, steigender Frauenerwerbsquote etc. beeinflusst. Bis zu einem gewissen Grad zählt hierzu auch die steigende Motorisierungsrate. Diese Makrotrends sind durch legistische oder verkehrsplanerische Maßnahmen im

Wesentlichen nicht zu beeinflussen. Die Massenmotorisierung ist ebenso eine Tatsache, die zur Kenntnis zu nehmen ist, wie der weitverbreitete Wunsch nach dem „Eigenheim im Grünen“. Nicht alle raumstrukturellen Entwicklungen können daher der Raumordnung angelastet werden.

Obwohl über die qualitativen Zusammenhänge von Zersiedelung, Verkehrserzeugung und deren Folgen weitgehend Einigkeit herrscht, gibt es über die quantitativen Folgen des Versagens der Raumordnungsinstrumente bisher wenig konkrete Aussagen.

2 DER KORS MODELL-ANSATZ

Ziel der Arbeit war es, die Folgen von Raumordnungsfehlern am Beispiel einer Region zur quantifizieren. Zur Beurteilung der Folgen mangelhafter Siedlungsentwicklung musste der Einfluss überlagerter Makrotrends wie Wohlstandsentwicklung, steigende Frauenerwerbsquote, steigende Motorisierung auf die Verkehrsentwicklung etc. eliminiert werden. Bei KORS wurde daher die Gegenwart nicht mit der Vergangenheit verglichen, sondern mit einem Szenario, das sich bei gleichbleibenden makroskopischen Trends mit einer günstigeren Siedlungsentwicklung eingestellt hätte. Dazu wurde der Bevölkerungszuwachs 1991 bis 2001 im Untersuchungsraum mit geringfügig erhöhter Dichte in verkehrs- und raumplanerisch günstigere Siedlungen verschoben.

2.1 Der KORS-Untersuchungsraum

Der oberösterreichische Zentralraum, im Städtedreieck Linz-Wels-Steyr bildet einen der bedeutendsten Wirtschaftsstandorte Europas und zeichnet sich durch eine hohe Siedlungsdynamik aus. Im Rahmen der Suburbanisierung haben zahlreiche Bewohner, sowie eine Vielzahl von Unternehmen ihren Standort von den Ballungsräumen in die Räume zwischen den Zentren verlagert.

Die dynamische Entwicklung der letzten Jahre und Jahrzehnte gab den Ausschlag für die Wahl der politischen Bezirke Linz-Land und Wels-Land als KORS-Untersuchungsraum. Ein weiteres Kriterium war die Verfügbarkeit von detaillierten Daten über das Verkehrsverhalten, die vom Land Oberösterreich seit nunmehr fast drei Jahrzehnten erhoben werden und in vollem Unfang für die Analyse zur Verfügung stehen .

2.2 Das KORS Verkehrsmodell

Zur Darstellung der gegenwärtigen Situation wurde ein Verkehrsmodell entwickelt, mit Hilfe dessen es möglich ist den Einfluss disperser Siedlungsstrukturen auf die Verkehrsentwicklung zu quantifizieren.

Zur Abschätzung der Verkehrsnachfrage wurde der Untersuchungsraum in 998 Verkehrszellen auf der Basis der Statistik Austria 250m-Bevölkerungsraster aufgeteilt. Jede dieser Verkehrszellen symbolisiert ein Set der verschiedensten Verkehrserreger. Der - im Vergleich zu anderen Verkehrsmodellen - hohe Grad an Detailliertheit ist notwendig, um den Effekt disperser Siedlungsstrukturen abseits des ÖV auf das Verkehrsverhalten abbilden zu können.

Die Verkehrszellen erheben den Anspruch in sich möglichst homogen sein, sich nach außen hin von den umliegenden Verkehrszellen unterscheiden und möglichst exakt die regionalen Verhältnisse abbilden. Zusätzlich wurden jene Bezirke, mit denen der Untersuchungsraum in einem starken funktionalen Zusammenhang steht, als weitere Verkehrszellen in das Modell integriert. Als Kriterium für die Messung des funktionalen Zusammenhanges zwischen dem Untersuchungsraum und den umliegenden Bezirken wurden die Pendlerströme im Berufsverkehr gewählt.

Das KORS Verkehrsmodell ist ein disaggregiertes, verhaltensorientiertes Verkehrsnachfragemodell auf der Basis verhaltenshomogener Gruppen, d.h. die Verkehrsnachfrage wird auf der Basis des Verkehrsverhaltens unterschiedlicher Bevölkerungsgruppen modelliert. Zur Gruppenbildung wurden Kriterien wie

- die Berufstätigkeit,
- die Verfügbarkeit eines PKW und
- das Lebensalter

herangezogen. Aus der Kombination dieser Kriterien wurden neun Gruppen gebildet, welche sich jeweils durch ein spezifisches Mobilitätsverhalten auszeichnen.

Die Verteilung der Bevölkerung auf die verhaltenshomogenen Gruppen wurden ebenso wie die Aktivitätenketten und die Ganglinien der Aktivitätenpaare, den Ergebnissen der oberösterreichischen Haushaltsbefragung entnommen.

Die Aktivitätenketten bilden das Verkehrsverhalten der einzelnen verhaltenshomogenen Gruppen in Form von Wegekettenmustern ab. Diese Aktivitätenketten kommen durch das Aneinanderreihen verschiedener Aktivitäten wie Wohnen, Arbeit, Freizeit, Einkauf, Schule, Universität, Berufsschule im tageszeitlichen Ablauf zustande.

Die Ganglinien der Aktivitätenpaare gehen als Parameter für die tageszeitliche Verteilung der einzelnen Aktivitätenpaare (Wohnen-Arbeit, Wohnen-Freizeit, ...) in die Modellberechnung ein.

Aus den zellenweisen Strukturdaten wird das Quell- und Zielverkehrsaufkommen, d.h. das „Verkehrsbedürfnis“ einer Zelle ermittelt. Als Basis für die Berechnung des Quell- und Zielverkehrsaufkommens, dient das Quell- und das Zielpotenzial einer Zelle.

Das Quellpotenzial im Verkehrsmodell bildet die Wohnbevölkerung in neun verhaltenshomogenen Gruppen, die Zielpotenziale beschreiben die Attraktivität für die einzelnen Aktivitäten (Wohnen, Arbeit, Freizeit, Einkauf, Schule, Berufsschule, Hochschule). Bei der Aktivität „Einkauf“ wurde zwischen täglichem Bedarf und gehobenem Bedarf unterschieden.

Basierend auf den vorgegebenen Mobilitätsmustern der einzelnen Gruppen wird das berechnete Verkehrsaufkommen im Zielwahlmodell nach Attraktivität auf die Verkehrszellen verteilt. Dabei werden zahlreiche verkehrsnachfragerelevante Parameter, wie der Wege-Widerstand, gemessen durch die Entfernung zwischen zwei Verkehrszellen oder die ÖV-Erschließungsklasse, welche sich durch die Anzahl der Umsteigevorgänge (Umsteigehäufigkeit) auf dem Weg zwischen zwei Verkehrszellen ausgedrückt, berücksichtigt.

Mit einem LOGIT-Modell werden die im Zielwahlmodell festgelegten Verkehrsströme auf die einzelnen Verkehrsmittel (PKW, PKW-Mitfahrer, Rad, Fußgänger, ÖV) aufgeteilt. Für die Aufteilung werden verkehrsmittel- und gruppenspezifischen Parametern, wie die Fahrzeit, die Zu- und Abgangszeit herangezogen. Das LOGIT-Modell ermittelt den Nutzen eines Verkehrsmittels für eine Fahrt zwischen zwei Verkehrszellen für Personen einer bestimmten verhaltenshomogenen Gruppe.

Um ein möglichst realistisches Bild der Verkehrssituation zum Zeitpunkt 2001 zu erhalten, wurden die Modellparameter anhand der vorliegenden empirischen Werte aus der oberösterreichischen Haushaltsbefragung kalibriert. Die Abstimmung erfolgt zum einen anhand von ausgewählten Beispielzellen, zum anderen im Vergleich der Modellergebnisse für einzelne verhaltenshomogene Gruppen mit den beobachteten Werten aus der Haushaltsbefragung.

Die Umlegung der vom Modell generierten Fahrtenmatrizen auf das Straßennetz liefert ein realistisches Bild der Verkehrsströme im Untersuchungsraum. Auch der modellmäßig errechnete Modal Split für das Szenario 2001 stimmt sehr gut mit den empirischen Werten aus der Haushaltsbefragung überein.

Der im Szenario 2001 modellierten derzeitigen Situation wurde ein Szenario mit einer alternativen, raum- und verkehrplanerisch günstigeren Siedlungsentwicklung gegenübergestellt (Szenario KORS).

2.3 Die alternative Siedlungsstruktur KORS

Die Siedlungsentwicklung in geringer Dichte und abseits der Erschließungsbereiche des Öffentlichen Verkehrs ist eine der Hauptursachen für das starke Anwachsen des PKW-Verkehrs und den damit verbundenen Problemen.

Der Entwurf einer alternativen Raumstruktur für das Szenario KORS erfolgte nach folgenden Kriterien:

- Die Siedlungsdichte wurde geringfügig erhöht, der prinzipielle Charakter der Siedlungen wurde jedoch nicht verändert, da der generelle Trend zur Suburbanisierung und zu geringerer Dichte als invariant angenommen wurde.
- Die Festlegung der alternativen Siedlungen erfolgte mit dem Ziel optimaler Erschließung mit dem vorhandenen Öffentlichen Verkehr.
- Beim Entwurf dieser alternativen Raumstruktur wurden eine Reihe von Rahmenbedingungen berücksichtigt, welche in Folge angeführt werden.

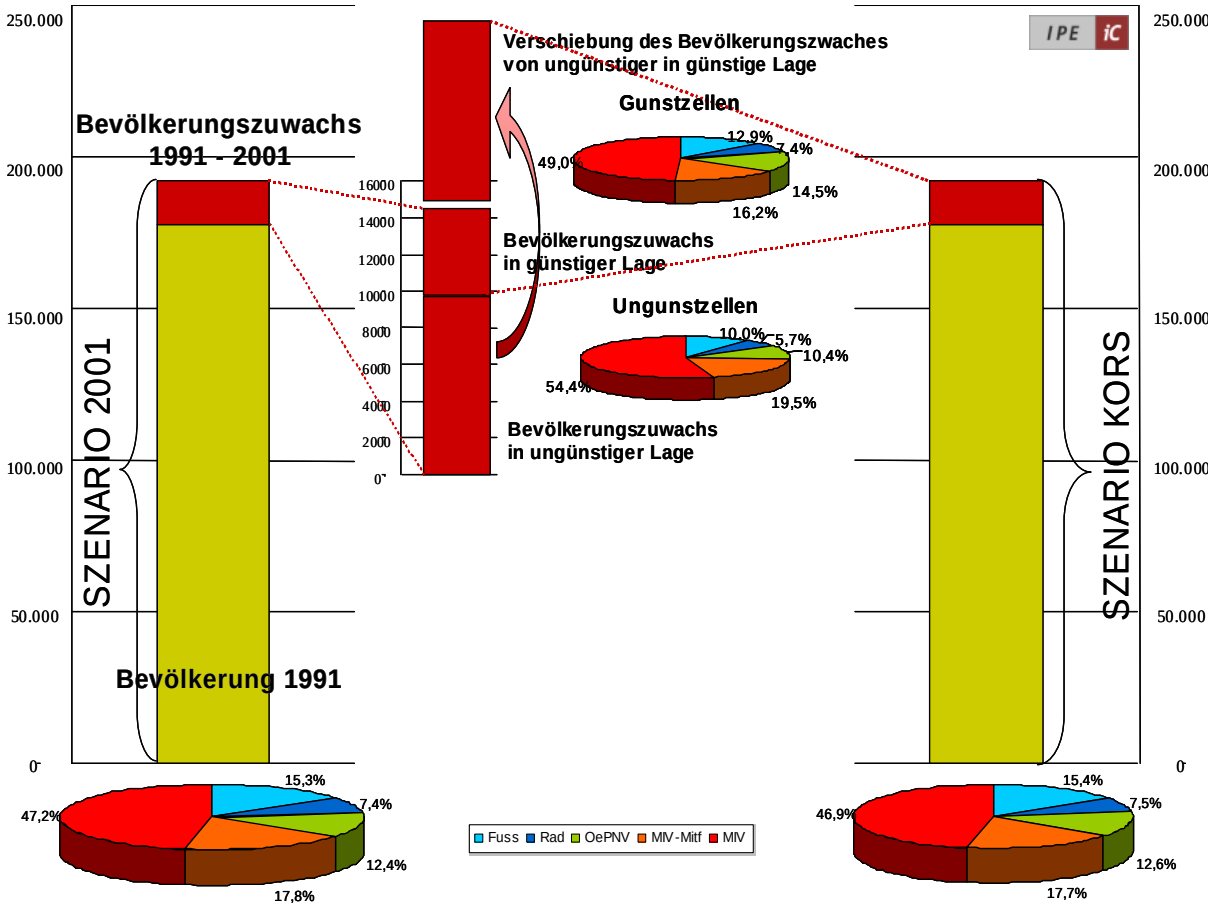
- Es wurden nur jene Bevölkerungsteile dieser alternativen Raumstruktur zugeführt, die zwischen 1991 und 2001 ihren Wohnstandort gewechselt haben, dh jener Teil der Bevölkerung, der für die Raumordnung „greifbar“ gewesen wäre.
- Die Verschiebung des Bevölkerungszuwachses in Verkehrszellen günstigerer Lage erfolgt nur innerhalb von Kleinregionen, die nach naturräumlichen Kriterien bzw. dem Grundstückspreis abgegrenzt werden. Damit wird dem Umstand Rechnung getragen, dass die Wohnstandortwahl nach bestimmten Motiven erfolgt (detailliertere Ausführungen dazu erfolgen in einem späteren Kapitel).

Flächenwidmungs- und Bebauungspläne wurden beim Entwurf der alterntiven Raumstruktur nicht berücksichtigt, da sie das Produkt der Raumordnung sind, deren Nicht-Funktionieren nachgewiesen werden soll.

Basierend auf den festgelegten Kriterien werden die zwischen 1991 und 2001 aus verkehrs- und raumplanerisch besonders ungünstigen Zellen („Ungunstzellen“) zugezogene Bevölkerung in günstige Zellen („Gunstzellen“) verschoben.

Von dieser Maßnahme sind insgesamt 9.711 Personen aus 391 Ungunstzellen betroffen.

3 MODELLERGEBNISSE



Graphik 1: Alternative Siedlungsstruktur KORS

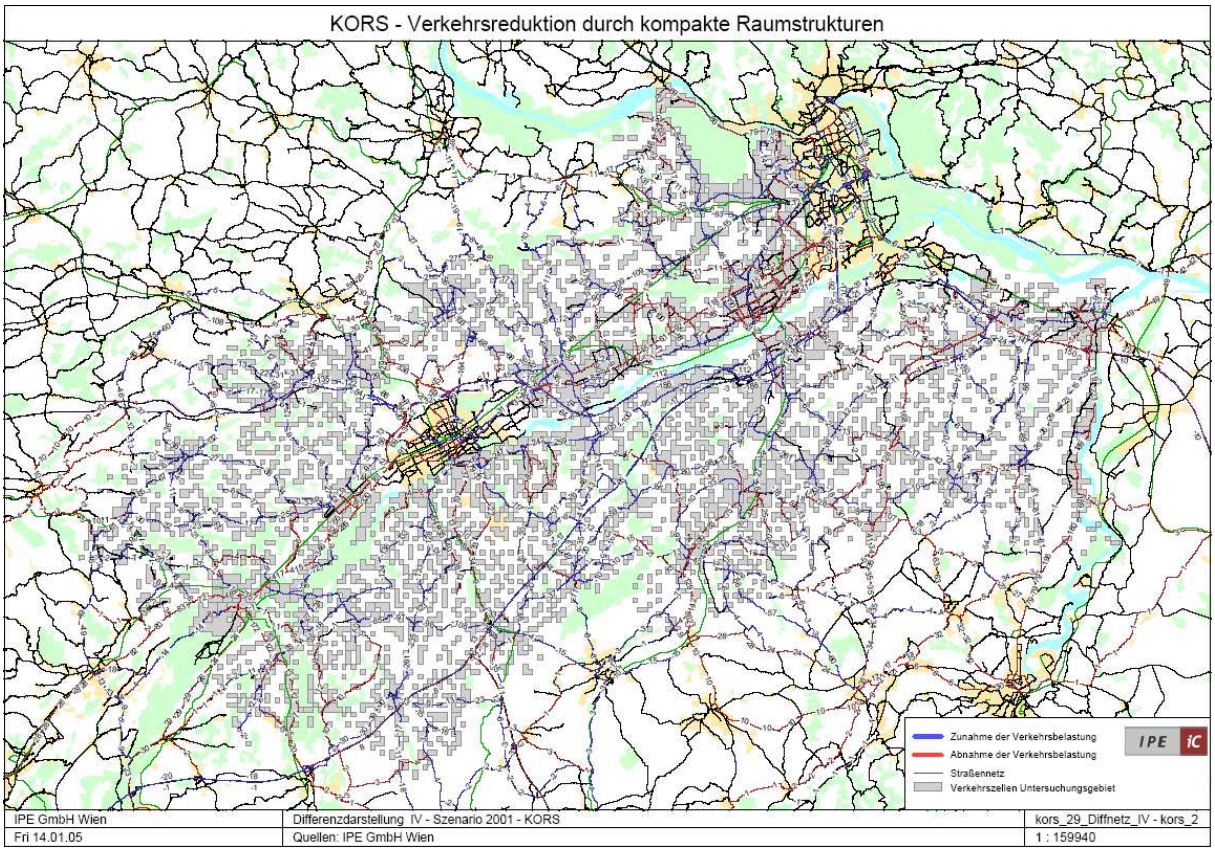
3.1 ZUSÄTZLICHER VERKEHR DURCH MANGELHAFTE SIEDLUNGSENTWICKLUNG

Als Folge der mangelhaften Siedlungsentwicklung im Zeitraum 1991 – 2001 wurde für den Untersuchungsraum eine zusätzliche Verkehrsleistung von 6,38 Mio. PKW-Fahrzeugkilometern pro Jahr errechnet. Diese Zahl ergibt sich aus der Differenz der Verkehrsleistung im Szenario 2001 und dem Szenario KORS und ist somit direkt auf die mangelhafte Siedlungsentwicklung zurückzuführen.

Die Verkehrsreduktion unter der Bedingung der gewählten alternativen Raumstruktur, geht einher mit einer Verlagerung zwischen den Verkehrsmitteln. Dies wird insbesondere bei der Betrachtung der Verkehrsmittelwahl in den Gunst- und den Ungunstzellen deutlich.

Der Vergleich zeigt eine deutliche Verlagerung vom MIV zum ÖV. Benützen die Bewohner der Ungunstzellen für 10% der Wege öffentliche Verkehrsmittel, so sind es in den Gunstzellen fast 15%. Entsprechend erhöht die Verschiebung des Bevölkerungszuwachses in die Gunstzellen den Anteil des ÖV. Auch zwischen Bus und Bahn, also innerhalb der ÖV, kommt es zu Verlagerungen. Während die Bus-Personenkilometer um 1,5% abnehmen, kommt es zu einer verstärkten Benützung der Bahn (+6,9%).

Durch die kompakteren Siedlungsstrukturen in den Gunstzellen steigen auch die Fußwege und die mit dem Fahrrad zurückgelegten Wege.



Graphik 2: Veränderungen der Verkehrsströme durch die Alternative Siedlungsstruktur KORS

3.2 KOSTEN DER MANGELHAFTEN SIEDLUNGSENTWICKLUNG

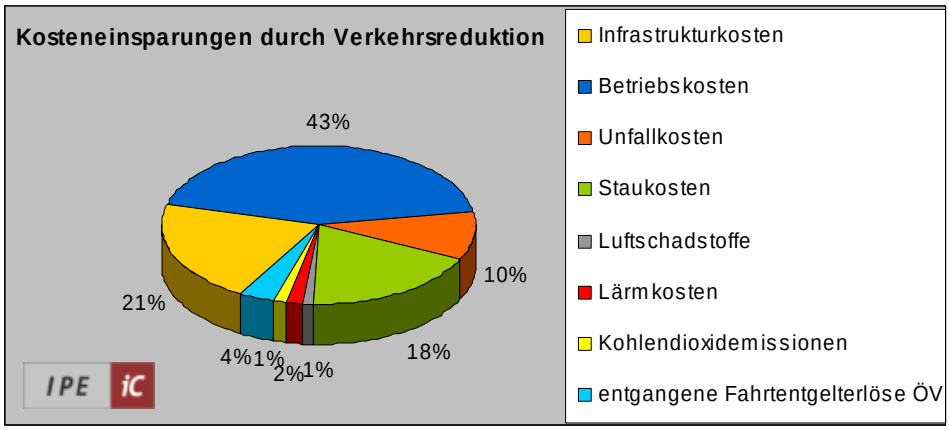
Die Grundlage der Kostenschätzung ist der durch die mangelhafte Sieldungsentwicklung generierte zusätzliche Verkehr. Zur Quantifizierung der Kosten für die Volkswirtschaft wurden Kostensätze aus der Literatur entnommen. Da bei mehreren in Frage kommenden Quellen für die Kostensätze stets der niedrigste Wert herangezogen wurde und eine Reihe von schwer zu quantifizierenden Bereichen aus der Berechnung ausgeklammert wurden, stellt der errechnete Wert die untere Schranke eines breiten Kostenkorridors dar. Die Ergebnisse sind demnach eine Berechnung auf der Basis sehr vorsichtiger Annahmen, die von den tatsächlichen Kosten keinesfalls unterschritten werden.

Als Folge des durch mangelhafte Siedlungsentwicklung entstandenen zusätzlichen Verkehrs entstehen der Allgemeinheit an mehreren Stellen Kosten:

- Infrastrukturkosten: Diese umfassen neben den einmaligen Errichtungskosten von Verkehrsanlagen auch die Finanzierungskosten sowie die laufenden Kosten für Betrieb und Unterhalt (VCÖ 1998).
- Fahrzeugbetriebskosten: Fahrzeugbetriebskosten umfassen die jährlichen Abschreibungen und Finanzierungskosten, sowie alle anderen Kosten, die im Zusammenhang mit Betrieb und Wartung der Fahrzeuge anfallen (VCÖ 1998).
- Staukosten: berechnen sich vor allem aus dem zusätzlichen Platzbedarf, welcher im PKW-Verkehr ca. 15-mal höher ist, als mit Bus oder Straßenbahn (VCÖ o.J.).
- Unfallkosten: hier werden nur die externen Unfallkosten, also jene Kosten, die nicht von den Verursachern getragen werden berücksichtigt. Dazu zählen externe medizinische Heilkosten,

Produktionsausfälle, Immaterielle externe Kosten (wie der subjektive Wert von Leben und Gesundheit), externe Administrativkosten, externe Polizeikosten, externe Rechtsfolgekosten der Justiz) (Bundesamt für Raumentwicklung 2002).

- Umweltkosten: Kosten durch Schadstoffemissionen, Lärmkosten, Kosten durch CO2-Emissionen (VCÖ 1998).
- Entgangene Fahrtentgelte im Öffentlichen Verkehr: die Differenz der Fahrgastzahlen des Öffentlichen Verkehrs zwischen dem Szenario KORS und Szenario 2001 entspricht einer Minderung der Fahrtentgelterlöse und damit einem erhöhten Zuschussbedarf zum ÖV seitens der Öffentlichen Hand (IPE 2004).



Graph 2: Kosteneinsparungen durch Verkehrsreduktion (Quelle: IPE)

Durch die Verschiebung von 9.711 Personen in verkehrs- und raumplanerische Gunstzellen können Verkehrskosten in der Höhe von mehr als 3,2 Mio.€ jährlich eingespart werden. Bedenkt man, dass von den Maßnahmen nur 5% der Bevölkerung in einem Zeitraum von 10 Jahren betroffen sind, wird das Einsparungspotenzial durch die Förderung kompakter Siedlungsstrukturen mit gutem ÖV-Anschluss deutlich.

Neben Kosten durch den zusätzlichen Verkehr fallen der Allgemeinheit Kosten durch die dispersen Sieldungsstrukturen an. Bis 2011 wird der Gesamtinvestitionsbedarf in die für die Neuerrichtung technischer Infrastruktur (Straße, Wasserleitung, Kanal) in Österreich jährlich auf rund 944,7 Mio.€ geschätzt (Doubek o.J.).

Um die Kosten der geringen Siedlungsdichte quantifizieren zu können, wurden die anfallenden Erschließungskosten (Errichtungskosten technischer Infrastruktur) in den Ungunstzellen mit jenen in den Gunstzellen verglichen. Ausgegangen wurde dabei von siedlungstypenspezifischen Kosten für die Erschließung des Baulandes (Doubek, o.J.). Die Differenz ergibt ein Einsparungspotenzial von fast. 71.000 € pro Jahr, welches auf die geringfügige Verdichtung in den Gunstzellen zurückzuführen ist.

Abseits der anfallenden Erschließungskosten muss die öffentliche Hand für Betrieb und Instandhaltung der technischen Infrastruktur aufkommen. Zur Quantifizierung der Betriebskosten steht nur sehr wenig Datenmaterial zur Verfügung. In der Berechnung wurden nur die Kosten für Betrieb und Instandhaltung der Gemeindestraßen (inkl. Schneeräumung) (ÖROK 1999) sowie Transportkosten im Bereich der sozialen Infrastruktur (Doubek, o.J.) berücksichtigt.

Gemeinsam betragen die Einsparungspotenziale durch eine geringfügige Erhöhung der Siedlungsdichte ca. 240.000€/Jahr.

Insgesamt betragen die Kosten der mangelhaften Siedlungsentwicklung im Zeitraum 1991 bis 2001 34,4 Mio. €.

4 LITERATUR

Doubek, C.: Die Kosten der Zersiedlung. Empirische Befunde aus Österreich. Abfragedatum: 18.11.2004, Verfügbar von: http://www.srl.de/fg/fmv/termine/verkehrsreform-workshop_2003-04-11/Vortrag_Doubek.pdf, o.J.

Doubek, C.: Die Kosten der Zersiedlung. Was das Haus im Grünen den Nachbarn kostet. Abfragedatum: 18.11.2004; Verfügbar von: http://www.noel.gv.at/SERVICE/RU/RU2/download/301_Dou.pdf, o.J.

IPE: Strategie für den Nah- und Regionalverkehr Oberösterreich, 2004
ÖROK, Österreichische Raumordungskonferenz: Siedlungsstruktur und öffentliche Haushalte, ÖROK Schriftenreihe Nr. 143, 1999
PTV AG: ptv demand – VISEM 8.0 Basiskurs, 2001
Schnabel, W., Lohse, D.: Grundlagen der Straßenverkehrstechnik und der Verkehrsplanung. Band 2 Verkehrsplanung, 1997
VCÖ Verkehrclub Österreich: Factsheet Staukosten. Abfragedatum: 18.12.2004, Verfügbar von: http://www.bahnfakten.at/files/file_fak/VCOe_Factsheet_Staukosten.pdf, o.J.
VCÖ Verkehrsclub Österreich (Hrsg.) (1998): Leitungsfähiger Verkehr durch effiziente Preisgestaltung, Wissenschaft & Verkehr 4, 1998

Nachhaltiges grenzüberschreitendes Siedlungsflächenmanagement - Erfahrungen und Hintergründe zu dem Kooperationsprojekt Raum+

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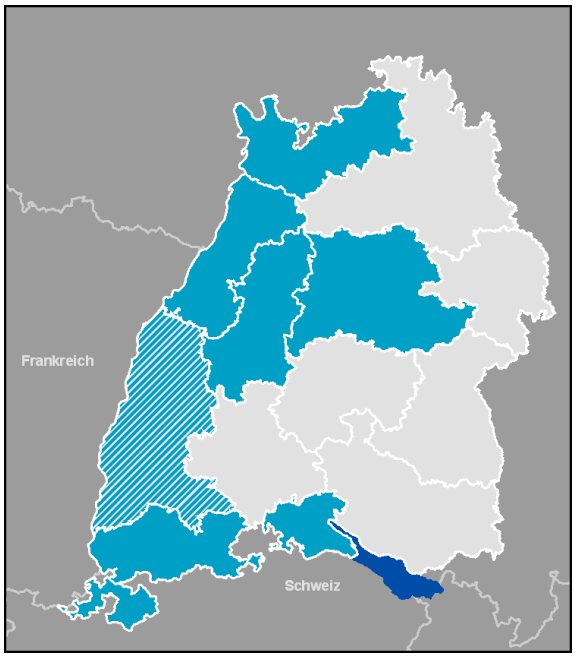
1 EINLEITUNG

Im vorliegenden Artikel soll das sich derzeit (Frühjahr 2007) in Bearbeitung befindliche Kooperationsprojekt Raum+ vorgestellt werden und auf zentrale Punkte des Projektes eingegangen werden, wie den grenzüberschreitenden Ansatz sowie die Notwendigkeit und Umsetzung einer „Übersicht“ als Grundlage für ein erfolgreiches Siedlungsflächenmanagement. Das Projekt wurde im Herbst 2007 gestartet und soll im Herbst 2008 abgeschlossen sein.

Projektpartner sind das Umwelt- und das Wirtschaftsministerium Baden Württemberg, der Verband Region Rhein-Neckar, die Regionalverbände Mittlerer Oberrhein, Nordschwarzwald, Südlicher Oberrhein, Hochrhein-Bodensee, der Verband Region Stuttgart und das Kanton Basel-Landschaft. Die wissenschaftliche Bearbeitung übernehmen das Institut für Raum- und Landschaftsentwicklung, Professur für Raumentwicklung der ETH Zürich als Leadpartner und das Institut für Städtebau und Landesplanung der Universität Karlsruhe (TH).

Im Rahmen des Projektes soll eine belastbare Grundlage für die Diskussion und Anpassung der derzeit existierenden Herangehensweisen, Planungsinstrumente und Fördermechanismen für ein nachhaltiges Siedlungsflächenmanagement geschaffen werden. Dazu haben sich die Kooperationspartner des Projektes Raum+ das Ziel vorgegeben, eine belastbare und fortschreibungsfähige Übersicht über Siedlungsflächenpotenziale im Innen- wie im Außenbereich Regions- und Nationalgrenzen überschreitend zu erarbeiten. Aufbauend auf den Erkenntnissen des Modellvorhabens der Raumordnung „Nachhaltiges regionales Siedlungsflächenmanagement in der Region Stuttgart“ (MORO-RESIM) soll über Ersterhebungsgespräche und eine fortschreibungsfähige internetbasierte Informationsplattform eine solche Übersicht in vier baden-württembergischen Regionen und dem Schweizer Kanton Basel Landschaft erarbeitet werden. Des Weiteren sollen Erkenntnisse über die Fortschreibung einer solchen Übersicht und notwendige flankierende Maßnahmen für die Unterstützung der Kommunen seitens der Region im Rahmen des Kompetenzzentrums Flächenmanagement in der Region Stuttgart gewonnen werden.



Grafik 1: Projektpartner und räumlicher Umgriff des Projektes Raum+ (Eigene Darstellung)

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Editors: Manfred SCHRENK, Vasily V. POPOVICH, Josef BENEDIKT

2 RAHMENBEDINGUNGEN

Die Reduzierung der Flächeninanspruchnahme ist ein ausgemachtes Ziel aller Planungsebenen in Deutschland, aber auch in der Schweiz. In Deutschland hat die Bundesregierung auf Bundesebene in ihrer Nachhaltigkeitsstrategie das Ziel der Senkung der bundesweiten Neuinanspruchnahme von Boden zu Siedlungszwecken von ca. 100 ha pro Tag auf 30 ha pro Tag bis ins Jahr 2020 definiert [BUND 2004]. Im Landesentwicklungsplan 2002 des Bundeslandes Baden-Württemberg ist unter anderem die Strategie „Innenentwicklung vor Außenentwicklung“ als Ziel festgelegt. Auch auf der regionalen Ebene wird diese Strategie zum Beispiel im aktuellen Regionalplan des Regionalverbandes Nordschwarzwald als Ziel geführt. In der Schweiz sind in den formalen Planwerken ähnliche Ansätze vorhanden. Der haushälterische Umgang mit dem Boden ist im Artikel 1 des Bundesgesetztes über die Raumplanung festgelegt [EIDG 2006]. Auch findet sich als Konsequenz auf der Schweizer Bundesebene „Innenentwicklung vor Außenentwicklung“ in den „Strategien der Raumordnung Schweiz“ [ARE 1996] wieder. Ein Planungsgrundsatz des kantonalen Richtplans des Kantons Basel-Landschaft ist die Siedlungsentwicklung nach Innen.

Die konkrete Umsetzung des Ziels der bevorzugten Innenentwicklung kann aufgrund der kommunalen Planungshoheit in beiden Staaten nur auf kommunaler Ebene erfolgen. Die Entscheidung in welchem Maße und für welche Zwecke Siedlungsfläche neu ausgewiesen werden soll, entscheidet schlussendlich jede Kommune selbst. Viele Kommunen sind schon im Bereich der Innenentwicklung aktiv und haben darin teilweise auch große Erfolge. So war in den meisten Kommunen, die im Rahmen des Projektes MORO RESIM erhoben wurden, schon auf die eine oder andere Weise das Thema der Innenentwicklung bearbeitet worden, sei es über Projekte im Rahmen des Landessanierungsprogramms, Über Ortsentwicklungspläne, regelmäßig fortgeschriebene Baulückenkataster, über die regelmäßig der Gemeinderat informiert wird, oder „nur“ durch die Erkenntnis und das persönliche Engagement von Bürgermeistern. Ein Ergebnis dieser Gespräche mit den Planern und Bürgermeistern vor Ort war aber gerade, dass es gewisse Hürden für die im Flächenmanagement aktiven Kommunen gibt, die Teils politischer Natur, teils auch technischer und finanzieller Natur sind und bei denen die Unterstützung seitens der Regionen und des Landes hilfreich sein könnte. Hierbei sind zu nennen:

- Für die Schwerpunktsetzung auf Innenentwicklung sind in den Gemeindegremien meist schwerer Mehrheiten zu finden, als für Projekte auf der grünen Wiese, von denen sich die Kommune auch Einnahmen für den kommunalen Haushalt und den Zuzug von jungen Familien verspricht.
- Der planerische Aufwand der sich mit Innenentwicklung verbindet, überfordert insbesondere kleinere Kommunen, da nicht entsprechende personelle Ressourcen vorhanden sind.
- Die finanziellen Mehrbelastungen und Risiken, die sich mit vielen Innenentwicklungsprojekten verbinden, werden gescheut und sind oft gerade für kleinere Gemeinden schwer zu schultern.
- Es kommt oft zu Konkurrenzsituationen zwischen benachbarten Kommunen, die zu vermehrten Ausweisungen führen können. Diese Konkurrenzsituationen verschärfen sich, wenn unterschiedliche Genehmigungsbehörden mit unterschiedlichen Maßstäben für benachbarte Kommunen zuständig sind. Dies kann innerhalb einer Region[59] , aber natürlich gerade auch an Regionsgrenzen der Fall sein.

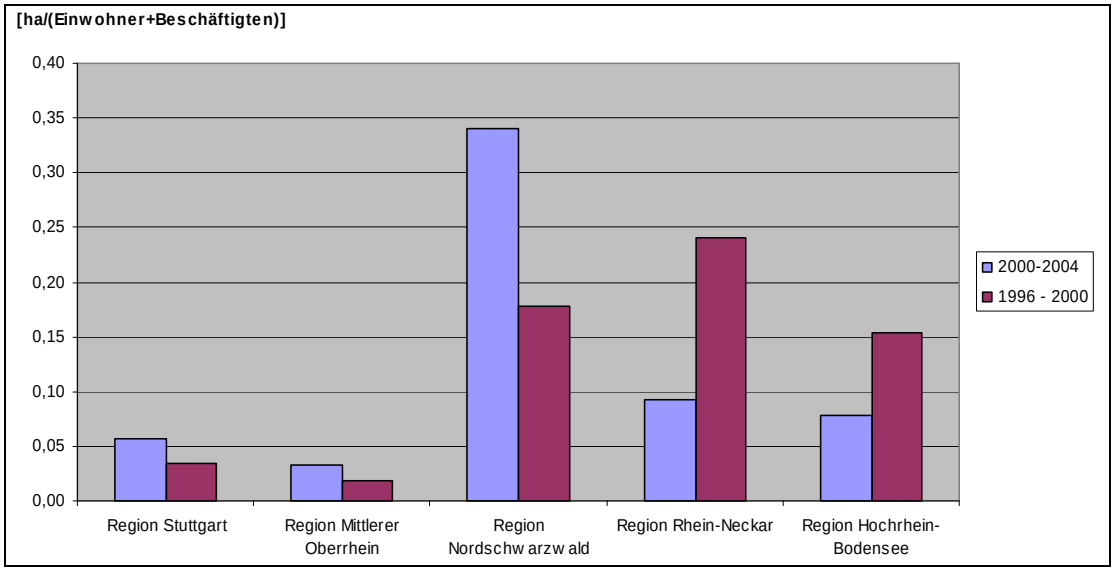
Damit wird ersichtlich, dass es zusätzlicher flankierender Maßnahmen seitens der Regionen und Bundesländer bzw. Kantone bedarf. Um diese Unterstützung zielgerichtet anbieten zu können, bedarf es jedoch belastbarer Grundlagen, die die Bedürfnisse der Kommunen, die Problembereiche, aber auch Chancen klar darstellen können, welche für die Innenentwicklung maßgeblich sind.

3 GRENZÜBERSCHREITENDE KOORDINATION IM FLÄCHENMANAGEMENT

Eine wichtige Erkenntnis im Vorfeld des Projektes Raum+ war, dass für ein erfolgreiches regionales Flächenmanagement die grenzüberschreitende Koordination der Siedlungsentwicklung ein zentraler Bestandteil ist. Dass ein regionales und auch kommunales Flächenmanagement mit den existierenden Instrumenten und Verfahren, in Prinzip möglich wäre, war ein Ergebnis der im Rahmen des Projekts MORO-RESIM durchgeführten Workshops mit Experten und Vertretern aus den Raumschaften. Einzig eine klarere Handhabung der gesetzlich gegebenen Möglichkeiten wäre dazu notwendig. In der politischen

[59] Region bedeutet hier Verbandsgebiet eines Regionalverbandes bzw. Gebiet eines Kantons.

Diskussion in den Regionen über die Umsetzung der Schwerpunktsetzung auf Innenentwicklung seitens der Kommunen und der Regionalverbände wird oft das Argument der Konkurrenz mit den benachbarten Regionen und der, gerade in den Grenzbereichen herrschenden Konkurrenz dazu herangezogen, nicht so strikt wie es möglich wäre, diese Mittel auszuschöpfen. Die Vermutung, dass es tatsächlich unterschiedliche Handhabungen bezüglich der Steuerung der Siedlungsentwicklung in verschiedenen Regionen gibt, kommt auf, wenn man die Entwicklung der Zunahme der Siedlungs- und Verkehrsfläche in verschiedenen Regionen bezogen auf die Einwohner und Erwerbstätigenentwicklung betrachtet. In Grafik 2 sieht man signifikante Unterschiede zwischen den Regionen. So kann in der Region Nordschwarzwald ein bis zu siebenfacher Wert im Vergleich zu den Nachbarregionen Mittlerer Oberrhein und Stuttgart festgestellt werden. Statistische Auswertungen können also diese Vermutung nicht entkräften, dass es tatsächlich unterschiedliche Handhabungen in den Regionen geben könnte. Dies lässt sich jedoch nicht mit Bestimmtheit sagen, aufgrund der Aggregiertheit der vorliegenden statistischen Daten und unterschiedlicher Entwicklungsdynamiken in den Räumen.



Grafik 2: Zunahme der Siedlungs- und Verkehrsfläche zur Summe der Einwohner- und Beschäftigtenentwicklung (Eigene Bearbeitung auf Grundlage von Daten des Statistischen Landesamtes Baden-Württemberg)

Um diese Diskussion auf eine materielle Basis stellen zu können und die notwendigen flankierenden Maßnahmen auf Regions- und Landesebene bestimmen und umsetzen zu können, ist also gerade das Wissen um die Verteilung, Quantität und Struktur der Siedlungsflächenreserven von grundlegender Bedeutung.

Der im Projekt Raum+ umgesetzte nationale Grenzen überschreitende Ansatz und im speziellen die Einbeziehung eines Schweizer Kantons bei der Erstellung einer Übersicht über Siedlungsflächenpotenziale hat darüber hinaus folgende methodische Hintergründe. Die für das Projekt Raum+ auf Grundlage der Arbeiten in dem Vorgängerprojekte MORO-RESIM entwickele Vorgehensweise kann bei der Anwendung in einem vom deutschen, beziehungsweise baden-württembergischen „Planungssystem“ unterschiedlichen System auf ihre Robustheit getestet werden. Dies gilt einerseits für die Ergebnisse der Erhebungen, andererseits auch für das methodische Vorgehen. Der dezentrale und kooperative Ansatz in der Zusammenarbeit Region/Gemeinde kann hier unter veränderten Rahmenbedingungen getestet werden. Auch hinsichtlich der Bedeutung und der Möglichkeiten der Landesebene ist das Labor „Schweizer Kanton“ von Interesse, da man dieses ja vom räumlichen Zuschnitt mit einer baden-württembergischen Region, von den Kompetenzen her aber auch mit einem deutschen Bundesland vergleichen kann.

Das dazu im Projekt beteiligte Kanton Basel-Landschaft bildet darüber hinaus am Hochrhein zusammen mit den angrenzenden Teilen des Regionalverbandes Hochrhein-Bodensee einen funktional zusammenhängenden Raum, einen Teil der trinationalen Agglomeration Basel. Hierbei sind gerade die Muster der Siedlungsflächenpotenziale und deren räumliche Verteilung über Nationalgrenzen hinweg von großem Interesse, nicht nur für die Forschung, sondern auch für die Arbeit der regionalen Vertreter in diesem Raum.

4 ÜBERSICHTEN ÜBER SIEDLUNGS-FLÄCHENPOTENZIALE IN DEUTSCHLAND UND DER SCHWEIZ

Das derzeit in Deutschland praktizierte Monitoring der Bauleitplanung allein erlaubt die aggregierte Erfassung der Siedlungsflächenentwicklung im Außenbereich. Über die Siedlungs- und Verkehrsfläche samt Unterkategorien wird deutschlandweit auf Gemeindeebene die Neuinanspruchnahme von Fläche für Siedlungszwecke dargestellt. Wie viel Fläche im Bestand umgenutzt wird und welche Reserven im Innern der Städte- und Gemeinden zur Verfügung stehen, ist weder flächenbezogen noch summarisch bekannt. Ein Indikator, der Rückschlüsse auf die Entwicklungen im Bestand zulässt, ist in Deutschland nicht vorhanden.

Grobe Aussagen lassen sich höchstens über die Entwicklung des Wohnungsbestandes und der für Wohnzwecke verbrauchten Siedlungs- und Verkehrsfläche zusammen mit durchschnittlichen Dichtewerten erstellen. Damit kann also in Deutschland hierbei nur über meist sehr unscharfe Abschätzungen argumentiert werden. Aus der Region Frankfurt ist bekannt, dass in den 90ern, die dortige Wohnflächenentwicklung zur Hälfte im Bestand stattgefunden haben muss. In den Regionen Baden-Württembergs wurden bei einer informellen Umfrage Werte zwischen 30 und 60 Prozent genannt.

In der Schweiz gibt es mit der Bauzonenstatistik ein detaillierteres Instrument im Rahmen der Raumbeobachtung zur Ermittlung der Reserven innerhalb der Bauzonen[60] , zu welcher die Kantone gesetzlich verpflichtet sind. Ziel seitens des Schweizer Bundes ist es damit erstmals Mitte 2007 und ab dann im 5-Jahresrythmus die „Bauzonenstatistik Schweiz“ [ARE 2006] herauszugeben.

Unter anderem erfasst im Schweizer Kanton Basel-Landschaft die dortige Raumbeobachtung dazu im 5-Jahres-Rhythmus (erstmals im Jahr 2000) unter anderen alle Flächen der Kommunen, welche noch nicht überbaut sind, aber in den Zonenplänen für eine Bebauung zulässig wären. Dazu erstellt das Kanton Basel-Landschaft in diesem Rahmen eine Übersicht über den „Stand der Überbauung, der Erschliessung und der Baureife gemäss Artikel 31 RPV“ [BL 2006]. Die Grundlage hierfür ist die Raumplanungsverordnung des Bundes vom 28. Juni 2000 (RPV), diese verlangt in Art. 31 Abs. 1 vom Gemeinwesen die Erstellung einer Übersicht über den Stand der Erschliessung.

Folgende Inhalte werden hierbei erwartet[BL 2004]:

- Übersicht über die Erschliessungssituation im Baugebiet
- Übersicht über die baureifen Bauzonenteile
- Übersicht über Bauzonenteile, welche voraussichtlich in fünf Jahren baureif werden
- Verfolgung der baulichen Entwicklung
- Ermittlung der Nutzungsreserven im Baugebiet

In der Umsetzung im Kanton Basel Landschaft werden hierfür folgende Datensätze aufbereitet:

- Stand Erschliessung Wasser, Abwasser, Strasse
- Notwendige Massnahmen Raumplanung (zur Erlangung der Baureife)
- Notwendige Massnahmen Lärmschutz (zur Erlangung der Baureife)
- Notwendige Massnahmen Landumlegung (zur Erlangung der Baureife)
- Zeitliche Planung der Gemeinde zur Erlangung der Baureife
- Stand der Überbauung

Mit diesem Vorgehen liegen also im Kanton Basel Landschaft mit zeitlichen Horizonten versehen für jede Gemeinde des Kantons die baulichen Reserven auf denjenigen Grundstücken vor, die nicht überbaut sind. Jedoch fehlen hierbei diejenigen Siedlungsflächenreserven, die schon überbaut sind, aber brachgefallen, unternutzt sind, beziehungsweise eine Umnutzung möglich ist.

[60] Bauzonen sind die Bereiche innerhalb der Gemeinden in denen Siedlungstätigkeit zugelassen ist. Der dazu zu zugrundeliegende Nutzungsplan (i.d.R. Zonenplan) ist mit der deutschen Bauleitplanung vergleichbar, wobei in der Schweiz parzellenscharfe Festlegung von Art und Maß der Nutzung, sowie die gemeindeweite Definition von Siedlungs- und Nichtsiedlungebieten innerhalb eines Planes, dem Bauzonenplan, geschieht.

Zusammenfassend kann festgehalten werden, dass trotz der existierenden Grundlagen es sowohl in Deutschland, wie auch in der Schweiz schwierig ist, die notwendigen Maßnahmen, insbesondere die Förderpolitik und der Infrastrukturplanung, auf die Anforderungen der inneren Entwicklung der Kommunen vorausschauend abzustimmen. Dazu sind erstens das Entwicklungspotenzial innerhalb der bebauten Gebiete der Kommunen nicht ausreichend bekannt, wie auch eventuelle Hinderungsgründe, warum auf den Flächen im Innenbereich keine Entwicklung möglich ist.

5 DAS PROJEKT RAUM+

5.1 Übersicht über Sieldungsflächenpotenziale

Für die erfolgreiche Entwicklung und Umsetzung einer Strategie [SCHOLL 2005], wie „Innenentwicklung vor Außenentwicklung“ auf kommunaler aber auch auf regionaler und überregionaler Ebene, bedarf es als Grundlage einer Übersicht über die Möglichkeiten für Siedlungsentwicklung im Inneren der Gemeinden und Städte. Die Aufgabe zur Siedlungsentwicklung in den vergangenen Jahrzehnten war im Wesentlichen davon geprägt, neue Siedlungsflächen im Außenbereich zu erschließen, was in der Regel wenigen großen Entwicklungsvorhaben gleich kam. Bei Wechsel Schwerpunktsetzung auf Innenentwicklung ändert sich auch der Maßstab von größeren Vorhaben auf kleinteilige Sammelsurien verschiedener Möglichkeiten und Problemlagen. Dies kann in kleineren Kommunen gegebenenfalls noch „im Kopf“ beherrscht werden, für größere Gemeinden und gerade auf regionaler Ebene, trotz Fokussierung auf „regionale bedeutsame Potenziale“, ist dies nur mit Hilfe lokaler Akteure und eine technisch unterstützten Übersicht, bewältigtbar [VRS 2005].

Daraus ergibt sich der Ansatz, die Übersicht über Siedlungsflächenpotenziale fortschreibungsfähig, dezentral organisiert, dialogorientiert und mit Mehrwert für die Gemeinden zu gestalten. Für die technische Umsetzung der Übersicht bedeutet dies, allgemein verfügbare technische Mittel zu nutzen und möglichst einfache Zugänglichkeit (für die Übersicht notwendigen Akteure, nicht für die Allgemeinheit). Der dialogorientierte Ansatz erfordert darüber hinaus, dass besonderer Wert auf die Vertraulichkeit der Daten gelegt werden muss und für die Nutzung der Plattform auch z.B. Bereiche für Daten geschaffen werden müssen, auf die ausschließlich die Kommune Zugriff hat und je nach Bedarf, auch für Zwecke nutzen kann, die über die Absichten des Projektes hinausgehen.

Für die Erhebung der Potenziale bedeutet dies, dass trotz der dezentralen Organisation der Plattform, direkter Kontakt mit den Verantwortlichen und Planern vor Ort, zumindest für die Ersterhebung, notwendig ist. Dabei ist die Teilnahme von Vertretern der Regionalverbände, bzw. des Kantons wichtig, um dem Termin und auch den Erhebungsergebnissen eine gewisse Verbindlichkeit zu geben, aber auch, um einen informellen Anlass für den Austausch zwischen regionaler Verwaltung und Kommune zu bieten. An dieser Stelle sei darauf hingewiesen, dass gerade in einem insbesondere auf freiwillige Mitarbeit basierenden Ansatz, die sogenannten „weichen Faktoren“ (soft factors) neben der technischen und organisatorischen Umsetzung eine maßgeblich Rolle für das Gelingen des Vorhabens spielen [ELGENDY WILSKE 2006].

Der grundsätzliche Aufbau der Erhebungsplattform und das Vorgehen bei der Erhebung wurde wie schon oben genannt aus dem Projekt MORO-RESIM übernommen und weiterentwickelt. Dies wird im Abschlussbericht zu diesem Projekt ausführlich vertieft [VRS 2005]. Daher soll an dieser Stelle nur auf die Weiterentwicklungen der Methodik im Projekt Raum+ eingegangen werden. Zwei Bereiche konnten dazu als maßgeblich indentifiziert werden:

- verstärkte Einbindung kleinerer Gemeinden in die Erhebungen
- Beurteilung der Potenziale bezüglich ihrer Entwicklungsmöglichkeiten

Eines der Erkenntnisse des Projektes MORO-RESIM war, das sich an den Erhebungen relativ wenige kleine Gemeinden, gerade auch Gemeinden aus eher ländlich geprägten Regionsteilen beteiligt haben. Daraus ergibt sich für das Projekt Raum+ erstens über die Auswahl der Regionen und zweitens auch der Anpassung der Erhebungsmethodik die Aufgabe, gerade auch Kommunen im ländlichen Raum mit einzubeziehen. In diesen Bereichen werden große Reserven [DAHM 2006] für Innenentwicklung erwartet und es ist bezogen auf Baden-Württemberg, abseits der Entwicklungsachsen, auch als erstes mit Bevölkerungsrückgang aufgrund des demographischen Wandels zu rechnen. Daher ist gerade für die Kommunen des ländlichen Raumes eine verstärkte Konzentration auf eine nachhaltige Entwicklung und die Reduzierung der

Flächeninanspruchnahme, von zunehmender Bedeutung. Dazu wurde die Erhebungsmethode in folgenden Punkten angepasst:

- Erhebung von Potenzialen ab einer Größe von 2000m² in kleinen Gemeinden. Im Projekt MORO-RESIM war die Mindestpotenzialsgröße auf 5000m² festgelegt. Diese Festlegung war einer der Gründe, mit denen gerade die kleineren Kommunen Ihren Verzicht auf die Teilnahme am Projekt begründeten. Hierbei sei jedoch bemerkt, dass von den 75 Kommunen (darunter auch kleinere Gemeinden) die im Rahmen von MORO-RESIM in der Region Stuttgart untersucht wurden, nur in einer Gemeinde kein Potenzial in dieser Klasse gefunden werden konnte)
- In sehr kleinen Gemeinden wird den Gemeinden das Angebot gemacht, im Rahmen des Erhebungsgepräch auch mit der Erhebung von Baulücken und Leerständen zu beginnen und die kommunalen Vertreter im Gebrauch der Arbeitsplattform einzuführen.
- Integration der Erfassung von Baulücken, entwicklungsbedingten Leerständen und Nachverdichtungspotenzialen in die Arbeitsplattform). Gerade die Erfassung der entwicklungsbedingten Leerstände ist für Kommunen im ländlichen Raum von großem Interesse, da dies erstens für die Ortskerne ein wachsendes Problem darstellt und zweitens der Nachweis dieser Flächen für Förderproramme für den ländlichen Raum in Baden-Württemberg gefordert wird.

Für die Umsetzung, beziehungsweise die Einschätzung der Entwicklungsfähigkeit ist, neben den das Potenzial beschreibenden Merkmalen (Name, Nutzung, Planungsstand), auch die Einschätzung notwendig, inwiefern das Potenzial für eine weitere Entwicklung zur Verfügung steht, welche Hindernisse und Vorzüge das Potenzial hat und wie das Potenzial insgesamt unter Berücksichtigung der maßgeblichen Merkmale einzuschätzen ist. Dazu wird zu jedem Potenzial eine sogenannte Lagebeurteilung erstellt, in die unter anderem Altlastensituation und Eigentumsverhältnisse erfasst werden. Die bisherigen Erfahrungen zeigen, dass dies im Rahmen der Erhebungsgespräche ohne großen Aufwand möglich ist und verwertbaren Ergebnissen führt. Der derzeitige Projektstand lässt dazu aber noch keine abschließende Bewertung zu.

5.2 Kompetenzzentrum Flächenmanagement

Die Erstellung einer Übersicht über Siedlungsflächenpotenziale kann nur ein Baustein, bzw. das Fundament auf dem Weg zu einem nachhaltigen Flächenmanagement sein. Für die konkrete Aktivierung der Flächenpotenziale in den Städten und Gemeinden bedarf es weiterer Anstrengungen, die Entwicklung zu unterstützen oder anzustoßen. Die Übersicht stellt dabei eine materielle Basis dar, auf welcher belastbare quantitative, wie auch qualitative Argumente für die Arbeit auf der Fach- und Sachebene entwickelt werden können. Diese bilden dann die materielle Basis für einen aktiven Wissenstransfer unter den Beteiligten. Aktuelle Anwendungsbeispiele sind die Zuhilfenahme der Ergebnisse seitens der Kommunen für die, von den Genehmigungsbehörden im Rahmen der Flächennutzungsplanung einzufordernden Gesamtflächenbilanzen. Ein weiterer Anwendungsbereich war der Einsatz der Erhebungsergebnisse als eines von mehreren Kriterien im Rahmen von Teilraumgutachten für eine Schieneninfrastrukturausbaumaßnahme. Dabei ist die Feststellung wichtig, dass die Verwendung der Daten immer nur im Einvernehmen mit der Gemeinde geschieht und geschehen kann.

Es stellt sich also die Frage, in welcher Form Fach- und Beratungskompetenz zu bündeln ist, um nachhaltiges Flächenmanagement in den Gemeinden und Regionen zu verankern. Eine weitere ungeklärte Frage ist, was notwendig ist, um die Fortschreibung einer einmal erstellten Übersicht zu organisieren. Hier setzt das Kompetenzzentrum Flächenmanagement angesiedelt beim Verband Region Stuttgart an, welches aktiv die Fortschreibung der dort schon existierenden Übersicht und den Aufbau von Beratungs- und Unterstützungsangeboten für die Kommunen der Region organisieren soll. Dabei werden verschiedene Vorgehensweisen bei der Fortschreibug getestet, die Möglichkeiten und Anreize bieten sollen, die Übersicht fortzuschreiben. Als ein aktuelles Bespiel sei eine telefonische Betreuung der Kommune bei der Fortschreibung genannt. Eine weitere Aufgabe des Kompetenzzentrums besteht darin, weitere Kommunen zur Teilnahme an dem Projekt und einer Ersterhebung zu gewinnen.

6 SCHLUSSFOLGERUNGEN

Da sich das Projekt Raum+ derzeit noch in der Bearbeitungsphase befindet, ist es für ein abschließendes Fazit sicherlich noch zu früh. Einige Punkte kristallisieren sich aber schon als Ergebnisse heraus. Der Schritt

hin zu einer überregionalen Übersicht über Innenentwicklungspotenziale und damit auch die Möglichkeit des Austausches zu dem Thema über Grenzen hinweg, ist lohnenswert. Dies wird seitens der regionalen Akteure bestätigt.

Die Akzeptanz in den Kommunen und Regionen ist bislang durchaus positiv und es bestätigen sich hierbei die guten Erfahrungen die im Rahmen des Vorgängerprojektes MORO-RESIM gemacht werden konnten.

Das Thema der entwicklungsbedingten schon existierenden und zukünftigen Leerstände bestätigt sich gerade in den ländlich geprägten kleineren Kommunen als derzeit sehr aktuelles Thema und ist meist schon stärker im Fokus und auf der Agenda der lokalen Verantwortlichen, als es das Thema „Innenentwicklung vor Außenentwicklung“ ist.

Die bisherigen Erhebungen im Kanton Basel-Landschaft bestätigen die Vermutung, dass es nennenswerte Siedlungsflächenpotenziale in den Gemeinden gibt, die mit dem bisherigen Vorgehen der Ermittlung der Bauzonenreserven noch nicht erfasst wurden. Die größeren Kompetenzen einer kantonalen Verwaltung im Vergleich zu denen eines deutschen Regionalverbandes scheinen die Überzeugung der Gemeinden für eine Mitwirkung an dem Projekt einfacher zu gestalten. Gegebenenfalls spielt hier aber auch der Umstand eine Rolle, dass über die auf Schweizer Bundesebene fest verankerte Raumbeobachtung und die Erfahrungen der Zusammenarbeit Kanton mit Kommune bei den dazu notwendigen Erhebungen, schon eine eingespielte Zusammenarbeit in diesem Themenbereich existiert.

Über die Kooperation von Ministerien, Regionen und Hochschulen, sowie die Einbindung der Kommunen ist der notwendige Austausch zwischen maßgeblichen Ebenen im Rahmen des Projektes angelegt. Damit besteht auch ein Korrektiv und ständige kritische Hinterfragung der Vorgehensweise und der Ergebnisse. Dies hat sich im Projektverlauf bislang sehr gut bewährt.

Die Ergebnisse des Projektes sollen Ende 2008 vorliegen, weitere Informationen können unter www.raum-plus.info abgerufen werden.

7 LITERATURVERZEICHNIS

ARE 1996: Amt für Raumentwicklung, Strategien der Raumordnung Schweiz, 1996

ARE 2007: Amt für Raumentwicklung, http://www.are.admin.ch/themen/raumplanung/00246/00451/02323/index.html?lang=de , Abruf April 2007

BL 2004: Amt für Raumplanung des Kantons Basel-Landschaft; ANLEITUNG ZUR ERHEBUNG DER ÜBERSICHT ÜBER DIE ÜBERBAUUNG, DIE ERSCHLIESSUNG UND DIE BAUREIFE NACH ART. 31 RPV, 2004

BL 2007: Amt für Raumplanung des Kantons Basel-Landschaft, http://www.baselland.ch/docs/bud/arp/daten/ueberbauung /ueberbauung.htm, Abruf April 2007

BUND 2006.: Deutsche Bundesregierung, Fortschrittsbericht 2004 Perspektiven für Deutschland, 2004

BUND 2006: Deutsche Bundesregierung, Fortschrittsbericht 2004 Perspektiven für Deutschland, 2004

DAHM 2006: Dahm, Susanne; Bau- und Wohnflächenreserven in kleinen Kommunen Baden-Württembergs - Innenentwicklungspotenziale vor dem Hintergrund einer sich ändernden Bevölkerungsstruktur, Dissertation

EIDG 2006: Bundesbehörden der Schweizerischen Eidgenossenschaft, Bundesgesetz über die Raumplanung, Artikel 1, 2006

ELGENDY WILSKE 2006: Elgendy, Hany; Wilske, Sebastian: The role of soft-factors in the success of collaborative planning information systems. in: Schenk, Manfred (Hg.): CORP 2006. Sustainable Solutions for the Information Society (Tagungsband).

SCHOLL 2005: Scholl, Bernd in Akademie für Raumforschung und Landesplanung (Hg.), Handbuch der Raumordnung, 2005

VRS 2005: Wilske, Sebastian; Scholl, Bernd; Vallée, Dirk; Elgendy, Hany; Seidemann, Dirk; Schön, Ulrich in Verband Region Stuttgart (Hg.): Nachhaltiges Regionales Siedlungsflächenmanagement S.43 ,2005

🏆 *reviewed paper*

Die Organisation der architektonischen und dynamischen Stadt
Ansatz für eine hierarchische Konfiguration von Raum

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Zusammenfassung

In diesem Beitrag wird die Begrifflichkeit der Hierarchie als ein Grundbaustein städtebaulicher Organisation und dynamischer Prozesse einer Stadt dargestellt und erläutert. Verschiedenste Ansätze und Ausformulierungen wie topologische, planerische Hierarchien werden identifiziert und anhand des Beispiels Wien eingehender besprochen. Eine schlüssige urbane Hierarchie unterstützt Funktionalität im Sinne von Fortbewegung und Erreichbarkeit qualitativ und impliziert Effizienz- und Optimierungssteigerung für städtebauliche Systeme.

1 EINLEITUNG

In der Architektur werden Beziehungen zwischen physischen Elementen kreiert. Urbane Architektur ist eine Komposition von Beziehungsgeflechten dichter, weniger dichter und separaten Räumen (vgl. Franck). Die Grundlage dieser räumlichen Zusammenhänge stellt die „räumliche Natur“ von Städten dar, die sich aus Gebäuden und Bewegungskanälen konstituiert. Das Wesen von Räumen (z.B der Aspekt der Zentralität und Zugänglichkeit) wird unter anderem durch ihre Konfiguration[61] , also ihre architektonische Organisation diverser Räume zueinander bestimmt. Organisation ist somit als ein Überbegriff dieser Attribute ein wesentlicher Grundbaustein eines urbanen Gefüges. Neben einer weitreichenden Anzahl von Einflussfaktoren wird die Organisation von Raum durch ein geometrisches Muster bestimmt (Hillier, Batty, Salingaros et al.).

Etymologisch leitet sich der Terminus „Organisation“ vom griechischen „organon“ bzw. lateinischen „organum“, Werkzeug, Instrument (Kluge 2002, 670) ab. Am treffensten lässt sich Organisation im modernen Sprachgebrauch mit „Bewerkstelligung“ übersetzten und verweist auf die Planung und Durchführung eines Vorhabens (Wikipedia, 2007). Die Begrifflichkeit kann nun in zwei zeitliche Richtungen interpretiert werden. Erstens, als ein in der Zukunft lokalisiertes Plaungsvorhaben einer Intension und zweitens, als eine im Präsens lokalisierte Darstellung eines Zustandes, also einer in der Vergangenheit liegenden Durchführung. Enstehen, Bestehen und Funktionsweise, die auch die Kernpunkte von Organisationstheorien sind, führt zu einer Fragestellung bezüglich urbanen Raum:

Wie ist der urbane Raum organisiert?

2 HIERARCHISCHE KONFIGURATION

Die eingangs erwähnte geometrische Anordnung von dicht gepackten und anderseits getrennten Räumlichkeiten wird durch ein System von Stapelung und einem hierarchisches System der Erschließung bewerkstelligt. Jeder Raum liegt einem anderen an, der ihn erschließt, und jeder Raum erschließt wieder andere Räume. Die Haustür erschließt den Fußgängersteig, der wiederum die Anliegerstraße erschließt und diese die Durchgangsstraße. In letzter urbaner Konsequenz erschließt die Stadtautobahn die überregionale Autobahn zu anderen Städten oder aber auch zum Flughafen, der als urbaner Nullpunkt gesehen werden kann.

Das Schema von erschließenden und erschlossenen Räumen wiederholt sich auf allen Ebenen der Maßstäblichkeit. Es wiederholt sich in soweit gehendem Maße, dass es als fraktale Struktur angesprochen werden kann. Es ist ein Schema, das sich selbst organisiert und überall dort exisitiert, wo viele Menschen auf

[61] Hillier definiert die räumliche Konfiguration (spatial configuration) als ein Set von Beziehungen, in denen jede räumliche Beziehung durch ihre Beziehung zu allen anderen Räumen bestimmt ist. Räumliche Beziehung wird durch die simultane Ko-Präsenz of zumindest eines dritten Elements und allen anderen möglichen Elementen eines Komplex bestimmt (Hillier, 1996). Space Syntax ist eine Theorie und Methode für eine quantitative Beschreibung von Mustern eines räumlichen Aufbaus und setzt diese Muster in Beziehung zu sozialen Aktivitäten wie Bewegung, Verhalten und auch sozialen Bedeutungen und Interpretationen (Parra, 2003).

engem Raum miteinander leben. Es strukturiert den Raum in historisch gewachsenen Städten ebenso, wie in syntetisch geplanten (Franck, 2005, 145f).

Die Organisation von urbanen Raum ist nicht nur eine Kaskade von Öffentlich zu Privat, sondern lässt sich in folgende hierarchische Aspekte einteilen:

- Topologische Hierarchie – Zentralität & Peripherie
- Hierarchie durch Auswahl der Routen – flow pattern
- Geplannte Hierarchie der Bewegungskanäle
- Fraktale Hierarchie[62]

2.1 Zugänglichkeit als Eigenschaft einer topologischen Zentralitäts-Hierarchie

Zugänglichkeit wird in zwei unterschiedlichen Bereichen verwendet: Als eine detailierte Planungscharakteristik eines Transportsystems, das auch die Nutzung für behinderte Menschen ermöglicht; weiters auf einer generalisierten strategischen Ebene, um die Leichtigkeit der Erreichbarkeit eines Gefüges von zu Hause aus zu beschreiben. Allgemeine Erreichbarkeit integriert beide Möglichkeiten.

Folgende Kernfrage stellt sich: Können Menschen bestimmte Zielorte mit angemessenen Kosten, in angemessener Zeit und mit angemessener Leichtigkeit erreichen? Diese Eigenschaften vereinen urbane Zentren, da ihre Zentralität in sehr hohem Maße vorhanden ist. Die Fortbewegung innerhalb zentraler Orte ist aufgrund ihrer Raumkonfiguration sehr effizienz. Sie implizieren zudem parallel ein Gefälle zwischen „zentral“ und „peripher“.

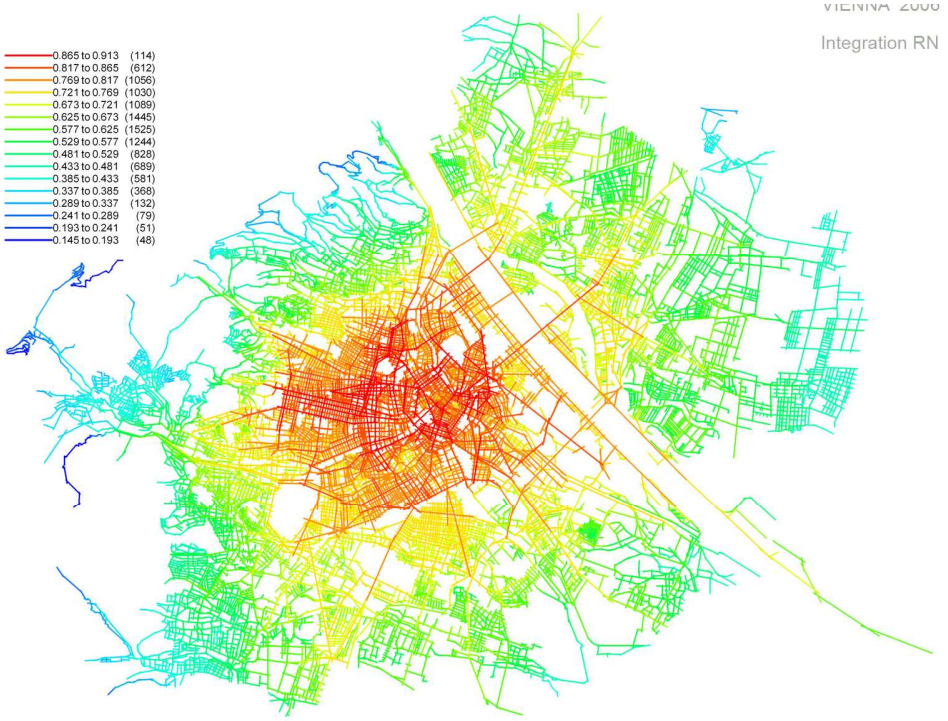

Abb.1: Space Syntax, Integration RN: Wien 2006. Die höchste Zentralität ist rot dargestellt.

Die Grafik Integration RN zeigt eine Analyse der Stadtstruktur Wiens[63] mit der Space Syntax Methodik von Bill Hillier, University College of London. Integration RN (Radius Infinity) ermöglicht die Messung einer

[62] Die fraktale Hierarchie ist ein wesentlicher Aspekt in der urbanen Organisation. In diesem Beitrag liegt der Fokus in der Space Syntax Methodik; aus Gründen der Vollständigkeit ist die fraktale Hierarchie aufgelistet. Für eine intensivere Auseinandersetzung mit der Thematik siehe Michael Batty, Pierre Frankhauser.

„relativen“ Zugänglichkeit von Raum und ist zudem ein Indikator für die zentralsten Orte innerhalb eines Systems. Integration ist in diesem Maße relativiert worden, um verschieden große Systeme miteinander direkt vergleichen zu können, z.B. New York/ Tokyo (vgl. Hillier and Hanson, 1984). Die Analyse zeigt deutlich, dass das historische Zentrum Wiens gleichzeitig das Zentrum einer guten Zugänglichkeit darstellt. Weiters erkennt man als gut zugängliche Orte die ehemaligen Vororte Wiens ab dem Wien Fluß (Naschmarktgebiet). Eine hohe Zugänglichkeit laut Analyse besitzen auch Teile des 16. Wiener Bezirks. Dies lässt sich durch den streng gebauten Raster erklären. Ein Raster besitzt die höchste Konzentation in der Korrelation von Achsenlängen und Überschneidungen von Straßen in Form von durchgehenden Linien und wird somit in der Analyse höher bewertet.

Was bedeutet das Zentrum einer urbanen Siedlung?

Prinzipiell ist es eine Konzentration und Mischung von Landnutzung und Aktivitäten in einer prominenten Lokation. Zu jeder Zeit ist in einer Stadt sehr klar, was als Zentrum definiert wird und wo seine Grenzen liegen. Der Versuch immer wieder Zentren zu revitalisieren hat gezeigt, dass es wenig Wissen über den Prozess, wie Zentren sich generieren und sich erhalten, existiert. Historisch ist klar, dass Zentren nicht nur wachsen, sondern auch schrumpfen, sich verschieben, verändern und mit dem Wachstum zu großen urbanen Strukturen eine ganze Hierarchie von Zentren und Sub-Zentren entsteht. Die Herausforderung besteht darin, Zentralität als einen Prozess, und nicht als einen Zustand zu beschreiben.

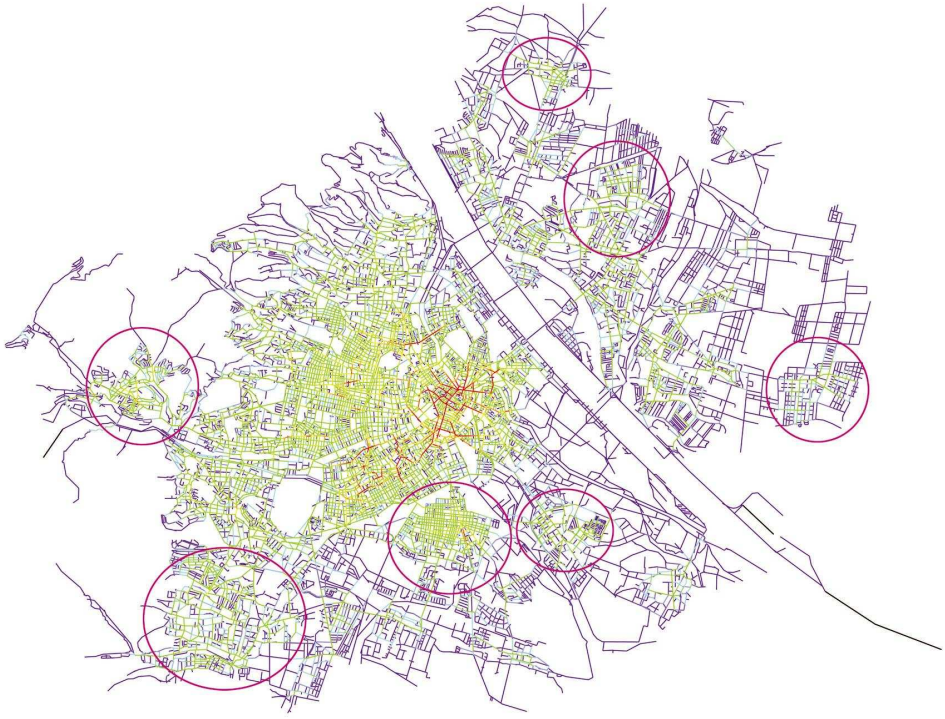

Abb.2: Angular Analysis – Choice: Wien 2006. Die Kreise zeigen die Subzentren an.

Der tägliche Prozess von Routenwahl, räumlicher Konfiguration - die eine gute Zugänglichkeit unterstützen kann - und der Anschlussfähigkeit beeinflussen die Flächennutzungslokationen und deren Wahl, sowie die Entwicklung von Arealen als „Attraktoren“ in einem urbanen Gefüge als Ganzes. Sozioökonomie unterstützt beim Aufbau.

Der erste Eindruck vermittelt das Verstehen von Zentralität als unproblematisch. Räumliche und funktionale Aspekte ersheinen klar und stabil. Ein historisches Zentrum mit einem Markt als zentraler Platz und dessen dichte Umraumaktivitäten erscheinen als zentral. In nächster Konsequenz ist dieses funktionale Zentrum

[63] Wie bei allen räumlichen Betrachtungen stellt sich auch hier die Frage der Systemabgrenzung bei einer analytischen Untersuchung eines Stadtsystems. Da Wien eine monozentrale Stadt ist, spiegeln die Verwaltungsgrenzen die räumliche Verteilung zu einem hohen Maße wieder. Dennoch darf nicht außer Acht gelassen werden, dass sich zunehmend Sub- und Nebenzentren am Stadtrand bzw. außerhalb Wiens bilden.

zugleich ein „live centre“ [64] des Handels. Eine Mischung mit ruhigeren Administrationszonen, Religion, etc. in näherer Umgebung kann das Zentrum in seinen Grenzen definieren und bilden die verschiedenen Funktionen in der Lokation ab, wie am Bsp. Londons.

Wird der Zeitfaktor miteinbezogen wird, so ist ein Zentrum weder klar noch stabil und die Grenzen bleiben mehr oder weniger über lange Zeiträume erhalten, expandieren oder verschieben ihr Zentrum.

Zentrumsverschiebungen können sich auch durch das Wachstum und der Herausbildung von Sub-Zentren ergeben, die wiederum eine Umverteilung von Funktions-Spefikationen mit sich zieht. Durch die Entwicklung verschiedenster Sub-Zentren-Größen und -Funktionen unterliegen sie implizit einer hierarchischen Einteilung von Zentralität und Zugänglichkeit.

So können Stadtzentren als Komplexe von unabhängigen Einrichtungen gesehen werden, die je nach Bedarf aufgesucht werden. Es muss nun möglich sein jede Einrichtung schnell und leicht zu erreichen, um eine gut funktionierende „Inter-Accessibility“ (Space Syntax Ltd.) zu erlangen, die den Grad an Effizienz bestimmt. Eine Maximierung der Zugänglichkeit zu den verschiedensten Einrichtungen wird ermöglicht. Dies ist die Vorraussetzung für ein gut funktionierendes System: Das Vorhandensein von Suche, Erkundung und Finden. Die Basisvoraussetzung für die vorangegangene Prämisse ist, dass eine leichte Route für diese Interaktionen vorhanden sein muß, egal ob die gleiche Route hin- und retour genommen, oder aber auf eine andere zugegriffen wird.

Auch im städtebaulichen Muster eines Zentrums sollten sich die Zugangsmöglichen reflektieren. Egal, von welcher Richtung man sich dem Zentrum nähert, soll es eine klare Zugänglichkeit und Durchlässigkeit besitzen. Der Effekt ist, dass Zentren sich oft entlang vorrangiger Routen entwickeln.

Aus der räumlichen Sicht scheint es, als ob Zentralität ein Produkt aus einer generellen Raumkonfiguration des Straßenrasters ist, der mitentscheidet, wo sich ein Zentrum konstituiert und den lokalen Prozessen hinsichtlich der Adaption des Rasters mit einer zusätzlichen Intensivierung durch z.B. Handel unterstützt.

Die topologische Hierarchie bildet sich über den Zugänglichkeitsaspekt ab. Die räumlichen Beziehungen zwischen Zentrum und Peripherie, Subzentren untereinander, als auch eine Kombination aus allen Teilbereichen ist die Ausformulierung dessen.

2.2 Hierarchie durch Auswahl der Routen – flow pattern

Die Routenwahl - nicht nur zu einem Zentrum hin oder innerhalb eines Zentrums - spielt eine Rolle für die Effizienz der Bewegungsstruktur innerhalb einer urbanen Struktur. Das Wissen um die Vorgänge zur Wahl einer Route ist in verkehrstechnischer Hinsicht ein wesentlicher Faktor, um die Kaskade der Straßen für eine Präferenz von Routen innerhalb eines Systems mit einem Masterplan in Einklang zu bringen und unterstützend zu den Netzbelastungsmodellen zu agieren.

Die Idee der Routenwahl pointiert Lynch (1960), indem er die Straßen als Verbindungen zwischen Landmarken deklariert und diese wiederum eine reale oder imaginäre Linie inklusive Abweichungen in dieser Richtung definieren. Straßenindikatoren sind Kreuzungen, also Schnittstellen, die als Punkt der Entscheidung, ob eine Straße als durchgehender Pfad angesehen wird oder nicht, unabhängig von Abweichungen und Kurven, gewählt oder nicht gewählt wird.

Neben der Adaption der Kontinuität hat das kognitive Wissen eines Netzwerkes entscheidenden Einfluss in der Wahl der Route. Für eine Fahrt quer durch die Stadt, werden Hauptstraßen als durchgehende Straßen kognitiv memoriert; bei einer Route innerhalb eines Areals wird diese in kleinem Maßstab bereitgestellt werden. Die Kenntnis eines Netzwerkes beeinflusst zudem auch die Entscheidung zwischen kürzester Euklidischer Länge und Weg mit den geringsten Winkel-abweichungen. Der Einheimische wird die Euklidische Distanz aufgrund des besseren Wissens wählen, der Tourist jene mit den geringsten Winkelabweichungen (vgl. Turner). Auch wenn die persönlich kognitive Karte des Netzbenutzers die Wahl der Route entscheidet, so werden immer wieder Entscheidungen in situ aufgrund von Verkehrsverhältnissen wie z.B. Stau getroffen, die die Route abändern. Fazit, die kognitive Distanz ist inkonsistent.

Als generelle Regelung kann zusammengefasst werden, dass Leute einen Pfad als kürzer empfinden, je weniger Abweichungen er besitzt, auch wenn die physische Distanz länger ist (vgl. Turner). Hillier betont,

[64] Bill Hilliers „Live Centrality“ vereint die Elemente von Zentralität, welche durch Handel, Märkte, Entertainment und anderen Aktivitäten geprägt ist und durch ein hohes Bewegungspotential in einem Gebiet profitieren.

dass Leute mit einem geometrisch-mentalen Modus von Distanzen navigieren, er nennt dies auch den „architectural mode“. Dieser hat einen bedeutenden Einfluss auf das Design von Städten.

Lynchs Idee der Kontinuität korreliert mit der „Angular Analysis“ von Turner und Dalton. Im Feld der Space Syntax Analyse kennt man die Methodik auch als „Betweeness Centrality“. „Angular Analysis“ ist ein gewichteter Graph um syntaktische Metrik zu kalkulieren. Es ist die Vorhersage von Bewegung durch und Besetztung (Quelle und Ziel) von Raum. Angular Analysis in From der Analysemethode „Choice“ von Space Syntax quantifiziert wie wahrscheinlich der gewählte Raum Teil einer Route von Ursprung zu Ziel sein wird, unter Betrachtung aller möglichen Kombinationen innerhalb eines Systems.

Formal gewichtet die „Angular Analysis“ jeden j-graph[65] durch einen Winkel jeder Verbindung eines Linienpaares. Linien, die in der Mitte „auseinandergeschnitten“ sind, haben keinen Einfluss auf das Ergebnis, da die zwei entstandenen Segmente den totalen Winkel der gesamten Linie nicht ändern. Das Ergebnis bleibt gleich.

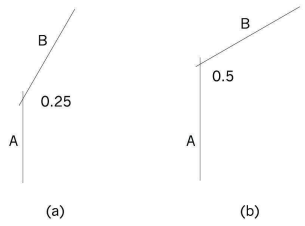

Figure 1: (a) A connection joining two axial lines at 30° to each other is weighted by 0.25
(b) A connection at 60° is weighted by 0.5

Abb.3: (a) Eine Verbindung zwischen zwei Linien in einem Winkel von 30 ° ist durch den Faktor 0,25 gewichtet (b) Eine verbindung von 60° durch den Faktor 0,5. (Turner, 2001)

Abb.5: Flow Pattern: Angular Analysis Choice N: Wien 2006. Die rot dargestellten Routen zeigen die vorrangige Wahl.

2.3 Geplante Hierarchie der Bewegungskanäle

Um keine frei gewählte Definition zu nehmen, wurde der Versuch gestartet sich möglichst genau an Vorschriften bzw. Richtlinien bzgl. Straßendefinitionen zu halten. Erklärungen der Begriffsinhalte der

[65] In der Space Syntax Theorie wird der j-graph oder auch „justified graph“ verwendet, um Beziehungen zwischen räumlichen Elementen visuell darzustellen. Individuelle Elemente werden durch Knoten dargestellt, die Beziehung zwischen den Elementen durch Linien, die die Knoten verbinden. Siehe Hillier, 1996.

einzelnen Straßenkategorien sind jedoch nicht speziell für Wien vorhanden. Die vorhandenen Zuordnungen der Begrifflichkeiten, z.B. Sammelstraße, sind für eine hierarchische Strukturierung und Bearbeitung des Wiener Straßennetzes nicht ausreichend. In der Wiener Bauordnung gibt es keine genaue inhaltliche Definition hinsichtlich der Straßentypologien. Im Gegensatz dazu definiert die NÖBO in §71, Absatz 1-6, [Regelung der Verkehrserschließung] die einzelnen Straßentypen.

Für das Straßennetz der Stadt Wien existieren zwei allgemeine Vorschriften, die eine Einteilung für Stadtstraßen in Wien vornehmen. Diese sind:

- „Richtlinien und Vorschriften für das Straßenwesen“ (RVS), RVS Stadtstraßen 03.04.12
- „Verordnung des Gemeinderats betreffend Feststellung der Hauptstraßen und Nebenstraßen“ - V 001/115

Die RVS gilt für das Straßennetz des gesamten Bundesgebietes, während die „Verordnung des Gemeinderats betreffend Feststellung der Hauptstraßen und Nebenstraßen“ ausschließlich für das Bundesland Wien gültig ist.

In der RVS existieren zwei Tabellen hinsichtlich der Unterteilung der Innerortsstrassen:

- einerseits durch maßgebliche räumliche Funktionen und
- andererseits durch zulässige Höchstgeschwindigkeit in Kombination mit Verkehrsorganisation für den Längsverkehr

Im Gegensatz dazu macht die Verordnung des Gemeinderates eine eindeutige Zuordnung der Straßen (MIV, ÖV, Fußgängerzonen) über deren Straßennamen. Sie werden in die Kategorien Hauptstraße A, Hauptstraßen B und Nebenstraßen, welche alle anderen Straßen sind, eingeteilt. Diese legt fesst, dass der Gemeinderat unter Bedachtnahme auf die Bedeutung und Funktion der Straßen im gesamten Straßennetz der Stadt durch Verordnung festzulegen hat, welche Straßen als Hauptstraßen A, Hauptstraßen B und Nebenstraßen gelten. Die Hauptstraßen werden namentlich in der Anlage 1 + 2 der oben genannten Verordnung aufgelistet. Zusätzlich werden als Nebenstraßen alle übrigen Straßen deklariert.

Jedoch existiert für die Gemeinde Wien keine allgemein gültigen Definitionen für die einzelnen Straßenkategorien. Es gibt weder für die Begriffe Haupt- und Nebenstraßen eine Definition; noch werden die Typen Durchgangs-, Sammel- und Anliegerstraßen im Sinne einer inhaltlichen Erklärung überhaupt erwähnt.

Die Magistratsabteilung MA 18 „Stadtentwicklung und Stadtplanung" der Stadt Wien schlägt folgende Definition für Hauptstraßen A und Hauptstraßen B vor. Diese haben nur Erläuterungscharakter und sind keine allgemein gültige Definition im Vergleich zur Regelung der Verkehrserschließung der NÖ Bauordnung.

- Hauptstraßen A: Die „Hauptstrassen A“ sind Gemeindestraßen mit besonderer Bedeutung und werden nach verschiedenen Kriterien beurteilt (z.B.Verkehrsbelastung, Vorrangstraßen, keine-Tempo-30-Zonen, etc.).
- Hauptstraßen B: Im Rahmen der Verlängerung der Bundesstraßen wurden im April 2002 mit Ausnahme der Autobahnen und Schnellstraßen sämtliche Bundesstraßen an das jeweilige Bundesland übertragen. Diese ehemaligen Bundesstraßen werden nun als Hauptstraßen B bezeichnet und haben den Status einer Gemeindestraße, allerdings mit erhöhter Verkehrsbedeutung.

Die RVS umgeht eine Erklärung der Begriffsinhalte von Straßentypen, indem sie entweder über die Funktion oder über die Geschwindigkeit eine Zuordnung trifft. Auch hier wird keine eigene Definition für Straßentypen angeführt.

Es ist zu erkennen, dass die Verordnung und die RVS-Richtlinien nicht kompartibel sind. Dies zeigt sich am Beispiel der Quellestraße, 1100 Wien, die namentlich im Anhang der „Verordnung des Gemeinderats betreffend Feststellung der Hauptstraßen und Nebenstraßen“ als Hauptstraße A angeführt wird. Bei Hauptstraßen sieht die RVS eine Verkehrsorganisation vor, die PKW und Fahrradverkehr trennt. Bei der Quellenstraße ist keinerlei bauliche Trennung diesbezüglich gegeben und in Zukunft geplant. Fahrradverkehr wird über die Gudrunstraße geleitet (Stand 2006).

Wie können nun die Wiener Straßen genauer differenziert und eine eindeutige Zuordnung vorgenommen werden?

Anhand der für Wien maßgenlichen Publikationen wird im folgenden eine Strukturierung vorgenommen, um das übergeordnete und untergeordnete Straßenverkehrsnetz in Zusammenhang zu bringen und ein schlüssiges System – angefangen von der Durchleitung über die Verbindung, Sammlung und Erschließung der einzelnen Straßen zueinander (Wechselwirkung) darzustellen. Die Kategorisierung laut Verordnung des Gemeinderats betreffend Feststellung der Hauptstraßen und Nebenstraßen bildet dabei die übergeordnete Struktur.

Zum Zwecke einer genaueren Differenzierung werden beide maßgebliche RVS-Tabellen miteinander kombiniert, um nicht nur topologisch, sondern auch über den Geschwindigkeitsparameter zu agieren, der maßgeblich für die Nutzung und Funktion der Straße ist. Wichtige Parameter für Straßen sind Geschwindigkeit und Verkehrsaufkommen.

Strassenhierarchie:

In Bedachtnahme hinsichtlich einer Generalisierung der geplanten Straßenhierarchie, muß nun der Verkehr in seine einzelnen Verkehrsteilnehmer unterteilt werden: motorisierter Individualverkehr (MIV), öffentlicher Verkehr (ÖV), Fahrradfahrer und Fußgänger.

Wesentlich für den Raumverbrauch beim Straßenquerschnitt sind MIV und ÖV. Der Fußgängerverkehr kann vernachlässigt werden, da jeder Straßentypus (abgesehen von der Hochleistungsstraße) immer einen Gehsteig integriert hat. Die durch Fußverkehr gestreuten Hauptachsen sind sehr dünn gesiedelt und aus diesem Grund vernachlässigbar. Auch Parkplätze werden vernachlässigt, da diese entweder als Quer- oder Längsparker individuell in jedem Quartier entschieden werden. Zudem ist der unterschiedliche Platzverbrauch zwischen Quer- und Längsparker immens. Beholfen wird sich in der Stadt durch die Bauordnung, die für jede neu gebaute Wohnung einen Garagenparkplatz vorschreibt. Fahrradfahrer können in den Fließverkehr integriert werden.

Daraus ergibt sich folgendes Diagramm für den motorisierten Individualverkehr (MIV):

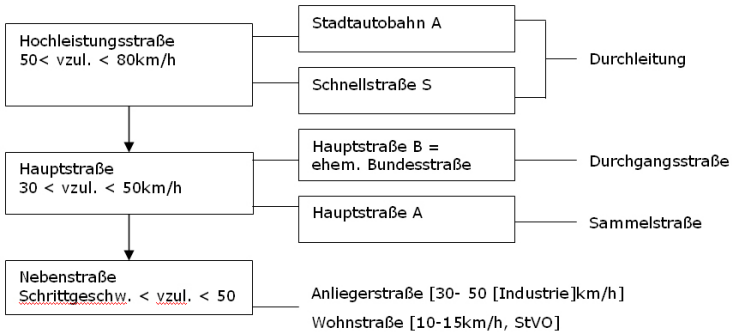

Abb.6: Kaskade des motorisierten Individualverkehrs

Im Wiener Straßennetz findet man alle Straßentypen, wie im Diagramm dargestellt, vor. Die Fußgängerzone [10-15km/h] ist gesondert zu behandeln. Meistens ist sie eine Geschäftsstraße, die sich hierarchisch als Sammelstraße darstellt, siehe z.B: Kärntner Straße, Favoritenstraße, Mariahilfer Straße.

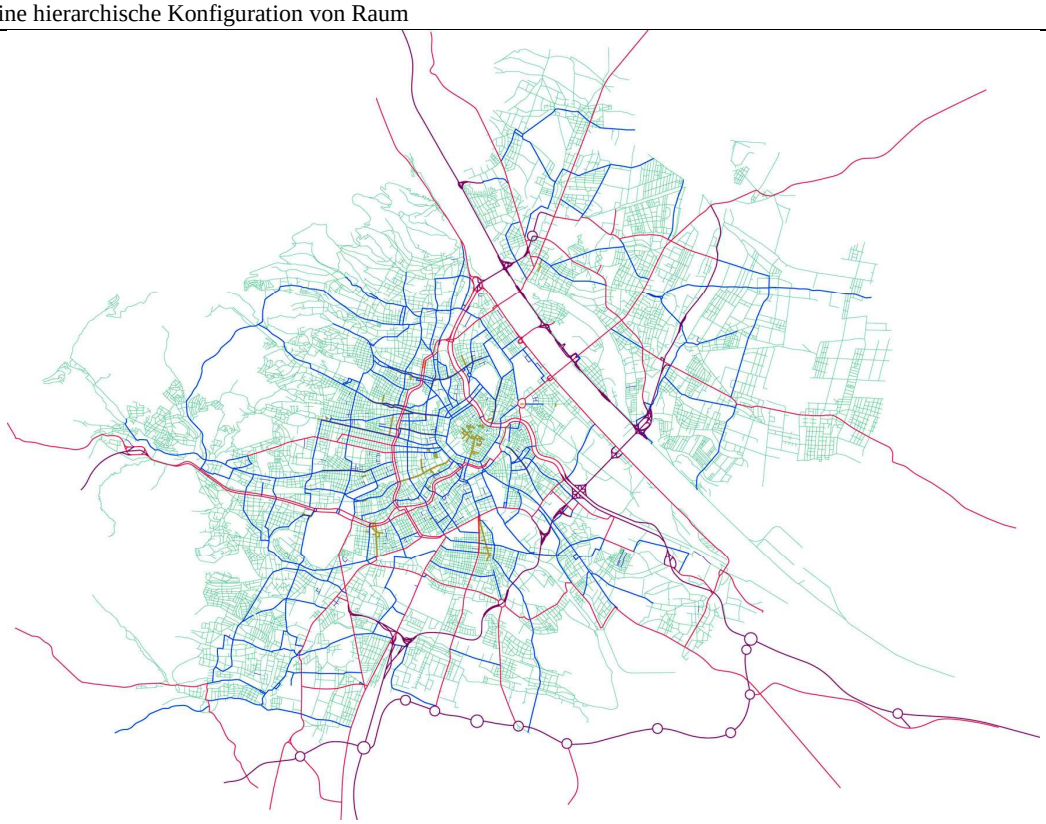

Abb.7: Geplante Straßenhierarchie: Visualisierung des Diagramms für MIV, Wien 2006

3 KONKLUSION & FORSCHUNGSAUSBLICK

Ein schlüssiges hierarchisches Gefüge von erschließenden und erschlossenen Räumen ergibt eine schlüssige Funktionalität. Dort, wo diese Kaskade unterbrochen wird, treten Nutzungsprobleme durch die verschiedenen Verkehrsteilnehmer auf.

Die weiterführende Forschungsarbeit untersucht auf Basis der dargestellten hierarchischen Gliederung noch folgende Struktur-Funktions-Modelle:

- Korrelation von topologischer, geplannter, fraktaler Hierarchie und Routenwahl
- Korrelation mit sozioökonomischen Daten
- Korrelation der Analysen mit Netzbelastungsmodellen

4 BIBLIOGRAPHIE:

[1] Batty, Michael, Paul, Longley, Fractal Cities, Academic Press, London, 1994
[2] Franck, Georg, Werben und Überwachen in: Bild-Raum-Kontrolle. Viedeoüberwachung als Zeichen gesellschaftlichen Wandels, Hrsg. Leon Hempel & Körg Metelman, Frankfurt/Main, Suhrkamp, 2005, S.141-155
[3] Hillier, Bill, Space is the machine. A configurational theory of architecture. Cambridge University Press, Cambridge, 1996
[4] Hillier, Bill, The art and the science of space, World Architecture, 11/ 2005, 185, Bejiing, Special Issue on Space Syntax, pp24-34 in Chinese, pp96-102 in English
[5] Hillier, Bill, Julienne Hanson, The social logic of space, Cambridge University Press, Cambridge, 1984
[6] Kluge, Etymologisches Wörterbuch der deutschen Sprache, 24.Auflage, Walter de Gruyter, Berlin/New York, 2002s
[7] Lynch, Kevin, The Image of the City, M.I.T Press & Harvard University Press, Cambridge, 1960. Übersetzung ins Deutsche: Das Bild der Stadt, Übersetzer: Henni Korssakoff-Schröder und Richard Michael, 2.Auflage, Basel/ Boston/Berlin, Birkhäuser Verlag, 2001
[8] Salingaros, Nikos, Principles of Urban Structure, Faculty of Architecture, Delft University of Technology, Techne Press, Amsterdam, 2005
[9] Space Syntax Ltd., Urban Form & Transport, Intranet, retrieved Oct.2006
[10] Turner, Alasdair, 3rd International Symposium on Space Syntax, Georgia Institute of Technology, 7-11 May, 2001
[11] Richtlinien & Vorschriften dür das Straßenwesen, Stadtstraßen 03.04.12

[12] Verordnung des Gemeinderats betreffend Feststellung der Haupt- und Nebenstraßen – V001/115 vom 12.5.2005, Amtsblatt 19/2005, gemäß §103 Abs. WStV [Wiener Strassenverordnung], LGBl. für Wien Nr. 28/1968 idF. 18/02
[13] Niederösterreichische Bauordnung in der Fassung von 1996
[14] LGBl für Wien Nr. 28/1968 idF 18/02, §103 Abs.2(2)
[15] www.magwien.gv.at/stadtentwicklung/bundesstrassen/hauptstrassen.html, 13.6.2006
[16] Wikipedia, www.wikipedia.org, 1.3.2007

Abbildungen:

[Abb.3] Turner, Alasdair, 3rd International Symposium on Space Syntax, Georgia Institute of Technology, 7-11 May, 2001, 2.
[Abb.] Wenn nicht anders angegeben, so sind die in diesem Beitrag eingearbeiteten Abbildungen von der Autorin CC berechnet und visualisiert bzw. erstellt worden. Als Grundlage der Berechnungen der Abb. 1,2,5,7 dienten die Pläne des Magistrats MA 18, Stadtentwicklung und Stadtplanung, Wien 2006.

🏆 *reviewed paper*

Rauminformationssystem Steiermark (Raum|IS)

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1 EINLEITUNG – AUSGANGSLAGE

Bis zum Jahr 2004 stand in der Steiermark kein einheitliches Rauminformationssystem zur Verfügung. Die vorhandenen analogen und digitalen Planungsgrundlagen waren nicht einheitlich und systematisch verwaltet, eine gemeinsame Betrachtung aller für ein Gebiet relevanten (Geo-)Daten war nur mit Expertenwissen und sehr aufwendig möglich.

Entsprechend der im Land Steiermark vorliegenden Konzeptionen und Überlegungen wurde vom Österreichischen Institut für Raumplanung (ÖIR) bzw. der ÖIR-Informationsdienste GmbH (ÖIR-I:D:) im Auftrag der Abteilung 16 – Landes- und Gemeindeentwicklung (überörtliche Raumplanung) auf Basis der vorhandenen Elemente ein Analyse-, Monitoring, Berichts- und Präsentationsinstrument für raumbezogene Fragestellungen in Verwaltung und Politik entwickelt und in der Projektendphase (z.T. gemeinsam mit der FA1B-Informationstechnik) implementiert.

Das System bildet die Basis für eine effiziente laufende Raumbeobachtung und wurde so konzipiert, dass es über fachliche und thematische Zugangsbeschränkungen sowohl für den internen Gebrauch als auch über Internet der interessierten Öffentlichkeit zur Verfügung steht.

„Ein Rauminformationssystem ist ein Instrument zur Entscheidungsfindung sowie ein Hilfsmittel für Planung und Entwicklung. Es besteht aus einer Datensammlung zur Bevölkerungs-, Wirtschafts- und Siedlungsentwicklung, zum Infrastrukturausbau, zur Flächennutzung und den Ressourcen, die in regionale Entwicklungsprogramme und raumbedeutsame Vorhaben einfließen. Ebenso sind die Verfahren und Methoden zur Erfassung, Aktualisierung und Umsetzung dieser Daten wesentlicher Bestandteil des Informationssystems. Die Grundlage bildet der einheitliche Raumbezug, der die verschiedenartigen Daten miteinander verknüpft. Anwendungen finden primär im Planungsbereich (Raumordnung, Landesplanung, Regionalplanung, kommunale Planung) und der amtlichen Statistik statt.“

(Quelle: Geoinformatik-Service der Universität Rostock)

2 KURZBESCHREIBUNG DES RAUMINFORMATIONSSYSTEMS STEIERMARK

Das Rauminformationssystem besteht im Kern aus dem

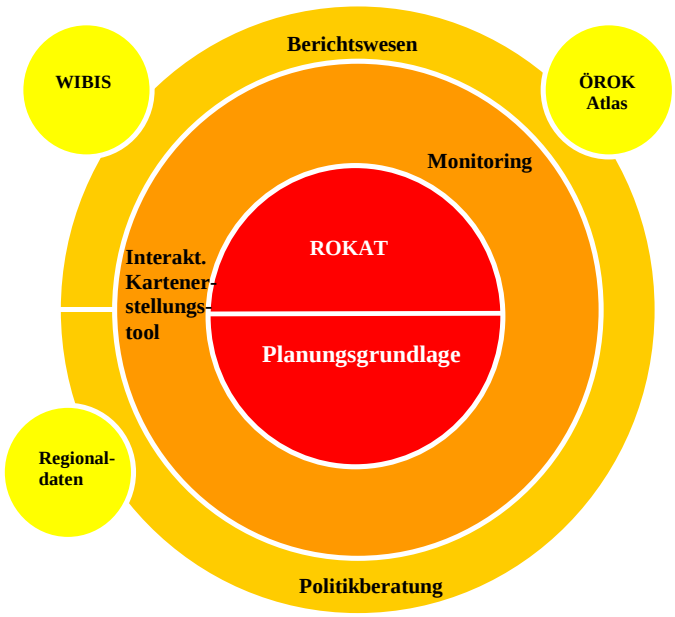
- Raumordnungskataster (ROKAT) und
- anderen vorhandenen Planungsgrundlagen

In der darauf aufbauenden Ebene steht für interne und externe Experten ein

- Monitoring-Tool für die laufende Beobachtung (Aufbau eines Indikatoren-Sets) und parallel dazu ein
- Interaktives Kartenerstellungstool zur Verfügung.

Die am stärksten nach außen wirksame Ebene beinhalten das

- Berichtswesen und die Politikberatung in Form von Regionsprofilen und einem Raumentwicklungsbericht und der



- Atlas für die räumliche Entwicklung auf Basis des ÖROK Atlas

2.1 Organisatorische Einbettung

Basis des Rauminformationssystems Steiermark ist die laufende Arbeit der Raumplanung. Auf Ebene der Geo-Daten nutzt das Rauminformationssystem Steiermark die technischen Möglichkeiten und die Daten des GIS-Steiermark und tauscht Daten mit kommunalen Informationssystemen aus. Es benötigt statistische Daten der Landesstatistik (Fachabteilung 1C Dokumentation, Öffentlichkeitsarbeit und Perspektiven) und greift auf externe Datenanbieter zurück. Das Landes-Umwelt-Informationssystem (LUIS) wird vor allem indirekt über verschiedene Themen mit räumlichem Bezug über das GIS-Steiermark in ein Rauminformationssystem einfließen.

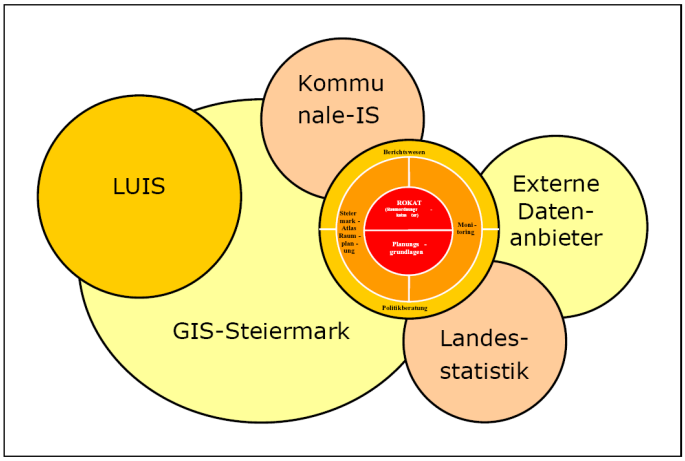


Abbildung 1: Schema über die Organisatorische Einbettung

3 DIE MODULE DES RAUM|IS STEIERMARK

Die rasche Verfügbarkeit von (fachlichen) Informationen wird für eine funktionierende Administration sowohl nach innen als auch nach außen immer wichtiger. Um dies gewährleisten zu können, ist eine effiziente Organisation und Aufbereitung der vorhandenen Informationen notwendig.

Mit der Umsetzung des Rauminformationssystems Steiermark wird ein spezieller Weg beschritten, raumordnungsrelevante Daten und Informationen zu bündeln und in systematischer Weise für den internen als auch den externen Gebrauch zur Verfügung zu stellen.

Das Raum|IS Steiermark besteht in der endgültigen Version zum Zeitpunkt des Projektabschlusses aus drei Hauptmodulen, nämlich den Teilbereichen

- Strukturierung der Planungsgrundlagen
- Regionale Informationen
- Laufende Raumbeobachtung – Monitoring

Zusätzlich wurde eine vergleichende Analyse bestehender Informationssysteme im Bereich Raumordnung durchgeführt. Diese bietet einen Überblick über bereits bestehende bzw. in Aufbau befindliche nationale, regionale und internationale Informationssysteme im Bereich der Raumordnung und erfolgte anhand der drei Kriterien

- inhaltliche Ausrichtung und Elemente,
- Zielgruppen sowie
- Betreiber bzw. institutioneller Hintergrund.

Um das bestehende breite Spektrum aufzuzeigen, wurden sehr unterschiedliche Informationssysteme ausgewählt. Betrachtet wurden bspw. ESPON (European Spatial Planning Observation Network), das Raumbeobachtungssystem des BBR, verschiedene Schweizer Raumbeobachtungssysteme sowie regionale Informationssysteme in Österreich (ÖROK Atlas zur räumlichen Entwicklung Österreichs, Regionalbericht, etc.).

Im Wesentlichen kann zwischen statistisch orientierten und stärker GIS orientierten bzw. GIS-unterstützten Systemen unterschieden werden. Inhaltlich konzentrieren sich die meisten Systeme auf den systematischen Zugang und die Darstellung regionaler Informationen. Der Bereich Monitoring wird nur selten eigens ausgewiesen und intensiv betreut. Raumbeobachtung und Monitoring erfolgen in den meisten Fällen über Berichtslegung und regelmäßige Auswertung vorhandener Daten und Informationen zur Vorlage für die jeweiligen politischen Entscheidungsträger (z.B. Konjunkturberichte, Arbeitsmarktberichte, Berichte zur Siedlungsentwicklung und Bautätigkeit, Umweltbericht, usw.).

Die Ergebnisse der Analyse wurden in Form einer kompakten Stärken- und Schwächenanalyse zusammengefasst, das Resultat der Analyse konnte in weiterer Folge als Orientierungshilfe für den Aufbau des steirischen Rauminformationssystems herangezogen werden.

3.1 Strukturierung der Planungsgrundlagen

Die Planungsgrundlagen, die als Basis für die Arbeit der Raumordnung dienen, umfassen sowohl statistische Daten, gesetzliche Grundlagen, Pläne, Geodaten als auch Studien und Analysen u.v.m. und beinhalten auch den Raumordnungskataster (ROKAT).

Die systematische Erfassung und Aufbereitung der in diesen angesprochen Bereichen vorhandenen Informationen war der Schwerpunkt dieses Arbeitspaketes. Ergebnis der Bearbeitung des Moduls ist ein Konzept für den Aufbau einer Datenbank sowohl für den Raumordnungskataster verlinkt mit dem GIS – Digitalen Atlas der Steiermark als auch für die anderen Planungsgrundlagen, das auch mögliche Beschlagwortungen und Suchfunktionen umfasst. Weiters wird parallel dazu noch in diesem Jahr eine neue Planzeichenverordnung für die im Rahmen der örtlichen Raumplanung zu erstellenden Pläne beschlossen. Diese gibt einerseits einheitliche Planzeichen vor (Grafik) und regelt andererseits die Übernahme der digitialen Pläne an das Land Steiermark (Schnittstelle).

3.1.1 Digitaler Raumordnungskataster (ROKAT)

Gemäß Stmk. Raumordnungsgesetz 1974 idgF. Abschnitt II (Überörtliche Raumordnung) § 7 ist beim Amt der Steiermärkischen Landesregierung ein Raumordnungskataster mit den für die Raumordnung relevanten örtlichen und überörtlichen Gegebenheiten und raumbedeutsamen Maßnahmen zu führen.

Der bisher analoge Raumordnungskataster (ROK), bestehend aus einer Access-Datenbank und einem analogen Kartenwerk wurde im Rahmen des Projektes RAUMIS in Zusammenarbeit mit der Fachabteilung 1B und dem GIS-Steiermark in eine digitale Form (ROKAT) überführt. Dabei werden nunmehr in einer Oracle-Datenbank die rechtsrelevanten Informationen gesammelt und eine unmittelbare Verbindung zu den entsprechenden grafischen Objekten (GIS) hergestellt.

Derzeit werden in der Datenbank des ROKAT 12 Sachgebiete mit 79 Themen und insgesamt etwa 6900 Datensätze verwaltet. Bei etwa 15 Themenebenen ist bereits die entsprechende Verbindung zum Planausschnitt im GIS Steiermark gewährleistet.

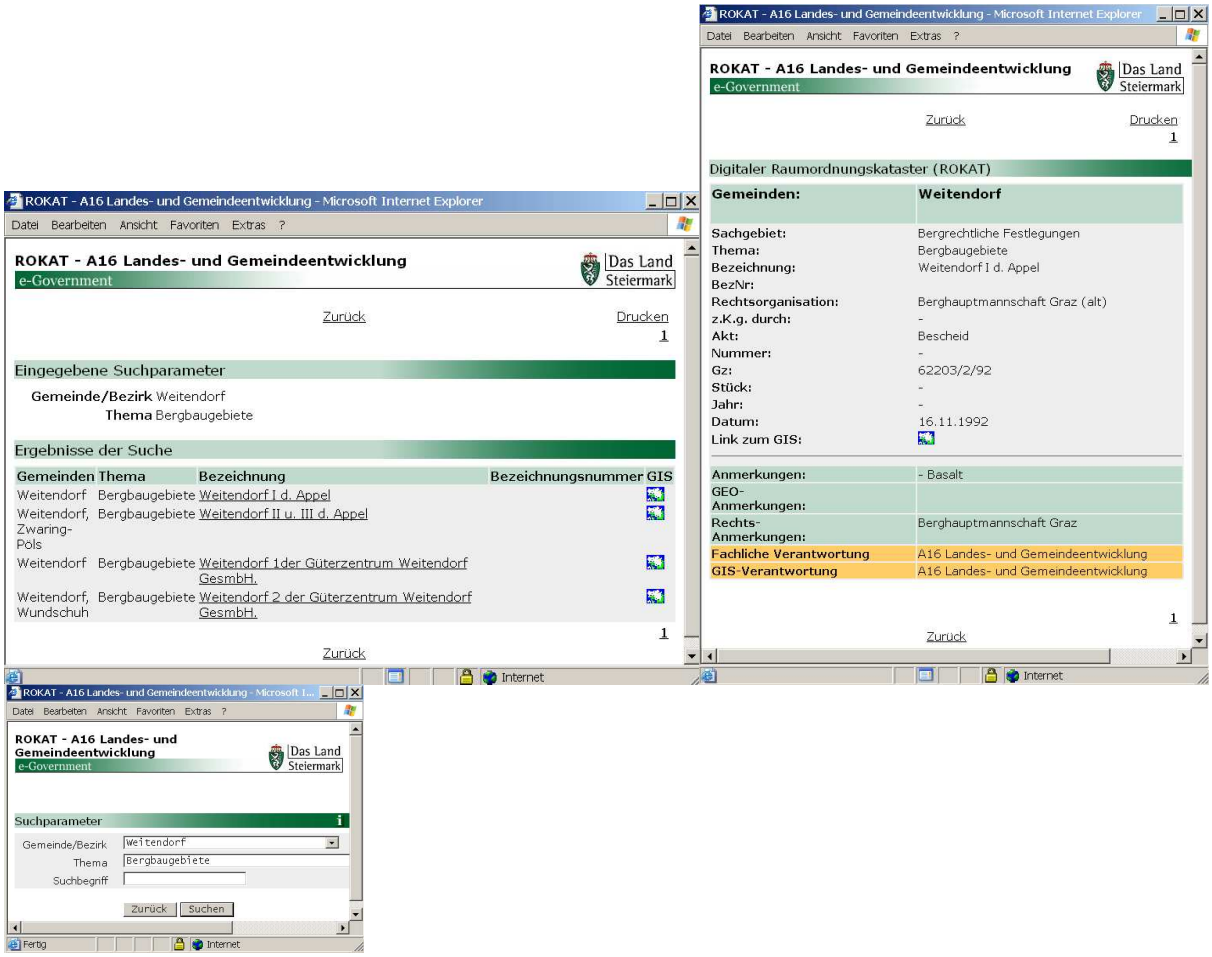


Abbildung 1: ROKAT - Datenabfrage über die Webapplikation

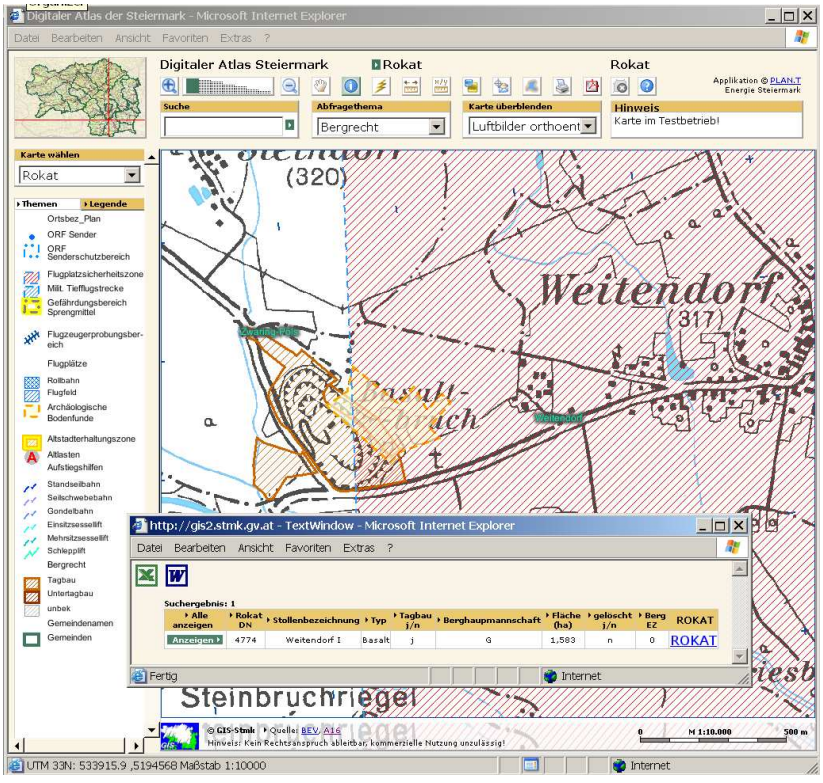


Abbildung 2: Darstellung der ROKAT – Themen im Digitalen Atlas der Steiermark

Seit Dezember 2006 wird diese Oracle-Datenbank in der Abteilung 16 im Echtbetrieb geführt. Ab April 2007 soll die ROKAT-Datenabfrage öffentlich über das Internet zugänglich sein. Damit besteht die

Möglichkeit, je Gemeinde/Bezirk bzw. Themenbereich die jeweiligen ROKAT-Datensätze abzufragen. Dies führt nicht nur zu einer Verringerung des Verwaltungsaufwandes z.B. bei der Bekanntabe von Planungsinteressen, sondern ermöglicht besonders den Gemeinden und Planern einen raschen Überblick über die raumrelevanten Festlegungen und Nutzungen.

Neben der Möglichkeit der direkten Verknüpfung der Themen bzw. einzelnen ROKAT-Datensätze mit dem entsprechenden grafischen Objekt über den Digitalen Atlas der Steiermark ist auch der umgekehrte Weg möglich. Im Digitalen Atlas der Steiermark wird eine eigene Karte mit den ROKAT Themen erstellt, in der über die Informationsabfrage eines Themes die direkte Verbindung mit der ROKAT-Datenbank hergestellt wird und die ROKAT-Datensatzinformation abrufbar macht (siehe Abbildung 2).

3.2 Regionale Informationen

Das Rauminformationssystem Steiermark greift auf eine umfassende und periodisch aktualisierte Datenbank zurück, die alle wesentlichen Indikatoren und Daten von der Landes- bis zur Gemeindeebene und im langjährigen Vergleich beinhaltet.

Diese Datenbank bildet die Grundlage für die Visualisierung aller für die Raumplanung relevanten Themenbereiche. Das Rauminformationssystem Steiermark bietet mittels komplexer Karten (mit erklärenden Texten), einer Kartenbox für die Online-Kartendarstellung sowie einer Reihe von Regionsprofilen ein umfassendes Bild über alle Entwicklungen und Situationen, die für die Raumplanung von Interesse sind.

Die Darstellung der räumlichen Entwicklung der Steiermark erfolgt entlang raumordungs- und regionalpolitisch relevanter Sachverhalte und erfolgt mittels unterschiedlicher Medien.

3.2.1 Atlas zur räumlichen Entwicklung

Der Teilbereich Atlas zur räumlichen Entwicklung umfasst themenspezifische Karten, Tabellen und Texte zu verschiedenen raumordnungsrelevanten Themen. Die inhaltliche und optische Gestaltung der Karten erfolgte in Anlehnung an den ÖROK-Atlas zur räumlichen Entwicklung Österreichs (http://www.oerok.gv.at/).

Aus folgende Themenbereichen werden Karten zur Verfügung gestellt:

Verwaltung, Raumstruktur:

- Die steirischen Gemeinden
- Die steirischen politischen Bezirke und NUTS 3-Regionen
- Raumstrukturen (GIS Steiermark)
- Landschaftsräumliche Gliederung der Steiermark (GIS Steiermark)

Bevölkerung:

- Bevölkerungsentwicklung ab 1971 (Gemeinden)
- Bevölkerungsentwicklung (Eurostat Jahresdurchschnitte) 1997-2002 (NUTS 3, inkl. Nachbarregionen
- Altersaufbau 2001 (Gemeinden)
- Veränderung der Wohnbevölkerung durch Wanderungsbilanz 1991-2001 (Gemeinden)
- Veränderung der Wohnbevölkerung durch Geburtenbilanz 1991-2001 (Gemeinden)
- Über-15-Jährige Wohnbevölkerung nach höchster abgeschlossener Ausbildung 2001 (Politische Bezirke)
- Bevölkerungsentwicklung – ÖROK-Prognosen 2001-2031: Gesambevölkerung und Altersklassen (Politische Bezirke)

Arbeitsmarkt und Wirtschaft:

- Bruttoinlandsprodukt/Kopf 2002 (Eurostat, Kaufkraftparitäten, NUTS 3, inkl. Nachbarregionen)
- Beschäftigung/Wirtschaftsstruktur – Zahl der Erwerbstätigen am Arbeitsplatz (Arbeitsplätze) 2001 und Veränderung 1991-2001 nach Geschlecht (Gemeinden)

- Veränderung der Zahl der Arbeitsplätze nach Wirtschaftsbereichen 1991-2001 (Politische Bezirke und Gemeinden)

Umwelt und Naturraum:

- Landschaftsgliederung (GIS Steiermark)
- Klimaregionen (GIS Steiermark)
- Klimaeignung (GIS Steiermark)
- Natura-2000-Gebiete (GIS Steiermark)
- Naturräumliche Schutzgebiete (GIS Steiermark)
- Biotope (GIS Steiermark)
- Waldentwicklungsplan (GIS Steiermark)
- Wasserschongebiete (GIS Steiermark)

Mobilität:

- Verkehr-Grundkarte (GIS Steiermark)
- Pendelwanderung 2001 (Gemeinden)

Wohnen:

- Haushaltsgrößen 2001, Entwicklung der Zahl der Haushalte 1991-2001 (Politische Bezirke)
- Wohnungsbestand 2001, Veränderung und Gebäudetypen 1991-2001 (Gemeinden)
- ÖROK-Prognosen 2001-2031 – Wohnungsbedarf

Die Kartendarstellungen zeigen neben den administrativen Einheiten der Steiermark (Gemeinden, Bezirke, NUTS-III-Regionen) auch Regionen in den benachbarten Bundesländern bzw. Nachbarstaaten. Neben österreichspezifischen Darstellungen wurden auch grenzüberschreitende Ansichten (auf Basis von Eurostat-Daten) in die Kartensammlungen aufgenommen. Zu in GIS Steiermark vorhandenen Karten wird direkt verlinkt.

Der Aufbau der entsprechenden Seiten folgt einem einheitlichen Schema (Abbildung 1). Dem Großteil der Karten (die auch in einer vergrößerten Ansicht zur Verfügung stehen) ist ein interpretativer Text beigefügt, sofern auch die zugrunde liegenden Daten (i.A. auf Ebene der politischen Bezirke) zur Verfügung gestellt werden, ist eine Tabelle als Pop-Up aufrufbar. Die Kombination Karte-Text-Tabelle steht jeweils auch als PDF-Dokument zum Download zur Verfügung.

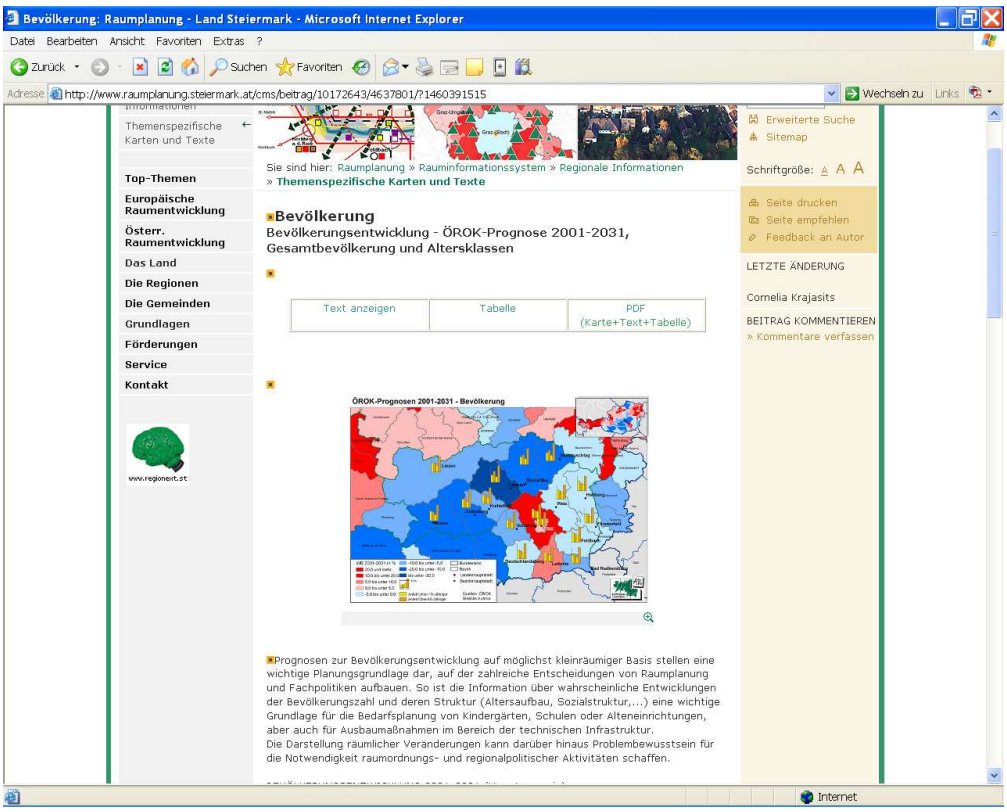


Abbildung 3: Einbettung Atlas zur räumlichen Entwicklung in den Internetauftritt

3.2.2 Regionsprofile

Für alle Bezirke und Regionen der Steiermark wurden Regionsprofile (siehe Abbildung 4) entwickelt. Diese beinhalten landesweit vergleichbare Darstellungen und ermöglichen einen individuellen, kompakten und informativen Überblick über die Strukturen und die Entwicklungen der einzelnen steirischen Regionen.

Auf Basis von statistischen Daten werden in diesen Profilen für die Themenbereiche Landschaft, Lage und Erreichbarkeit, Demografie, Haushalte, Wohnungen, Wirtschaft und Arbeitsmarkt, Tourismus, Einkommen sowie Bildung und Bildungsinfrastruktur langfristige und aktuelle Entwicklungen beschrieben und interpretiert. Abgerundet wird das Bild der Region durch einen Vergleich mit dem Landesdurchschnitt und nationalen Werten sowie durch einen Überblick über die beschäftigungsstärksten Produktions- und Dienstleistungsbetriebe. Die Texte werden durch Grafiken und thematische Karten unterstützt.

Die Regionsprofile stehen der interessierten Öffentlichkeit als PDF zum Download zur Verfügung (http://www.raumplanung.steiermark.at/).

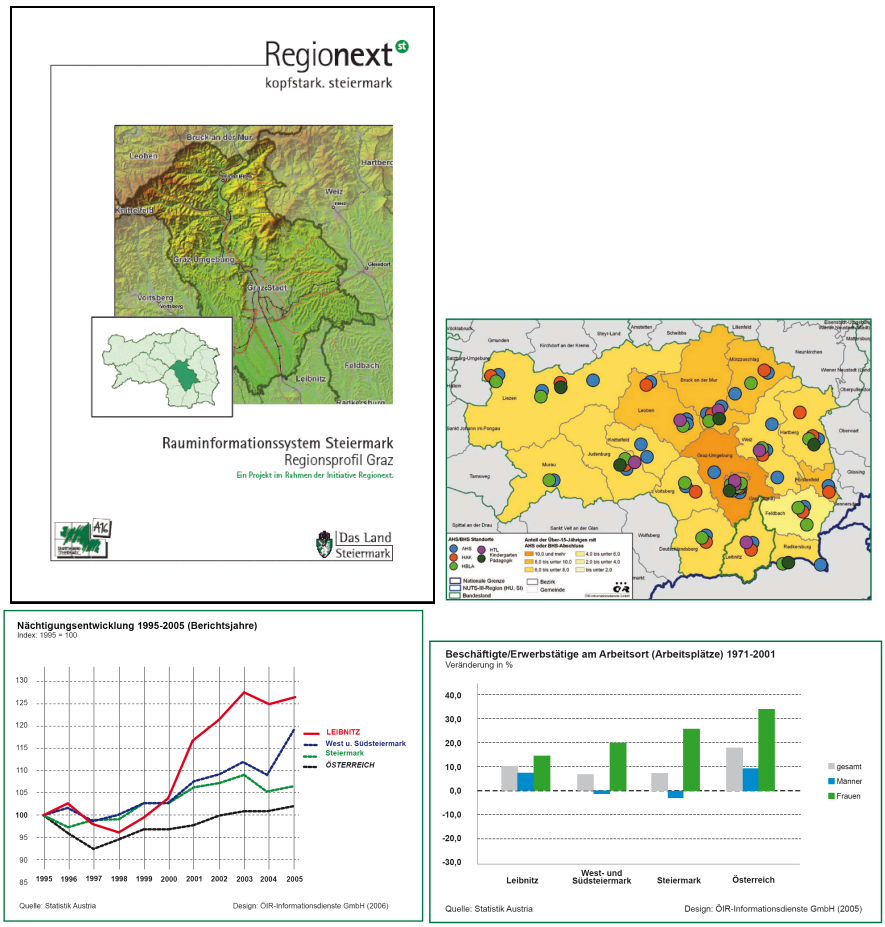


Abbildung 4: Regionsprofil-Deckblatt – Beispiele Grafiken und Diagramm

3.2.3 Interaktives Kartenerstellungstool

Als zusätzliche Möglichkeit der Visualisierung raumordnungsrelevanter Daten und Informationen wurde von der ÖIR-Informationsdienste GmbH ein Werkzeug zur interaktiven Kartenerstellung (siehe Abbildung 5) entwickelt.

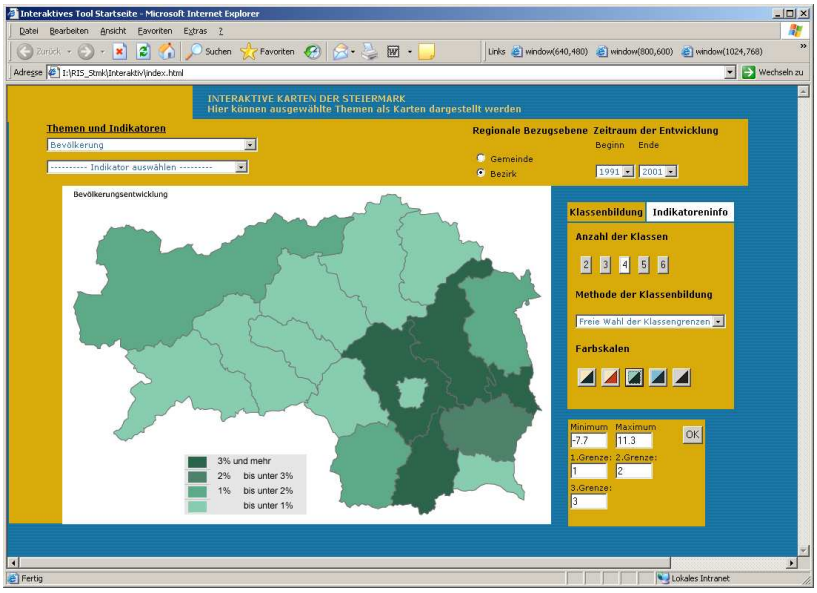


Abbildung 5:Interaktives Kartenerstellungstool

Benutzer haben damit die Möglichkeit, sich rasch und einfach einen Überblick der räumlichen Verteilung ausgewählter Indikatoren zu verschaffen. Im Gegensatz zu einem umfangreichen Web-GIS, wie es das Land Steiermark schon besitzt, verzichtet dieses Online-Kartenwerkzeug auf klassische Interaktionsmöglichkeiten wie Ausschnitt vergrößern, verkleinern oder verschieben. Es reduziert ganz bewusst die möglichen

Benutzerinteraktionen auf das Allernotwendigste der Indikatorvisualisierung, um die zu transportierenden Inhalte nicht aus den Augen zu verlieren. Neben der Indikatorauswahl stehen lediglich die Veränderung der Schwellwerte, Klassenanzahl, Klassifizierungsmethode und Farbverlaufauswahl zur Verfügung.

Realisiert wurde die Kartendarstellung in erster Linie mit SVG (Scalable Vector Graphics), das im weit verbreiteten Internet Explorer mit Hilfe des frei verfüberen Plugins von Adobe bzw. im Mozilla Firefox bereits nativ unterstützt wird. Basierend auf dem AJAX (Asynchronous JavaScript and XML) Programmierungskonzept wurde eine sehr komfortable Benutzerschnittstelle geschaffen:

Jeweils nach entsprechenden Benutzerinteraktionen werden im Hintergrund der Applikation neue Daten in die Karten nachgeladen oder bestehende Karten modifziert (z.B. Änderung der Datenklassifizierung). Der Vorteil für den Benutzer besteht darin, dass die Interaktion mit der Raum|IS Datenbank kaum bemerkbar ist, d.h. dass sich die Seite nicht nochmals neu aufbaut und der Benutzer während der Interaktion mit der Karte nicht gezwungen wird, das Werkzeug zu verlassen.

3.3 Laufende Raumbeobachtung – Monitoring

Ziel der laufenden Raumbeobachtung ist es, die räumliche Entwicklung der Steiermark sowie deren Einflussfaktoren systematisch zu beobachten und zu analysieren und somit die Möglichkeit zu eröffnen, Chancen und Risken frühzeitig zu erkennen und entsprechende Handlungsoptionen zu erarbeiten.

3.3.1 Nutzenbetrachtung

Ziel der Konzeption des Monitoringsystems war es, ein umfassendes, einfaches, über Web zugängliches und anwendungsorientiertes System zur laufenden Raumbeobachtung zu entwickeln. Dieses System, das als eine umfangreiche Datenbanklösung in Zusammenarbeit mit der FA1B Informationstechnik konzipiert und realisiert wurde, soll in erster Linie den Sachbearbeiterinnen und Sachbearbeitern der Abteilung A16 (Landes- und Gemeindeentwicklung) bzw. auch externen Expertinnen und Experten zur kontinuierlichen Beobachtung und Beurteilung von hoheitsrechtlichen, entwicklungspolitischen und projektspezifischen Maßnahmen vor dem Hintergrund einer nachhaltigen räumlichen Entwicklung dienen.

Die räumliche Entwicklung sowie deren Einflussfaktoren können mit diesem Monitoring systematisch verfolgt und ausgewertet werden. Basis des Monitorings ist dementsprechend ein Set von Indikatoren, deren Entwicklung Aussagen über raumrelevante Prozesse ermöglicht, sodass Chancen und Risiken frühzeitig erkannt und zeitgerecht Handlungsvorschläge zur nachhaltigen räumlichen Entwicklung der Steiermark entwickelt werden können. Die Zusammenstellung der Indikatoren erfolgte auf Basis der Auswertung einer Vielzahl von Programmen und Konzepten (z.B. EUREK, Regionale Entwicklungsprogramme und SUP-Indikatorenanalyse):

Die Resultate sind demzufolge wesentliche Grundlagen der Planung und damit Voraussetzung für eine aktive und vorausschauende Raumordnungspolitik und eine sachgerechte Raumplanung.

3.3.2 Datenstrukturen innerhalb des Monitoringssystems

Das Datenmodell des Monitoringsystems besteht aus zwei Informationsclustern:

- Cluster 1: Sammlung und Systematisierung verschiedener Daten zu bestimmten Themenbereichen (Wohnbevölkerung, Arbeitslosendaten, diverse Flächeninformationen, usw.). Diese Daten sind nicht nur themenweise sondern auch jahresabhängig in regionalen Ausprägungen gruppiert (Daten je Bezirk, je Nuts III Region, je Naturschutzgebiet, usw.).
- Cluster 2: Kern des Monitoringsystems ist ein Indikatorenset. Indikatoren sind die von der Raumplanung definierten Überwachungswerkzeuge für die Raumentwicklung. Mit ihnen wird auf Basis der vorhandenen Daten des Clusters 1 überprüft, welche Entwicklungen bestimmte Indikatoren nehmen. Anhand der (Indikatoren)Kurven (Entwicklung über die Zeit in der ausgewählten Region) können raumplanerische Aussagen getroffen werden bzw. können diese als Input zu Entscheidungsprozessen der Raumplanung dienen.

3.3.3 Funktionalitäten

- Sammlung und Systematisierung von Rohdaten: Jeder Datensatz und in weiterer Folge jeder Indikator (Cluster 2) wird genau einem Themenbereich zugeordnet. Die Auswahl der

Grundgesamtheit der Themenbereiche erfolgte in Anlehnung an die im Atlas zur räumlichen Entwicklung Österreichs (ÖROK-Atlas) behandelten Themen. Ausführliche Quellenangaben und zusätzliche Informationen wie Erläuterungen zu den Datensätzen (bspw. Definitionen) oder Angaben zum Gebietsstand werden erfasst.

- Indikatoren: Indikatoren bündeln unter einem raumplanerischen Begriff ein Rohdatum oder mehrere Einzelthemen. Die Zuordnung der Daten ist in einer Prozedur verpackt und kann beliebig komplex sein. Somit sind auch beliebige Einschränkungen von Indikatoren auf räumliche Teilbereiche möglich. Ein Indikator wird eindeutig einer Dimension zugeordnet. Weiters werden an die Indikatoren (bewertende) Symbole vergeben, um Aussagen zur gewünschten Entwicklung dieses Indikators (die je nach Zielformulierung und den entsprechenden Rahmenbedingungen unterschiedlich sein kann) machen zu können. Diese Symbole visualisieren Verben wie bspw. stärken, schaffen, erhalten, eindämmen, verringern, etc. Im nächsten Schritt wird dem Indikator und seinem Symbol das entsprechende Instrument zugeordnet. Da in den relevanten Instrumenten in erster Linie qualitative und nicht quantitative Zielformulierungen für die Raumplanung vorherrschen, werden konkrete Zielformulierungen als Zusatzinformation und nicht als determinierendes Element angegeben.
- Ausgabe: Eine Indikatorenberechnung kann in tabellarischer Zahlenform oder grafisch (Businessgrafik; Entwicklung der Indikatorenwerte in der ausgewählten Region über die gewählte Zeit) ausgegeben werden.

3.3.4 Inhaltliche Betreuung – Aktualisierung und Wartung

Die Gesamtverantwortung für das Monitoring-System liegt jedenfalls (auch langfristig) bei der A16. Die A16 beauftragt sogenannte (interne oder externe) „Kompetenzknoten“, die inhaltlich für die Aktualisierung und Wartung bestimmter Bereiche des Systems (bspw. regionalstatistische Daten und Indikatoren, SUP-Indikatoren, Flächendaten) verantwortlich sind.

Die Kompetenzknoten sind für die Beobachtung der Datenlage und die Aktualität der Indikatoren in ihrem Verantwortungsbereich zuständig und übernehmen gegebenenfalls die Datenrecherche und Datenbeschaffung für die in ihren Zuständigkeitsbereich fallenden Indikatoren. Die Daten werden anhand eines Pflichtenheftes derart aufbereitet, dass eine standardisierte Übernahme der Daten und die Programmierung des Indikators durch den/die SachbearbeiterIn der FA1B möglich ist. Zur Aufbereitung der Daten gehört eine Überprüfung auf Konsistenz und Vollständigkeit ebenso wie eine umfangreiche Metadatenbeschreibung.

4 EIN AUSBLICK

Bis Ende dieses Jahres sollten alle Module des Rauminformationssystemes Steiermark für den internen aber auch externen Gebrauch über das Internet auf www.raumplanung.steiermark.at zur Verfügung stehen. Einzelne Teilmodule wie die Regionsprofile oder die ROKAT-Datenbank sind bereits fertiggestellt bzw. implementiert.

5 ANHANG

5.1 Abbildungen

5.2 Literatur/Links

HOFER, Thomas; „RaumInformationsSystem Steiermark -Ein Instrument zur Beschreibung der räumlichen Entwicklung in der Steiermark für Politik, Verwaltung, Experten und Öffentlichkeit“; Diplomarbeit zur Erlangung des akademischen Grades eines Magisters der Sozial- und Wirtschaftswissenschaften im Studium irregulare Umweltsystemwissenschaften mit dem Fachschwerpunkt Volkswirtschaftslehre; Institut für Volkswirtschaftslehre der Karl-Franzens-Universität; Graz; Oktober 2004

Bayerische Landesentwicklung – Daten zur Raumbeobachtung; http://www.stmwivt.bayern.de/landesentwicklung/inhalt.html

Donaudatenkatalog; http://www.donaudatenkatalog.bayern.de/

ESPON – European Spatial Planning observatory Network – Forschungs-Netzwerk zur Beobachtung der europäischen Raumentwicklung; http://www.espon.eu/
Geoinformatik-Service der Universität Rostock; http://www.geoinformatik.uni-rostock.de.
MONET (Monitoring der nachhaltigen Entwicklung der Schweiz); http://www.bfs.admin.ch/bfs/portal/de/index/themen/nachhaltige_entwicklung/uebersicht.html
Atlas zur räumlichen Entwicklung Österreichs – ÖROK Atlas online; http://www.oerok-atlas.at/
Raumbeobachtung Kanton Aargau; http://www.ag.ch/raumentwicklung/de/pub/raumbeobachtung.php
Raumbeobachtung Kanton Zürich; http://www.kantonalplanung.zh.ch/internet/bd/arv/kplan/de/beobachtung.html
Raumbeobachtung Schweiz; http://www.are.admin.ch/themen/raumplanung/00246/00451/index.html?lang=de
Raumbeobachtungssystem des BBR; http://www.bbr.bund.de/

🏆 *reviewed paper*

3D-Kataster

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KURZFASSUNG

Raum wird im städtischen Bereich immer knapper. Daher muss die Ausnutzung des Raumes verbessert werden. Eine Möglichkeit ist dabei die räumliche Überlagerung in verschiedenen Ebenen. Dies wird beispielsweise in vielen Großstädten beim öffentlichen Verkehr durchgeführt, der entweder unterirdisch (U-Bahn) oder auf erhöhten Trassen geführt wird.

Eine solche Vorgangsweise kollidiert jedoch sehr oft mit den Prinzipien des Grundbuches. Allgemein gilt, dass Grundstücke und darauf errichtete Bauwerke denselben Eigentümer haben. Das ist bei räumlicher Überlagerung nicht mehr gegeben. Der U-Bahntunnel gehört etwa nicht dem Grundeigentümer sondern dem Betreiber der U-Bahn. Wir untersuchen in diesem Beitrag die Möglichkeiten des österreichischen Grundbuches bezüglich dreidimensionaler Fragestellungen und zeigen internationale Tendenzen auf.

1 PROBLEM

Grundeigentum ist ein stark geschützter Rechtsbereich, da Boden ein nicht vermehrbares Gut ist. Daher wurde in Österreich ein strenges System für den Schutz von Grundeigentum angelegt. Dieses System setzt sich zusammen aus Grundbuch und Kataster. Das Grundbuch sichert die rechtlichen Komponenten wie beispielsweise Eigentum, Pfandrechte und Dienstbarkeiten. Der Kataster umfasst die technischen Komponenten, wobei hauptsächlich die Grundgrenze für die Eigentümer von Bedeutung ist. Diese Systeme wurden bereits im 19. Jahrhundert in der heute noch gültigen Form eingeführt (Twaroch 1997; Twaroch and Muggenhuber 1997). Zwischenzeitliche Änderungen betreffen hauptsächlich die technische Umsetzung und nur in geringerem Umfang die rechtlichen Grundlagen.

Im städtischen Bereich steht immer weniger freier Platz für Bauvorhaben zur Verfügung. Vor allem in historisch gewachsenen Städten besteht oft das Problem, dass vorhandene historische Bauwerke nicht einfach abgerissen werden dürfen, auch wenn sie den modernen Anforderungen nicht mehr entsprechen. Daher wird nach Lösungen gesucht, bei denen die verschiedenen Funktionen in unterschiedlichen Ebenen angeordnet werden. Dies steht jedoch in Konflikt mit den grundlegenden Definitionen, die in der Eigentumssicherung verwendet werden. Grundeigentum umfasst prinzipiell den gesamten Raum über und unter der betreffenden Fläche. Das schließt auch die darauf bzw. darunter befindlichen Bauwerke mit ein. Das widerspricht einer Regelung, bei der unterschiedliche Personen Eigentum an Bauwerken in unterschiedlichen Höhen besitzen, wie es beispielsweise bei der Überlagerung von Verkehrsflächen, Bürogebäuden und Privatwohnungen der Fall wäre.

Ziel dieses Artikels ist es, die Problematik anhand einiger Beispiele zu erläutern und internationale Tendenzen aufzuzeigen. Das Problem der intensiven Nutzung von Boden ist nicht auf Österreich beschränkt. Daher wird beispielsweise in Israel und Holland intensiv an Lösungen gearbeitet. Diese Lösungen werden kurz charakterisiert und mit der österreichischen Situation verglichen.

2 KATASTER UND GRUNDBUCH IN ÖSTERREICH

Wie bereits einleitend erwähnt, gliedert sich das österreichische System der Eigentumssicherung in Kataster und Grundbuch. Diese Teile sind über die Grundstücksnummer miteinander verknüpft und in der Grundstücksdatenbank dargestellt. Diese Zweiteilung spiegelt sich auch in der Zuordnung zu Ministerien wider. Der Kataster ist dem Bundesministerium für Wirtschaft und Arbeit unterstellt, wohingegen das Grundbuch zum Justizministerium gehört und somit bei den Gerichten angesiedelt ist.

Im Kataster werden Geometrie und Nutzung der Grundstücke dargestellt und mittels Koordinaten im zweidimensionalen Raum fixiert. Zusätzlich wird die jeweilige Grundstücksnummer angeführt (Himsl, Kollmann et al. 2007). Das Grundbuch gibt Auskunft über den oder die Eigentümer von Grundstücken, sowie Beschränkungen mit denen Grundstücke belastet sind. Das Register wird im Gegensatz zum Kataster von den Gerichten geführt, ist jedermann zugänglich und genießt öffentlichen Glauben (Muggenhuber, Schernthanner et al. 2001).

Wie ist nun ein Grundstück definiert? Unter einem Grundstück versteht der Gesetzgeber jenen Teil einer Katastralgemeinde (also einer Verwaltungseinheit), der im Kataster als solcher mit einer eigenen Nummer, der Grundstücksnummer bezeichnet ist (VermG 1968 § 7a Abs. 1). Das Grundstück ist ein Teil der Erdoberfläche. Ein dauerhaft mit dem Grundstück verbundenes Gebäude verliert nach dem alt-römische Grundsatz „superficies solo cedit" seine rechtliche Selbstständigkeit und wird als dreidimensionales Rechtsobjekt auf die zweidimensionale Grundstücksebene reduziert (ABGB 1811 § 297). Diese Reduktion findet theoretisch unabhängig von der Höhenlage statt, also gehört der gesamte Raum ober- und unterhalb der Erdoberfläche zum Grundstück. Eingeschränkt wird das jedoch durch andere Gesetze wie beispielsweise das Luftfahrtgesetz oder das Mineralrohstoffgesetz, die generelle Beschränkungen festlegen.

Wie sieht nun der Inhalt von Grundbuch und Kataster aus? Abbildung 1 zeigt ein Beispiel aus dem Kataster. Die Linien sind Grundstücksgrenzen bzw. Grenzen zwischen Nutzungsabschnitten. Die Nummern, beispielsweise 1313/3 sind die Grundstücksnummern, die im Grundbuch zur Referenzierung benutzt werden. Es handelt sich um eine rein zweidimensionale Darstellung. Abbildung 2 zeigt einen Auszug aus dem Grundbuch. Es handelt sich um eine Grundbuchseinlage, also eine aus einem oder mehreren Grundstücken bestehenden (nicht notwendigerweise zusammenhängende) Fläche mit einheitlichen Eigentums- und Belastungsverhältnissen. Der erste Abschnitt, bezeichnet als A1, stellt durch Angabe der Grundstücksnummer die Beziehung zum Kataster her. Der zweite Abschnitt (B) beschreibt die Eigentumsverhältnisse und der dritte Abschnitt (C) die Belastungen.

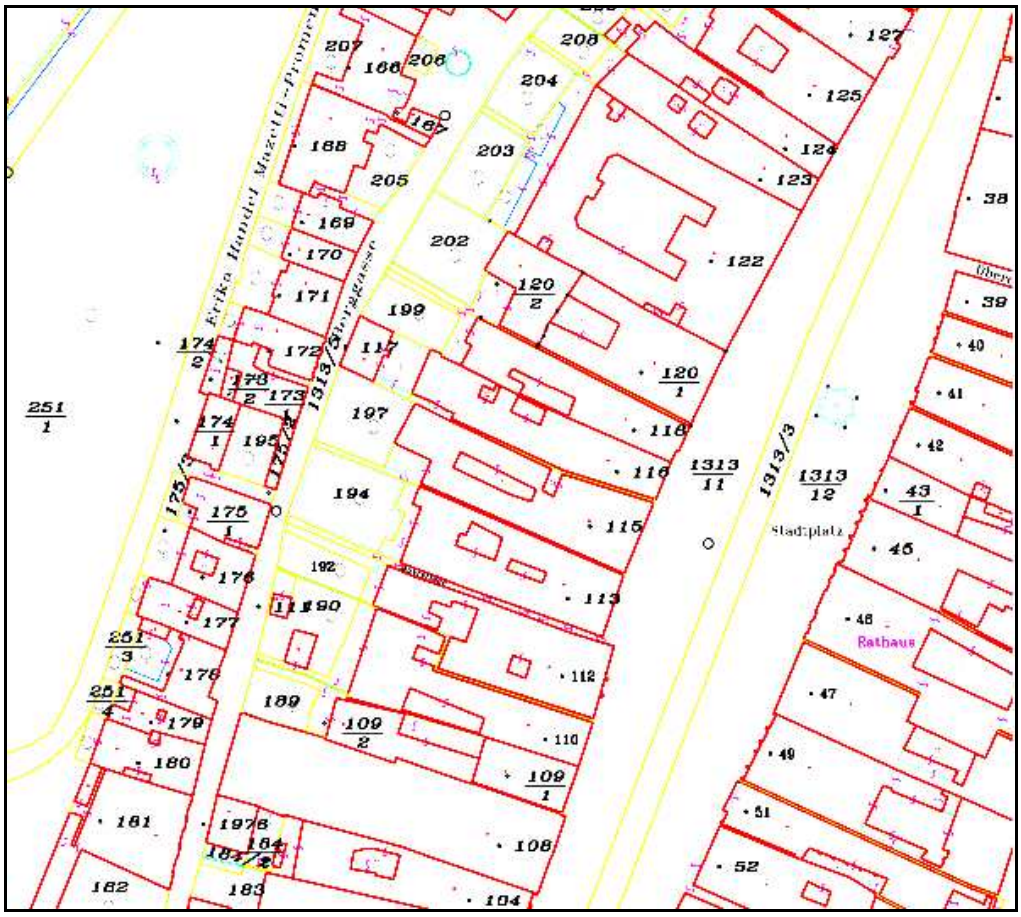
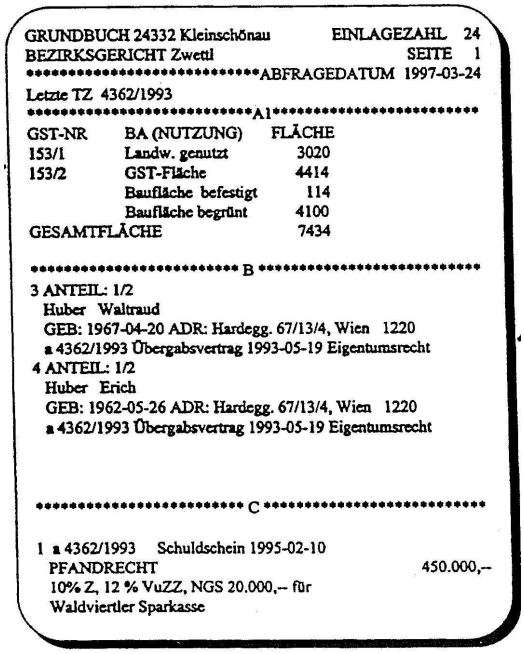


Abbildung 1: Auszug aus der digitalen Katastralmappe: Stadtplatz von Steyr (Hackl in Vorbereitung)



GRUNDBUCH 24332 Kleinschönau EINLAGEZAHL 24
BEZIRKSGERICHT Zwettl SEITE 1
**********ABFRAGEDATUM 1997-03-24
Letzte TZ 4362/1993
**********A1**********

GST-NR	BA (NUTZUNG)	FLÄCHE
153/1	Landw. genutzt	3020
153/2	GST-Fläche	4414
	Baufläche befestigt	114
	Baufläche begrünt	4100
GESAMTFLÄCHE		7434

********** B **********
3 ANTEIL: 1/2
Huber Waltraud
GEB: 1967-04-20 ADR: Hardegg. 67/13/4, Wien 1220
a 4362/1993 Übergabsvertrag 1993-05-19 Eigentumsrecht
4 ANTEIL: 1/2
Huber Erich
GEB: 1962-05-26 ADR: Hardegg. 67/13/4, Wien 1220
a 4362/1993 Übergabsvertrag 1993-05-19 Eigentumsrecht

********** C **********
1 a 4362/1993 Schuldschein 1995-02-10
PFANDRECHT 450.000,--
10% Z, 12 % VuZZ, NGS 20.000,-- für
Waldviertler Sparkasse

Abbildung 2: Auszug aus dem Grundbuch (Twaroch 2000 S. 18)

3 HILFSMITTEL FÜR DREIDIMENSIONALE FRAGESTELLUNGEN

Das österreichische Rechtssystem hat im Laufe der Zeit einige Hilfsmittel geschaffen, um die starren Grenzen des Systems Grundbuch-Kataster etwas aufzuweiten. Es handelt sich dabei um

- die räumliche Abgrenzung von Dienstbarkeiten,
- das Wohnungseigentum,
- das Superädifikat und
- das zivile Baurecht.

Zu beachten ist jedoch bei allen Hilfsmitteln, dass sie nicht über die Grenze einer Grundbuchseinlage hinausgehen dürfen. Muss also beispielsweise eine Dienstbarkeit für die Errichtung eines U-Bahn-Tunnels eingetragen werden, so muss das für jede betroffene Grundbuchseinlage separat geschehen.

3.1 Räumliche Abgrenzung von Dienstbarkeiten

Dienstbarkeiten sind Nutzungsrechte an fremden, unbeweglichen Sachen. Im vorliegenden Fall sind die unbeweglichen Sachen die Grundstücke. Die Dienstbarkeiten reichen von Wegerechten über das Recht des Wasserholens bis hin zu allgemeinen Nutzungsrechten. Der Eigentümer des Grundstückes muss die entsprechende Fremdnutzung dulden und darf sie nicht beeinträchtigen. Zur Errichtung einer Dienstbarkeit ist die Errichtung eines Dokumentes notwendig. Dieses darf eine räumliche Abgrenzung des Rechtes beinhalten. Da sich das Grundbuch jedoch nicht mit geometrischen Aspekten beschäftigt, ist diese räumliche Abgrenzung jedoch im Grundbuch nicht ersichtlich. Um sie zu erhalten, muss das ursprüngliche Dokument eingesehen werden. Vorteilhaft ist dabei jedoch, dass es nicht verboten ist, eine dreidimensionale Beschreibung der räumlichen Abgrenzung zu geben.

3.2 Wohnungseigentum

Wohnungseigentum wird im Grundbuch eingetragen. Die Vorgangsweise ist im Wohnungseigentumsgesetz geregelt. Dem Grundbuchsgesuch ist ein Gutachten über den Bestand an selbständigen Wohnungen und über die sonstigen selbständigen Räumlichkeiten auf der Liegenschaft, sowie ein Gutachten über die Nutzwertberechnung beizulegen. Dieses Vorgehen heißt Parifizierung und teilt die Liegenschaft in allgemeine und selbstständige Eigentumsbereiche. Die selbständigen Eigentumsbereiche werden im Grundbuch als TOPs geführt, fortlaufend nummeriert und den einzelnen Eigentümern zugewiesen.

Lage und Größe der betreffenden Wohnung ist nur aus den Bauplänen ersichtlich, die gemeinsam mit den übrigen Parifizierungsunterlagen am Grundbuchsgericht aufliegen. Im Kataster sind die Wohnungen nicht ersichtlich. Es ist maximal der Gebäudegrundriss eingetragen.

3.3 Superädifikat

Superädifikate waren ursprünglich für Gebäude gedacht, die nicht dauerhaft auf dem Grundstück verbleiben sollten. Superädifikate gelten als bewegliche Sachen und sind daher nicht im Grundbuch eingetragen (Krejci 1995). Heutzutage werden Superädifikate jedoch auch für bleibende Bauwerke verwendet, wenn der Grundstückseigentümer kein Baurecht einräumen will (Bittner 2003). So ist beispielsweise die Wiener Wirtschaftsuniversität, die sich auf einem Grundstück der Österreichischen Bundesbahn befindet, ein Superädifikat (Twaroch 2003).

Superädifikate werden durch Einreichung einer Urkunde zur Aufnahme in die Bauwerkskartei erworben. Somit sind sie im Grundbuch ersichtlich. Diese Kartei genießt jedoch keinen öffentlichen Glauben.

3.4 Ziviles Baurecht

Das zivile Baurecht trennt das Eigentum des Grundstückes von dem eines bestimmten Bauwerkes. Es ist somit möglich, ein Gebäude auf fremdem Grund zu errichten und trotzdem Eigentümer des Gebäudes zu bleiben. Für ein Baurecht wird eine eigene Grundbuchseinlage eröffnet. Daher ist es im Grundbuch sichtbar und es kann beispielsweise veräußert oder belastet werden. Baurechte können auch nur auf einen Teil des Grundstückes definiert und in ihrer Höhe begrenzt werden.

Nachteilig an den zivilen Baurechten ist, dass sie immer an der Erdoberfläche beginnen. Der Eigentümer des Grundstückes hat somit für die entsprechende Fläche keine Nutzungsmöglichkeit mehr. Dadurch wird das betreffende Grundstück im Wert stark beeinträchtigt.

4 INTERNATIONALE TRENDS

International treten ähnliche Schwierigkeiten auf wie in Österreich. Es besteht Bedarf an Lösungen, die eine räumliche Erfassung von Rechten erlauben. In diesem Abschnitt stellen wir einige Beispiele aus Holland und Israel vor, die so oder ähnlich auch in Österreich auftreten können.

4.1 Gebäudekomplex

Bei wachsendem Platzbedarf und schrumpfenden Reserven kann es passieren, dass vorhandener Raum über den Grundstücken genutzt werden soll. Ein Bürogebäude der Firma „Ing. Vastgoed Belegging BV“ in Den Haag liefert ein Beispiel für eine solche Situation. Der Komplex besteht aus zwei Gebäuden, die sich auf unterschiedlichen Seiten einer Autobahn befinden. Die Gebäude sind mit einer Brückenkonstruktion über die Autobahn hinweg miteinander verbunden (vergleiche Abbildung 3). Aus der Sicht eines Technikers handelt es sich um ein einziges Gebäude. Für die Darstellung im Kataster war es aber notwendig, Rechte und Beschränkungen in drei verschiedenen Grundstücken einzutragen. Abbildung 4 verdeutlicht die Unübersichtlichkeit dieser Situation. Der Pfeil am unteren Rand der Abbildung kennzeichnet die Blickrichtung von Abbildung 3.

Abbildung 3: Gebäude der Firma „Ing. Vastgoed Belegging BV“ über einer Autobahn in Den Haag (Stoter 2004)

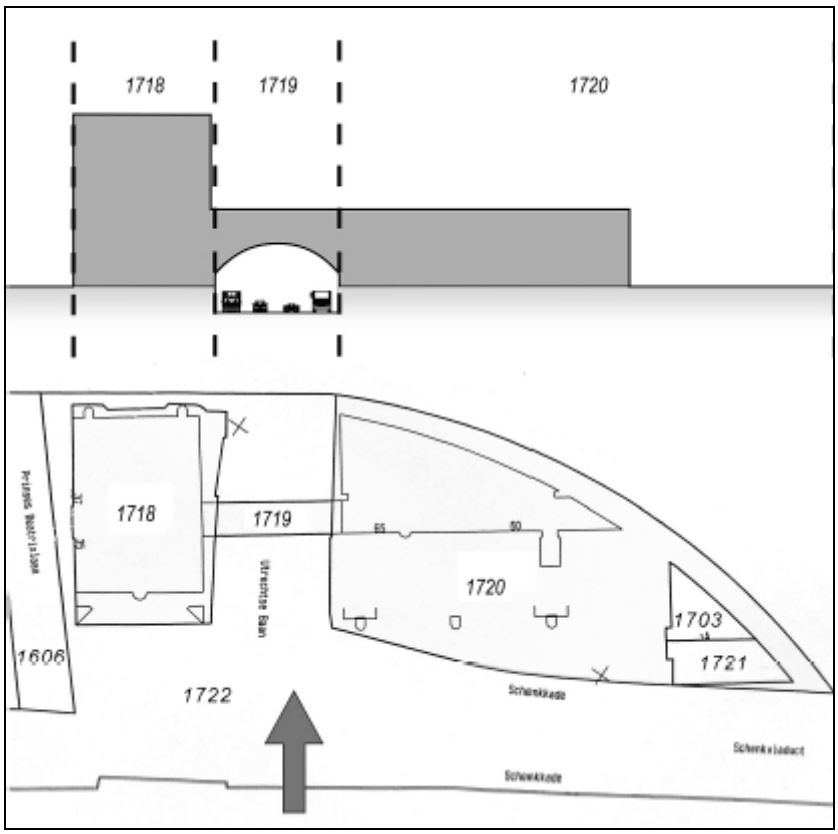


Abbildung 4: Darstellung des Gebäudes im Kataster (Stoter 2004)

Stoter schlägt eine Implementierung mittels 3D-Rechtsobjekten vor. Diese Objekte werden auf dem zweidimensional registrierten Grundstück definiert. Dabei sind der Grundriss des 3D-Rechtsobjekts und jener der zweidimensionalen Parzelle identisch. Die Höhe des 3D-Objektes kann beliebig definiert werden. Abbildung 5 zeigt, wie eine solche Lösung aussehen könnte.

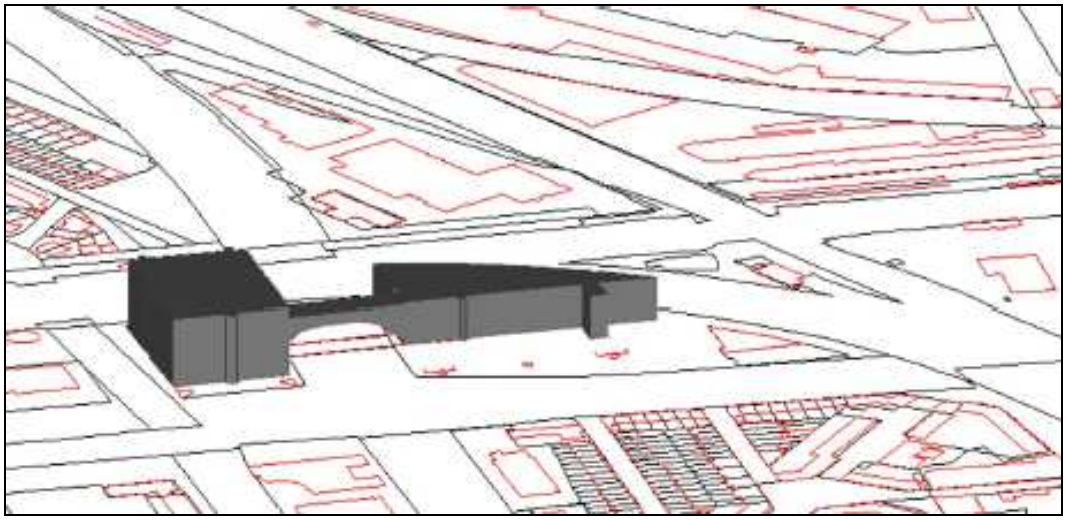


Abbildung 5: Realisierung des Gebäudekomplexes als 3D-Objekt (Stoter 2004)

4.2 Eisenbahntunnel und –station im Stadtgebiet

Einen Fall, der stark an die Situation der Wirtschaftsuniversität Wien erinnert, finden wir in Rijswijk, einem Vorort von Den Haag. Hier wurde die städtische Eisenbahnlinie durch Abdecken der Gleiskörper in einen Tunnel verlegt. Somit entstanden nutzbare Grundflächen, auf denen anschließend Gebäude errichtet wurden. Um diese Eigentumssituation zu regeln, wurde auf Baurechte und Superädifikate zurückgegriffen. An einer Stelle des neuen Tunnels treffen nun drei verschiedene Eigentumsverhältnisse aufeinander:

- Der Eisenbahntunnel mit Plattform ist im Eigentum der „NS Railinfratrust BV“.
- Öffentlicher Raum ist im Eigentum der Gemeinde.
- Ein auf dem Gebiet errichteter Kiosk ist im Eigentum von „NS Vastgoed BV.

Abbildung 6 zeigt auf der linken Seite eine Ansicht der Situation. Rechts ist die räumliche Situation überlagert mit den Abgrenzungen der verschiedenen Rechtsobjekte.

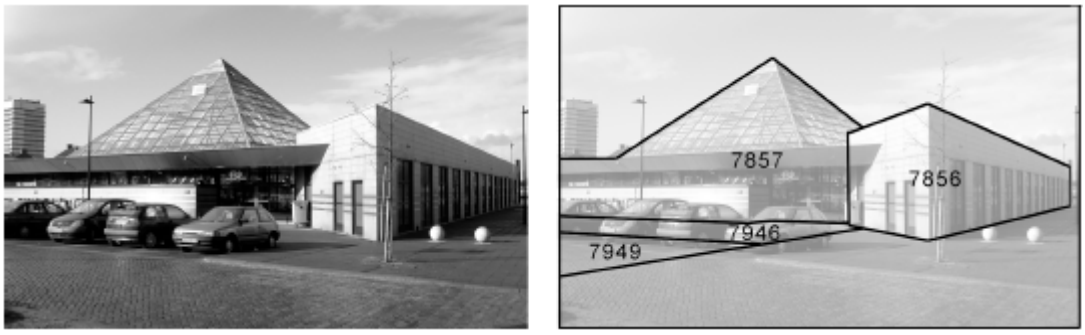


Abbildung 6: Lage der Gebäude und Parzellen des Bahnhofsareals (Stoter 2004)

Anhand dieses Beispieles zeigt Stoter auch, dass die momentan verwendeten Definitionen oft nicht ausreichend für eine echte dreidimensionale Modellierung sind. Oftmals wird auf eine exakte Höhenangabe verzichtet. In diesen Fällen muss entweder auf geschätzte Höhenangaben zurückgegriffen werden oder es müssen, falls die Bauwerke bereits vorhanden sind, die 3d-Objekte exakt an die Bauwerke angepasst werden. Der Nachteil der zweiten Lösung ist natürlich der erhöhte Aufwand bei eventuellen Umbauten, da das geänderte Gebäude eventuell über das 3D-Objekt hinausragen würde.

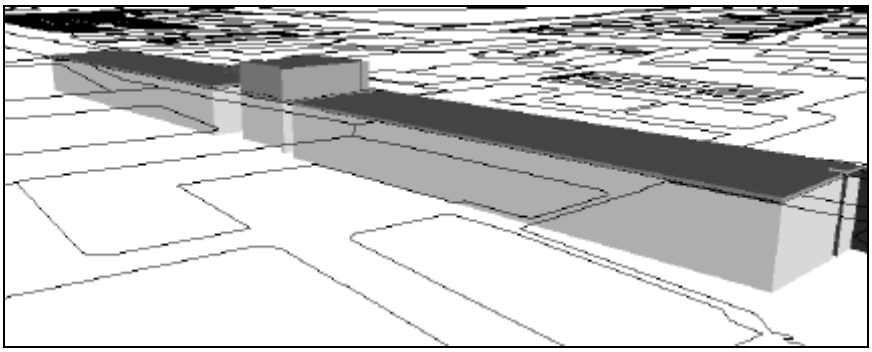


Abbildung 7: Mögliche Umsetzung der Situation (Stoter 2004)

4.3 Historische Funde

Eine etwas anders geartete, aber ähnlich komplexe Situation besteht bei dem Schutz historischer Funde. Da moderne Städte oft an Orten errichtet wurden, an denen bereits früher bedeutende Ansiedlungen existierten, kommt es speziell im mediterranen Raum häufig vor, dass bei Grabungsarbeiten historisch bedeutsame Stätten gefunden werden.

Ein Beispiel für einen solchen Fund ist Acre in Israel. Acre ist eine historische Hafenstadt, mit den Charakteristiken einer Verteidigungsanlage aus dem 18. und 19. Jahrhundert. Die Überreste aus der Zeit der Kreuzritter liegen heute nahezu unversehrt über und unter den Straßen der Stadt (siehe Aufriss vom „Templer's Tunnel“ in Abbildung 8). Die Stadt bieten eine einmalige Kombination von Rechten an Landeigentum. Verschiedene Eigentümerschichten sind durch mehrere Gesetze und Vorgaben in Bezug auf Wasser, Öl, Mienen, Mineralien usw. geregelt.

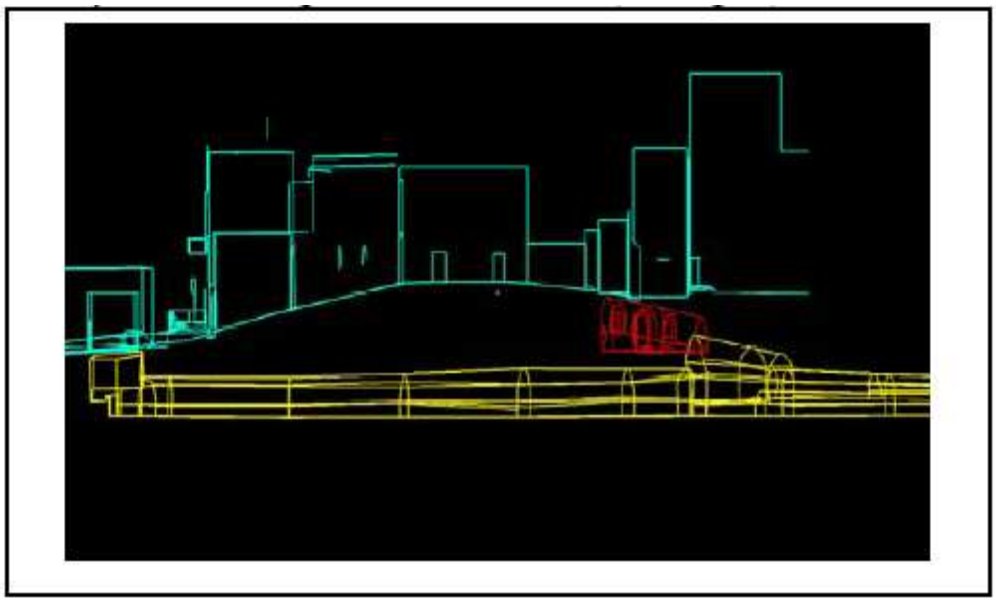


Abbildung 8: Der „Templer's Tunnel“ von Acre im Aufriss

Bis heute wurden erst ca. 1,2 ha von geschätzten 36 ha der unterirdischen Bauten erforscht. Sie liegen nur 0,3 bis 1,5 Meter unter der Oberfläche und berühren diese sogar in manchen Fällen. Hierin liegt auch eines der Probleme. Solange der Fund nicht komplett erforscht ist, kann eigentlich keine exakte räumliche Abgrenzung angegeben werden. Somit können teilweise Rechte nur „auf Verdacht“ angezeigt werden. Im Grundriss (Abbildung 9) ist klar ersichtlich, dass der Tunnel sich über eineunter Vielzahl an Grundstücken verläuft.

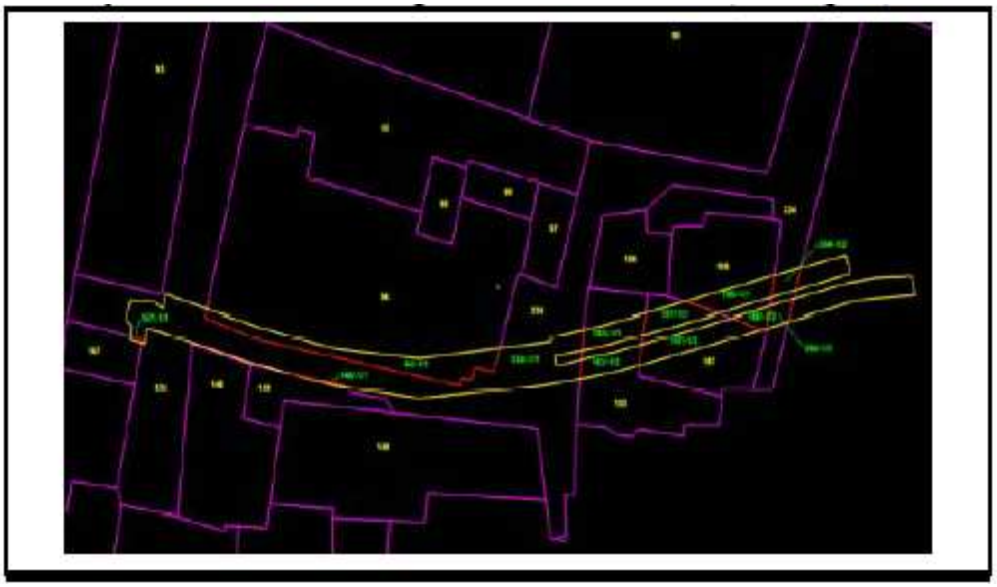


Abbildung 9: Der „Templer's Tunnel“ als räumliche Subparzelle, im Hintergrund ist die herkömmliche Landparzelle dargestellt

Auch in Israel geht man davon aus, dass eine dreidimensionale Registrierung unumgänglich ist. Anders als in Holland sollten die Objekte in Israel jedoch durch dreidimensionale Vermessungen definiert werden und nicht durch die zweidimensional gegebenen Grundstücksgrenzen. Das hat sich jedoch in der Praxis als wesentlich aufwändiger und schwieriger erwiesen als die Holländische Lösung.

5 ZUSAMMENFASSUNG

Wir haben gesehen, dass es im österreichischen Grundbuch eine Reihe von Möglichkeiten gibt, um räumlich abgegrenzte Rechte einzutragen. Es gibt dabei keine Einschränkung auf zweidimensionale Beschreibungen. Theoretisch sind auch zeitabhängige Rechte möglich. Problematisch ist nur die Darstellung der Ausmaße, da die Repräsentation im Kataster ausschließlich zweidimensional ist.

Die rechtlichen Grundlagen in Holland und Österreich sind vergleichbar. In beiden Ländern gibt es die Möglichkeit von Superädifikaten und Baurechten. In Holland wurde bisher keine Möglichkeit gefunden, diese rechtlichen Rahmenbedingungen in der dritten Dimension nutzbar zu machen, ohne die technische Realisierung des Katasters drastisch zu verändern. Daher ist auch für zukünftige Entwicklungen in Österreich zu erwarten, dass bei Registrierung von dreidimensional begrenzten Rechten eine Änderung der Darstellungsweise im Kataster nötig wird. Eine vollständige 3D-Darstellung, wie sie in Israel angestrebt wird, kann möglicherweise vermieden werden, doch ganz ohne Änderungen wird es nicht abgehen.

Die Aufgabe in Österreich wird es also sein, einerseits die Entwicklungen im Ausland weiter zu beobachten und andererseits Lösungsansätze für Probleme in Österreich zu suchen. Vorrangig sind dabei Lösungen für Tunnelprojekte. Dabei handelt es sich nicht nur um Tunnel im städtischen Bereich. Auch Tunnelprojekte im ländlichen Bereich leiden darunter, dass Eintragungen für alle Grundbuchseinlagen separat durchzuführen sind und zudem der fertige Tunnel im Kataster nicht oder nur unzulänglich wiedergegeben wird. Hier sind sowohl rechtliche Rahmenbedingungen, als auch technische Lösungen notwendig, wobei wahrscheinlich die rechtlichen Rahmenbedingungen mit geringen Änderungen auskommen, da bereits einige verwendbare Hilfsmittel existieren.

6 REFERENZEN

Kundmachung des allgemeinen bürgerlichen Gesetzbuches (ABGB, Civil Law Code). Justizgesetzsammlung. 946. 1811.

Bundesgesetz vom 3. Juli 1968 über die Landesvermessung und den Grenzkataster (Vermessungsgesetz - VermG). BGBl. Nr. 306/1968. 1968.

BITTNER, L. Wünsche des Vertragserrichters an Grundbuch und Kataster. In: Eigentumssicherung im 21. Jahrhundert. Wien, Manz, 2003.

HACKL, M. Dreidimensionaler Kataster – Möglichkeiten, Notwendigkeit und Fortschritt der Einführung in verschiedenen Ländern. Diplomarbeit, Institut für Geoinformation und Kartographie, TU Wien. In Vorbereitung.

HIMSL, D., K. KOLLMANN, H. POLLY, W. ROSIFKA. www.meingrundstueck.at, Bundeskammer der Architekten und Ingenieurkonsulenten und Arbeiterkammer Österreich. 2007.

KREJCI, H. Privatrecht. Wien, Manz, 1995.

MUGGENHUBER, G., G. SCHERNTHANNER, C. TWAROCH. Verbücherbare Rechte im urbanen Raum - Anforderungen der Gesellschaft an den Informationsinhalt von Grundbuch und Kataster. Österreichische Notariatszeitung 133. Jahrgang (12). 2001

STOTER, J. 3D Cadastre. Delft, Netherlands Geodetic Commission. 2004.

TWAROCH, C. Vom Steuerkataster zum Land-Management-System - Strukturüberlegungen zu einer Theorie des Katasters. Österreichische Zeitschrift für Vermessung und Geoinformation (VGI) 85 (3): 182-190. 1997.

TWAROCH, C. Organisation des Katasters Ziele, Grundsätze und Praxis. GeoInfo Series Bd. 14, Institut für Geoinformation und Landesvermessung, TU Wien. 2000.

TWAROCH, C. Rauminformation in öffentlichen Büchern. In: Eigentumssicherung im 21. Jahrhundert. Wien, Manz. 2003.

TWAROCH, C. and G. Muggenhuber. Evolution of Land Registration and Cadastre - Case Study: Austria. Joint European Conference on Geographical Information. 1997.

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Nachhaltige Lösungen bei umwelt- und öffentlichkeitsrelevanten Konflikten: Was kann Mediation im öffentlichen Bereich leisten?

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1 MEDIATION – OFTMALS LETZTE HOFFNUNG AUF EINE KONSENSUALE LÖSUNG

Viele Menschen sind grundsätzlich von dem Bedarf der Errichtung neuer Verkehrswege, neuer Kläranlagen, technisch optimierter Müllverbrennungsanlagen oder moderner Kraftwerke überzeugt. Dennoch steigt der Widerstand gegen solche öffentlichkeitsrelevanten Projekte. Manche Arten von Projekten sind kaum noch zu realisieren. Betroffene, Bürgerinitiativen und Umweltorganisationen stehen der Politik und Verwaltung sowie Unternehmen gegenüber. Was in vielen Fällen mit Widerstand im Verwaltungsverfahren beginnt endet oft vor dem Verwaltungsgerichtshof – immer öfter begleitet von öffentlichem Protest.

Ist das „Floriani-Prinzip“ alleiniger Grund für den immer stärker werdenden Widerstand gegenüber öffentlichkeitsrelevanten Projekten? Liegt es wirklich daran, dass sich Kosten und Nutzen eines Projekts in vielen Fällen ungleich verteilen? Oft haben große Teile der Bevölkerung einen Nutzen auf Kosten weniger Anwohnerinnen und Anwohner. Oder liegt die Ursache in der Art und Weise, wie in einzelnen Fällen seitens der Projektwerber, der Verwaltung und Politik mit den Interessen und Bedürfnissen der Betroffenen umgegangen wird? Müssen Betreiber öffentlichkeitsrelevanter Projekte den Preis für die lange Zeit geforderte politische Emanzipation der Bevölkerung zahlen?

Politikerinnen und Politiker werden gewählt, um Entscheidungen im Interesse der Bevölkerung zu treffen, die in weiterer Folge von der Verwaltung umgesetzt werden sollen. Im Rahmen von Beteiligungsverfahren verhandeln engagierte Betroffene mit Vertreterinnen und Vertretern aus Politik, Verwaltung und Unternehmen Fragen des Gemeinwohls. Der Staat sitzt als „primus inter pares“ am Verhandlungstisch. Ziel ist meist die Einbindung der Interessen aller Betroffenen in den Planungs- und Umsetzungsprozess. Wenn das Beteiligungsverfahren jedoch nicht den gewünschten Erfolg für alle Seiten gebracht hat – wenn "der Karren im Dreck steckt" – dann liegt in vielen Fällen die letzte Hoffnung auf eine konsensuale Lösung in einer Mediation.

2 MEDIATION – DEFINIERT ALS METHODE ZUR WAHRUNG VON INTERESSEN

Eine etablierte Methode der Interessenklärung ist jene der Mediation, aufbauend auf den Prinzipien des Harvard Konzepts [Fisher et al. 1998] – in den meisten Fällen nach einer klaren Abfolge und Struktur in einzelnen Phasen. Eine tiefgehende Erarbeitung von Interessen ist jedoch nur möglich, wenn weniger als 10 bis 15 Personen am Verhandlungstisch sitzen. Die Anzahl an Personen, die von den Auswirkungen einer Maßnahme betroffen sind ("Betroffene") und Personen, die an einem Verfahren aktiv beteiligt sind ("Beteiligte"), ist im Rahmen von öffentlichkeitsrelevanten Projekten in den meisten Fällen eine weitaus höhere. Mediationsverfahren im öffentlichen Bereich erheben den Anspruch, Lösungen, aufbauend auf den Interessen aller Betroffenen, zu ermöglichen. Ist es damit theoretisch überhaupt möglich, die Interessen aller Betroffenen zu berücksichtigen? Und wenn "ja" – wie? In der Literatur wird viel über die Bedeutung der Interessenklärung im Rahmen von Mediationsverfahren geschrieben. Es gibt jedoch nur wenige Hinweise darauf, wie in der Praxis eines Mediationsverfahrens die Interessen und Bedürfnisse der Betroffenen Berücksichtigung finden. Aus diesem Grund wurde Anfang 2006 eine Expertenbefragung unter Mediatoren durchgeführt, um Erfahrungen aus möglichst vielen Mediationsverfahren im öffentlichen Bereich zu sammeln. Die Ergebnisse dieser qualitativen (und damit nicht repräsentativen) Befragung werden erstmals in diesem Artikel dargestellt. Im Folgenden wird zuerst auf Erkenntnisse aus der Literatur und danach auf die Ergebnisse dieser Expertenbefragung eingegangen.

Im Projektbericht „Mediation im Öffentlichen Bereich – Status und Erfahrungen in Deutschland 1996 – 2002“ werden die zu erfüllenden Kriterien für ein „Mediationsverfahren im Öffentlichen Bereich“ in Hinblick auf die Interessenklärung und Verfahrensgestaltung folgendermaßen zusammengefasst: "Beteiligung wesentlicher betroffener Interessengruppen (Bürgerinitiativen, Verbände, Vorhabenträger, Vertreterinnen aus Politik und Öffentlicher Verwaltung etc.) und Verhandlung/ Diskussion größtenteils in direkter (face-to-face) Kommunikation." [Zilleßen et al. 2004]. Durch die Nennung von „Interessengruppen“

als zentrale Beteiligte ist der Fokus schon in der Namensgebung auf die Interessen als zentraler Aspekt gegeben. Eine klare Vorgehensweise im Verfahren hinsichtlich der Interessenklärung ist in diesem Projektbericht nicht dokumentiert.

Das Handbuch Umweltmediation [ÖGUT 2001] des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (BMLFUW) und der Österreichischen Gesellschaft für Umwelt und Technik (ÖGUT) stellt dar, was Mediation im Öffentlichen Bereich ist und wie ein Mediationsverfahren verlaufen soll: „Die Beteiligten erhalten zunächst die Möglichkeit, ihre Haltung zum Projekt darzustellen. Die anderen Beteiligten nehmen diese Positionen zur Kenntnis, ohne diesen zustimmen zu müssen. Durch gezielte Fragen und Methoden tragen die Mediatorinnen und Mediatoren dazu bei, die wesentlichen Interessen der Beteiligten herauszuarbeiten und für alle sichtbar zu machen. Sie sorgen für eine faire und gleichberechtigte Darstellung aller Positionen und Interessen. Durch die Auflistung und Strukturierung der konfliktbehafteten Bereiche werden die Gegensätze offenkundig aber auch die Punkte, in denen zwischen den Beteiligten Übereinstimmung besteht.“ Es ist nicht beschrieben, in welcher strukturellen Form diese Übersetzung der Positionen in Interessen erfolgen soll oder kann. Auch wird nicht dargelegt, inwieweit die Interessen aller Betroffenen durch die Gruppe der Beteiligten optimal vertreten werden können. Hinsichtlich des Ablaufs ist lediglich dargestellt:„Von Positionen zu Interessen: Zu Beginn der Verhandlungen stellen die Beteiligten ihre Positionen dar. Die dahinter stehenden Interessen und Bedürfnisse werden mit Hilfe der Mediatorinnen und Mediatoren herausgearbeitet und deutlich gemacht. Den Beteiligten wird dadurch ermöglicht, im Laufe des Verfahrens ein wechselseitiges Verständnis für die Bedürfnisse und Interessen zu entwickeln.“ [ÖGUT 2001]

Die vom Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft im April 2003 herausgegebene Studie „Umweltmediation im Österreichischen Recht“ beschäftigt sich in Teilausschnitten ebenfalls mit der Frage der Interessenklärung: „Selbstbestimmtheit und Eigenverantwortung: Die Beteiligten der Kontroverse nehmen ihre Interessen und Bedürfnisse eigenverantwortlich wahr und vertreten diese innerhalb des Umweltmediationsverfahrens.“ [Kerschner et al. 2003]. Im deutschen Entwurf der Unabhängigen Sachverständigenkommission zum Umweltgesetzbuch beim Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit aus dem Jahr 1998 findet sich in § 89 der Versuch, den "Verfahrensmittler" in das Verwaltungsverfahren institutionell einzubinden. Im § 89, Abs. 1 Interessenausgleich ist festgehalten: „Im Verfahren, das die Entscheidung vorbereitet, soll auf einen Ausgleich zwischen den beteiligten Interessen hingewirkt und eine einvernehmliche Lösung angestrebt werden.“ [UGB-KomE – Umweltgesetzbuch 1998]. Auch hier sieht der Gesetzgeber einen Interessensausgleich vor, ohne auf einen konkreten Weg einzugehen und ohne zwischen Betroffenen und Beteiligten zu unterscheiden.

Nach einer Erkenntnis des Österreichischen Verwaltungsgerichtshofs (VwSlg 14.654 A/1997) hinsichtlich der mündlichen Verhandlung in einem Verwaltungsverfahren wird festgestellt: "Die mündliche Verhandlung ist, wie die §§ 40 bis 44 AVG in ihrem Zusammenhang zeigen, nicht allein dazu bestimmt, den objektiven Sachverhalt zu klären. Sie soll auch durch Gegenüberstellung der am Verfahren Beteiligten die Erörterung der in Betracht kommenden Interessen fördern und nach Möglichkeit einen Ausgleich zwischen konkurrierenden Interessen herbeiführen helfen." Hier wird nur auf die Wahrung der Interessen der Beteiligten und deren Ausgleich eingegangen, nicht aber auf eine mögliche Diskrepanz zwischen den Beteiligten und den Betroffenen.

Die Akademie für Technologiefolgenabschätzung in Baden-Württemberg (D) geht in der Veröffentlichung „Umweltmediation in Theorie und Anwendung“ auf die Interessenklärung in Umweltmediationsverfahren folgendermaßen ein: „In der Phase der Verhandlung des Diskursangebotes werden die relevanten Konfliktparteien angesprochen und ihre jeweiligen Interessen und Positionen zum Streitgegenstand ermittelt.“ Es wird weiters festgehalten: „Gleichberechtigte Darstellung der Positionen und Interessen: Um das Spektrum der unterschiedlichen Meinungen und Bewertungen an einem Runden Tisch zu erfassen, empfiehlt es sich, für eine faire und gleichberechtigte Darstellung aller Positionen zu sorgen. Zum Teil ergeben sich hier bereits Gemeinsamkeiten unter den vermeintlichen Kontrahenten, indem man sich auf grundsätzliche Punkte einigt. Ähnliche Positionen können aber durchaus auch aufgrund unterschiedlicher Interessenlagen mehr divergieren, als das ohne die Gespräche angenommen wurde. Klärung von Missverständnissen: Das Zusammentreffen in einer vor der Öffentlichkeit geschützten Gesprächsatmosphäre kann dazu führen, dass Kontrahenten miteinander Missverständnisse klären.“ Auch in diesem Fall wird auf

die Bedeutung des Übergangs von Positionen zu Interessen hingewiesen und auf die Vertraulichkeit eines Mediationsverfahrens eingegangen – eine Vertraulichkeit, von der alle am Verfahren beteiligten Personen profitieren können. Bezogen wird dies auf die "relevanten Konfliktparteien", die jedoch nicht näher definiert werden. Eine konkrete Ablaufempfehlung wird nicht ausgesprochen. [Oppermann et al. 2000, Seite 32ff.]

In den angeführten Beispielen aus der Literatur wird die Bedeutung der Berücksichtigung von Interessen beschrieben – meist ohne Empfehlungen, wie dies in der Praxis von Mediationsverfahren im öffentlichen Bereich umgesetzt werden kann. Doch wessen Interessen und Bedürfnisse sind von zentraler Bedeutung für den Planungs- und Entscheidungsprozess von umwelt- und öffentlichkeitsrelevanten Projekten? Nur die Interessen der am Verfahrenstisch Sitzenden – die Interessen der Beteiligten?

3 BETROFFENE ODER BETEILIGTE?

Christina Lenz beschreibt in ihrem Buch "Prozessproviding am Beispiel des Mediationsverfahrens Flughafen Wien" sehr genau den Ablauf, die Intention und die Struktur der Startphase der Mediation - der Pre-Mediation. Darin wird immer wieder auf "relevante Interessensvertreter" und "Beteiligte am Verfahren" eingegangen [Lenz 2004]. Wen genau diese Gruppen umfassen, einbeziehen und vertreten sollen, wird nicht definiert. Auch Gerhart Conrad Fürst beschreibt ausführlich in seinem Buch "Umweltmediation – Methoden – Verfahren – Lösungswege" die Phase 1 der Mediation: "Vom Erstkontakt bis zum Mediationsvertrag": "Vorgespräche dienen dem Kennen lernen zwischen Mediationsteam und Beteiligten, ...". Einzubindende Personen und Gruppen werden taxativ aufgezählt. Dazu gehören: "zentrale Ansprechpartner, Geschäftsführer, Funktionäre", "vorgesehene Delegierte der Interessengruppen" und "weitere wichtige Personen in der Interessengruppe" [Fürst 2004]. Wie und ob in diesem Zusammenhang die Einbindung der Interessen aller Betroffenen gewährleistet ist, wird nicht angesprochen.

Im Handbuch Umweltmediation [ÖGUT 2001] wird in Bezug auf die Teilnehmerinnen und Teilnehmer an einem Mediationsverfahren folgendes formuliert: "Das Besondere an Umweltmediation ist, dass alle von einem Projekt Betroffenen in einem freiwilligen und klar strukturierten Verfahren gemeinsam eine tragfähige Lösung erarbeiten. Allparteiliche Dritte, die Mediatorinnen und Mediatoren, leiten das Verfahren und unterstützen die Beteiligten dabei, kreative Lösungen zu finden und verbindliche Ergebnisse zu vereinbaren." Des Weiteren wird der Satz "Alle Betroffene an einem Tisch" verwendet. Es werden in diesem Zusammenhang die Begriffe "Betroffene" und "Beteiligte" nicht klar getrennt. Zur der Frage der wesentlichen Beteiligten an einem Mediationsverfahrens werden neben dem Projektwerber, Gemeindevertreterinnen und Gemeindevertreter, Behörden etc. die Anrainerinnen und Anrainer sowie die Bürgerinnen und Bürger genannt. Weiters wird formuliert: "An den Verhandlungsrunden des Mediationsverfahrens sollen alle betroffenen Gruppen teilnehmen. Allerdings können nicht alle in der Sache engagierten Personen bei den Verhandlungen anwesend sein. Die Beteiligten entsenden deshalb Repräsentantinnen und Repräsentanten in das Mediationsforum." Auch hier werden die Begriffe der Beteiligten und Betroffenen vermischt und der Fokus auf "engagierte Personen" gelegt. Ob und wie die Interessen aller Betroffenen, also auch jener, die sich nicht engagieren können oder wollen, berücksichtigt werden können, wird nicht erwähnt. [ÖGUT 2001]

4 ERFAHRUNGEN AUS DER PRAXIS

Um mehr Informationen über den Ablauf der Interessenklärung im Rahmen von Mediationsverfahren im öffentlichen Bereich zu bekommen und der damit verbundenen Frage einer möglichen Diskrepanz zwischen den Interessen der Betroffenen und Beteiligten an einem Verfahren auf den Grund zu gehen, wurde Anfang 2006 eine Expertenbefragung durchgeführt. Die Stichprobe umfasste sieben Mediatoren, die in Österreich, Deutschland und der Schweiz im Bereich von öffentlichkeitsrelevanten Konflikten als Mediatoren tätig sind. Die befragten Experten konnten auf Erfahrungen von in Summe mehr als 30 Mediationen im Öffentlichen Bereich zurückgreifen.

Hinsichtlich der Klärung der Interessen ergaben sich Unterschiede aus der Verfahrensgröße bzw. aus der Anzahl an beteiligten Parteien und Personen und der Notwendigkeit, mit Delegierten zu arbeiten. Im Rahmen von Mediationsverfahren mit weniger als 10 – 15 Betroffenen erfolgte die Interessenklärung in wenigen Sitzungen, in denen fast immer alle Betroffenen anwesend waren. In einem offenen Diskurs war es allen Anwesenden möglich, unter Anleitung und Moderation des Mediatorenteams, die hinter den vorgetragenen Positionen liegenden Interessen zu erarbeiten und darzulegen. Wichtig war, dass alle Personen

in dieser Phase die Interessen jeder einzelnen Person hören konnten. Da so allen Anwesenden die Interessenlage jeder einzelnen Person klar werden konnte, war es möglich, darauf aufbauend die Erarbeitung von Lösungsoptionen in Kleingruppen vorzunehmen. Die Ergebnisse aus diesen Arbeitsgruppen wurden dem Plenum präsentiert und auch dort formal beschlossen. In machen Fällen haben einzelne Arbeitsgruppen vor einer Beschlussfassung vom Plenum den Auftrag zur Überarbeitung der Lösungsoptionen erhalten. Der Gesamtprozess erfolgte somit in mehreren iterativen Schritten. Meist war mangelnde Kommunikation mit dem Plenum während der Erarbeitung der Lösungsoptionen Ursache für den Überarbeitungsbedarf. Innerhalb der Arbeitsgruppen war es möglich, Interessen in einer größeren Tiefe zu erarbeiten und damit verstärkt Vertrauen aufzubauen. In diesem Klima waren Lösungen möglich, die von den Beteiligten im Plenum als "zu weitgehend" oder "mit zu vielen Zugeständnissen versehen" beurteilt wurden – und dies deshalb, weil es den Beteiligten im Plenum nicht möglich war, den Vertrauensbildungsprozess in der Arbeitsgruppe mitzuerleben. Aufgrund der Tatsache, dass in diesen sehr kleinen Verfahren so gut wie alle Betroffenen auch Beteiligte gewesen sind, war eine mögliche Diskrepanz zwischen den Interessen der Beteiligten und Betroffenen kein Thema.

Die Ergebnisse der Expertenbefragungen haben auch ergeben, dass die Herausforderung, Rückbindungsprozesse optimal zu organisieren, mit der Anzahl an Betroffenen eines öffentlichkeitsrelevanten Projekts steigt. Zentrales Gremium größerer Verfahren war immer eine Art "Forum", in das aus allen Herkunftsgruppen (Bürgerinitiativen, politische Partein, NGOs, Interessensvertretungen, Unternehmen etc.) Delegierte entsandt wurden. Aufgabe dieses Gremiums war unter anderem Interessen zu erarbeiten, Arbeitsgruppen zu bilden und Aufträge an diese zu formulieren und Beschlüsse zu fassen. Die Tatsache, dass in kleinen Gruppen – in diesem Fall innerhalb des Forums oder der Arbeitsgruppen – leichter Vertrauen entstehen kann, war für Verfahren dieser Struktur in zweierlei Hinsicht eine besondere Herausforderung: Einerseit in der Zusammenarbeit zwischen dem Forum und den Herkunftsgruppen und andererseits zwischen den Arbeitsgruppen und dem Forum. In beiden Fällen wurden erarbeitete Lösungen von der Herkunftsgruppe bzw. dem Forum ebenfalls als "zu weitgehend" oder "mit zu vielen Zugeständnissen versehen" beurteilt, da auch hier der Vertrauensbildungsprozess von der jeweils größeren Gruppe nicht miterlebt werden konnte. Lösungen der Arbeitsgruppen sind Lösungen, die vorerst nur auf dieser Ebene Gültigkeit haben und erst im Forum diskutiert werden müssen. Genauso verhält es sich hinsichtlich des Verhältnisses der Delegierten im Forum und der Herkunftsgruppen. Auch Ergebnisse im Forum müssen erst von den Herkunftsgruppen mitgetragen werden.

In sehr großen Verfahren erfolgte ein Großteil der Interessenklärung im Rahmen von Vorgesprächen mit allen beteiligten Interessengruppen im Vorfeld des Mediationsverfahrens. Ziel war es, neben der Darlegung, was Mediation in diesem Fall leisten kann und der Abfrage der Zustimmung zu einer Beteiligung am Verfahren, die Klärung der jeweiligen Einzelinteressen (Eigeninteressen) hinter den vorgebrachten Positionen. Die Gruppe der Beteiligten wurde im Rahmen der Vorgespräche in den meisten Fällen auf Vorschlag bereits involvierter Personen um weitere Personen oder Gruppen erweitert. In einer ersten Plenumssitzung wurde im Rahmen der Themensammlung ebenfalls auf Interessen eingegangen. Im diesen Verfahren wurde die inhaltliche Arbeit in unterschiedliche Arbeitskreise aufgeteilt. Die Arbeit in den Arbeitskreisen erfolgte immer themenzentriert in der Abfolge „Positionen Interessen Optionen Lösungen“. Diese Lösungen wurden in jedem Fall im Plenum präsentiert und dort formal beschlossen.

In keinem der hier betrachteten Mediationsverfahren war die Frage, ob mit den Interessen aller am Verfahren beteiligten Personen tatsächlich die Interessen aller Betroffenen Berücksichtigung finden konnten, ein großes Thema. Diese Frage ist jeweils zu Beginn des Mediationsverfahrens besprochen worden. Eine mögliche Kontrollfrage hinsichtlich der Vollständigkeit des Forums war: "Wenn wir uns hier auf eine Lösung einigen - wer könnte diese Lösung im Anschluss an das Mediationsverfahren wieder zu Fall bringen?". Diese Frage ist legitim, um die Umsetzbarkeit einer möglichen Lösung beurteilen zu können. Es ist allerdings sehr fraglich, ob damit eventuell nicht berücksichtigte Interessen erkannt werden können.

5 FAZIT

Sowohl die Ergebnisse der Expertenbefragung als auch meine eigene Erfahrung im Bereich von Mediationen im Öffentlichen Bereich haben gezeigt, dass immer dann, wenn im Rahmen von umwelt- und öffentlichkeitsrelevanten Konflikten unser demokratisches System an Grenzen stößt, Mediation als Rettungsanker ins Spiel gebracht wird. Mediationen haben in der Vergangenheit in vielen dieser Fälle "den

Karren aus dem Dreck geschoben" – auch in Situationen, in denen die Konflikthistorie und das Eskalationsniveau eine konsensuale Lösung als nicht mehr möglich erschienen ließen. Ein Grund dafür ist die Tatsache, dass in Mediationsverfahren die Erarbeitung und Berücksichtigung von Interessen einen zentralen Stellenwert haben und damit die Beteiligten am Verfahren in ihren Bedürfnissen und Ängsten ernst genommen werden. Dies ist, vor allem ab einer gewissen Verfahrensgröße, nur mit Hilfe geeigneter Strukturen und Rückbindungsprozesse möglich.

Es muss jedoch immer beachtet werden, dass selbst bei "optimalen" Mediationsverfahren im öffentlichen Bereich in den meisten Fällen nur ein kleiner Teil der betroffenen Personen am Verhandlungstisch sitzen kann. Damit bekommen die Interessen und Bedürfnisse weniger, engagierter Personen einen zentralen Stellenwert – und diese Interessen müssen sich nicht unbedingt mit den Interessen aller Betroffenen decken. Eine im Konsens im Rahmen eines Mediationsverfahrens im öffentlichen Bereich erzielte Lösung muss nicht zwangsläufig die Interessen und Bedürfnisse aller Betroffenen berücksichtigen. Dieser Umstand muss aus demokratiepolitischer Sicht immer bei der Frage, wie und von wem eine Entscheidung am Ende eines Mediationsverfahrens getroffen werden soll, mitbedacht werden.

Abschließend stellt sich aus meiner Sicht eine zentrale Frage: In welcher Form kann und soll in Zukunft die Methode der Mediation bei umwelt- und öffentlichkeitsrelevanten Konflikten eine Ergänzung zu unserem demokratischen System sein bzw. wie und in welche Richtung soll Mediation weiterentwickelt werden, damit auch aus demokratiepolitischer Sicht tragfähige Lösungen im Interesse aller Betroffenen entstehen können?

6 LITERATUR:

Fisher, R., Ury, W., Patton, B. 1998: Das Harvard Konzept, Frankfurt am Main: Campus Verlag

Kerschner, F., Bergthaler, W., Hittinger H. 2003: Umweltmediation im österreichischen Recht, Grundlagen – Potential – Instrumente, Studie im Auftrag des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien: Schriftenreihe des BMLFUW, Band 4/2003

Lenz, C. 2004: Prozessproviding am Beispiel des Mediationsverfahrens Flughafen Wien, Wien: Verlag Österreich

ÖGUT 2001: Das Handbuch Umweltmediation, eine Publikation der Österreichischen Gesellschaft für Umwelt und Technik (ÖGUT) und des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (BMLFUW), Wien

Oppermann, B., Langer, K. 2000: Umweltmediation in Theorie und Anwendung, Akademie für Technikfolgenabschätzung in Baden-Württemberg, Stuttgart

Zilleßen, H., Troja, M., Meuer, D. 2004: Projektbericht „Mediation im Öffentlichen Bereich – Status und Erfahrungen in Deutschland 1996 – 2002, Oldenburg

UGB-KomE – Umweltgesetzbuch 1998: Entwurf der Unabhängigen Sachverständigenkommission zum Umweltgesetzbuch beim Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, RdU 1998, 154

Internetgestützte Partizipation in der Verkehrsplanung - Beteiligung und Planungsoptimierung

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1 EINFÜHRUNG

Die Autobahnen A 22 und A 39 in Niedersachsen gehören neben der A 14 in Sachsen-Anhalt und der A 94 in Bayern zu den größten deutschen Neubauplanungen von Autobahnen, aber auch zu den kontrovers diskutierten Projekten.

Die zuständige Niedersächsische Landesbehörde für Straßenbau und Verkehr (NLStBV) hat für diese Neubauplanungen Informationsportale eingerichtet (siehe: http://www.strassenbau.niedersachsen.de/ und http://www.kuestenautobahn.info) und die Möglichkeit einer Online-Beteiligung im Rahmen des Raumordnungsverfahrens geschaffen. Im Fall der Küstenautobahn A 22 hat das Niedersächsische Ministerium für den ländlichen Raum, Ernährung Landwirtschaft und Verbraucherschutz die Online-Beteiligung fachlich begleitet und finanziell unterstützt.

Mit internetbasierten Beteiligungsverfahren möchte die Straßenbaubehörde einerseits den neuen gesetzlichen Anforderungen gerecht werden und andererseits die Maßgaben der Landesregierung auf Fachbehördenebene konsequent umzusetzen. Gleichzeitig wird e-Partizipation aber auch als Ansatz verstanden, die Qualität des Planungsprozesses durch eine intensive Beteiligung der Region zu verbessern. Dieser Beitrag zeigt anhand der Linienplanung der Küstenautobahn A 22 und des Raumordnungsverfahrens zur A39 in Niedersachsen, wie eine internetbasierte Beteiligung der Öffentlichkeit erfolgen kann und welche Erfahrungen damit gemacht wurden.

2 RECHTLICHE GRUNDLAGEN DER BETEILIGUNG

Bei den beschriebenen Beteiligungsverfahren handelt es sich um formelle Verfahren, d.h. für die verschiedenen Verfahrensebenen sind unterschiedliche Beteiligungsformen rechtlich bindend vorgeschrieben.

Für Straßenbauprojekte sind in der Regel Planfeststellungsverfahren durchzuführen. Hiefür ist die förmliche Beteiligung von Trägern öffentlicher Belange, Städten und Gemeinden, Betroffenen und auch anerkannten Verbänden vorgeschrieben. Entsprechende Vorschriften finden sich im Verwaltungsverfahrensgesetz [66] oder auch im Umweltverträglichkeitsprüfungsgesetz (UVPG).

Autobahnneuplanungen wie die der A 39 oder der A 22 hingegen, bedürfen darüber hinaus einer vorgeschalteten Linienbestimmung[67]. Daher ist hier vor der eigentlichen Planfeststellung ein Raumordnungsverfahren durchzuführen[68]. Bei einem solchen Raumordnungsverfahren ist die Öffentlichkeitsbeteiligung so geregelt, dass die sogenannten „Verfahrensbeteiligten“ auf der Grundlage geeigneter Unterlagen die Gelegenheit erhalten, innerhalb von zwei Monaten Stellungnahmen abzugeben. Die Planungsunterlagen werden in den betroffen Gemeinden ausgelegt und damit Jedermann die Möglichkeit gegeben, sich gegenüber der Gemeinde zu dem Vorhaben zu äußern[69]. Darüber hinaus ist den so genannten anerkannten Vereinen und Verbänden die Gelegenheit der Einsicht in die bei der zuständigen Behörde vorhandenen Unterlagen zu geben, soweit diese für die Beurteilung der Auswirkungen auf Natur und Landschaft erforderlich sind[70]. Die geäußerten Anregungen und Bedenken werden überprüft und (sofern sie für das Projekt relevant sind) in die Planungsunterlagen eingearbeitet. In einem Erörterungstermin werden alle Anregungen und Bedenken diskutiert. Schließlich erfolgt die Landesplanerische Feststellung des Verfahrens. Dann erst kann die weitere Detail-Planung vorgenommen werden.

[66] vergl. § 72 f. Verwaltungsverfahrensgesetz (VwVfG)
[67] vergl. § 16 Fernstraßengesetz
[68] vergl. Anlage 1 Nr. 8 der Raumordnungsverordnung
[69] vergl. § 15 Nds. Raumordnungsgesetz (NROG)
[70] vergl. § 60a Nds. Naturschutzgesetz (NNatG).

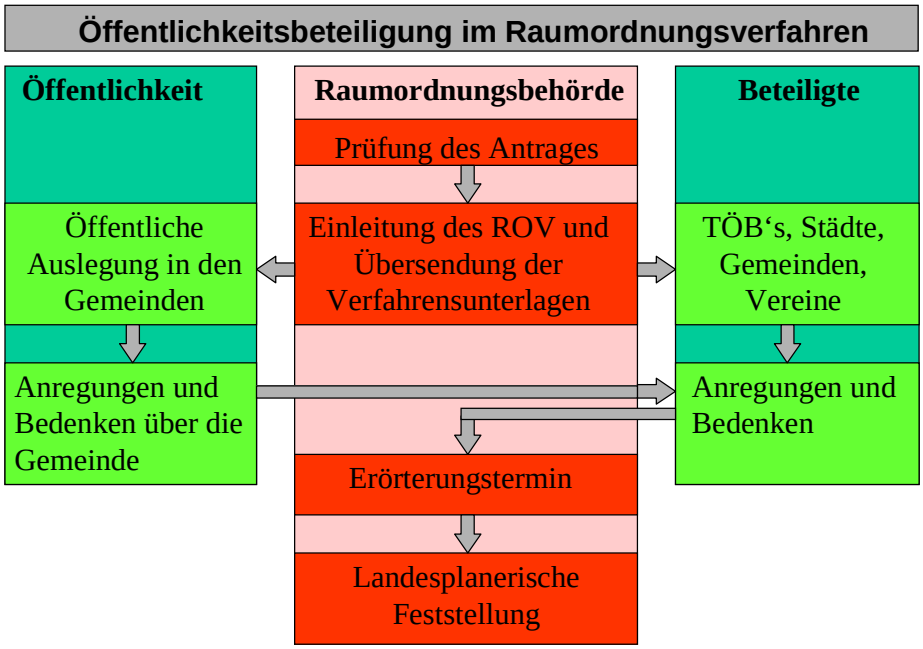

Abbildung 1 zeigt den grundsätzlichen Ablauf der formellen Beteiligung in einem Raumordnungsverfahren. Im Rahmen des Raumordnungsverfahrens muss außerdem eine Umweltverträglichkeitsprüfung (UVP) durchgeführt werden. Hierfür werden in einer so genannten Antragskonferenz der erforderliche Untersuchungsrahmens, die Untersuchungsmethodik und die zu untersuchenden Alternativen erörtert und festgeschrieben.

Neben den im Verwaltungsverfahrensgesetz vorgesehenen Beteiligungsverfahren muss bei Vorhaben mit einem hohen Konfliktpotential mit der Umwelt in immer stärkerem Maße auch den Anforderungen des Umweltinformationsgesetzes Rechnung getragen werden.

2.1 Umweltinformationsgesetz

Mit der EU-Umweltinformationsrichtlinie[71] wird die erste der drei Säulen der sogenannten „Aarhus-Konvention“[72] umgesetzt. Diese drei Säulen sind:

- Zugang zu Informationen,
- Öffentlichkeitsbeteiligung an Entscheidungsverfahren und
- Zugang zu Gerichten in Umweltangelegenheiten.

Diese Konvention soll durch eine höhere Transparenz und Kontrolle von Verwaltungsentscheidungen sowie durch eine verbesserte Partizipation der Öffentlichkeit einen Beitrag zum Schutz der Umwelt und zur Verbesserung der Umweltqualität leisten. Planungen und Entscheidungen im Bereich der Umwelt sollen künftig nachvollziehbarer werden und die Mitwirkungsrechte der Bürgerinnen und Bürger verbreitert und vertieft werden. Der Informationszugang wird erweitert und den Möglichkeiten der modernen Informationstechnologie angepasst. Die Beteiligungsrechte der Öffentlichkeit an umweltrelevanten Genehmigungs- und Planungsentscheidungen werden damit entscheidend gestärkt.

Die Bestimmungen der EU-Umweltinformationsrichtlinie wurden für die Bundesbehörden durch das Umweltinformationsgesetz (UIG)[73] umgesetzt. Zu den neuen Regelungen im UIG gehören insbesondere die Ausweitung des Behördenbegriffs auf alle Bundesbehörden sowie auf bestimmte private Stellen, soweit diese öffentliche Aufgaben im Zusammenhang mit der Umwelt erbringen und unter der Kontrolle von

[71] EU-Richtlinie 2003/4/EG vom 28. Januar 2003

[72] Die Aarhus-Konvention ist das am 25. Juni 1998 unterzeichnete und am 30. Oktober 2001 in Kraft getretene UN/ECE-Übereinkommen

[73] Gesetz zur Neugestaltung des Umweltinformationsgesetzes (UIG) vom 22. Dezember 2004

Bundesbehörden stehen. Darüber hinaus wurde die Definition des Begriffes „Umweltinformationen“ erweitert und die bestehenden Ausnahmegründe eingeschränkt. Des weiteren wurde die Pflicht formuliert, durch den Einsatz moderner Informationstechnik sowie die aktive und systematische Verbreitung von Umweltinformationen durch die Behörden, den Informationsfluss zu verbessern.

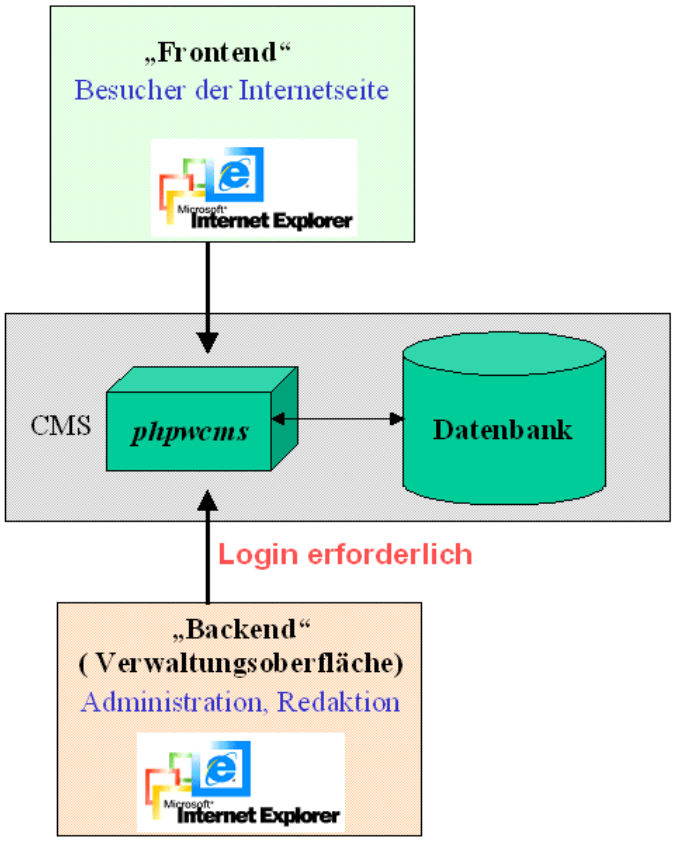

Abbildung 2: Grundsätzliche Funktionsweise eines Content Management Systems

Damit sind die Regelungen zum Informationszugang natürlich auch für die anstehenden Raumordnungsverfahren zu beachten. In der Konsequenz bedeutet dieses Gesetz, dass Jedermann unabhängig davon, ob er betroffen ist oder nicht, Unterlagen anfordern kann, die im Zusammenhang mit einem Vorhaben stehen und aus denen Aussagen über die Umweltauswirkungen des Vorhabens ableitbar sind. Durch die erweiterte Definition des Begriffes der „Umweltinformation“ werden nur wenige Unterlagen davon auszuschließen sein. Angesichts dieser umfassenden rechtlichen Anforderungen sind Öffentlichkeitsbeteiligungsverfahren im Grunde genommen nur noch unter Ausnutzung aller verfügbaren technischen Hilfsmittel, insbesondere durch entsprechende internetbasierte Verfahren durchführbar.

3 INFORMATIONSVERMITTLUNG

Zu Beginn des Jahres 2005 hat die NLStBV damit begonnen, bereits erarbeitete Planungs-Informationen für die A 22 und die A 39 im Internet für die Öffentlichkeit bereit zu stellen. Für die A 39, deren Planungsarbeiten zu diesem Zeitpunkt bereits sehr weit fortgeschritten waren, wurden daher auf der Homepage der NLStBV die aktuellen Planungsdokumente zum Download bereit gestellt.

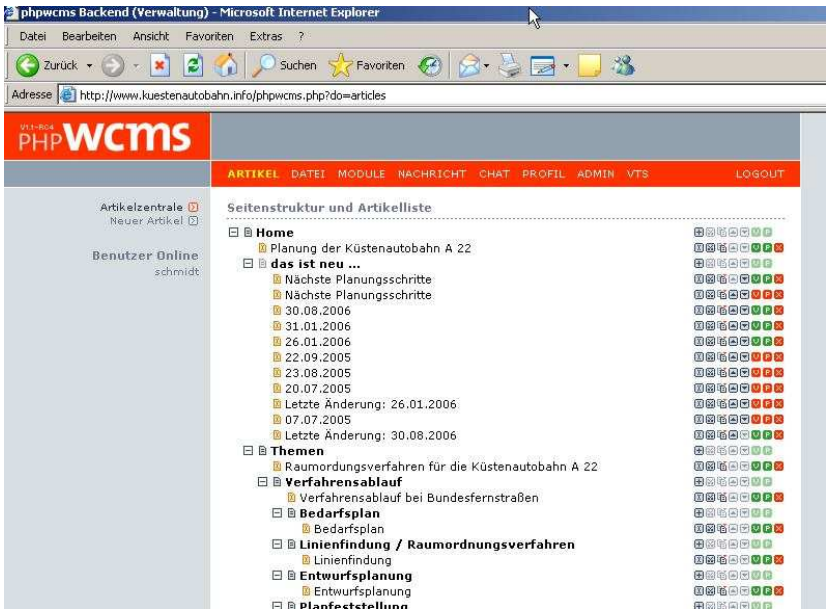

Abbildung 3: Frontend: Informationsportal *kuestenautobahn.info*

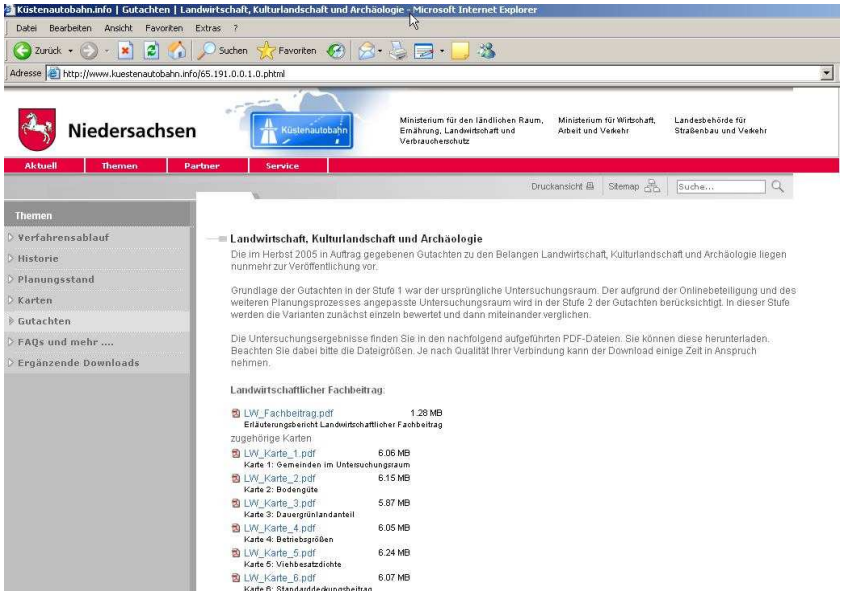

Abbildung 4: CMS Redaktions-Backend

Für die A 22 hingegen hatten die Planungen gerade erst begonnen (Auftragsvergabe der UVS I). Daher wurde hier ein anderer Weg beschritten, um die Informationen öffentlich zu machen. Es wurde ein eigenes Internetportal (vergl. Abb. 3) unter der Domain http://www.kuestenautobahn.info eingerichtet. Im Vorfeld fanden intensive Abstimmungen hinsichtlich des Designs und der Inhalte der Seite statt. Ziel war es, das landeseinheitliche Erscheinungsbild zu gewährleisten und neben den projektbezogenen Informationen auch grundsätzliche Informationen zum Planungs- und Verfahrensablauf von Bundesfernstraßenplanungen zu geben.

Da für eine attraktive Website eine laufende und zeitnahe Aktualisierung der Inhalte unerlässlich ist, wurde dieses Portal mit Hilfe eines Content Management Systems (CMS) aufgebaut (vergl. Abb. 2) [74]. Die Mitarbeiter der NLStBV wurde soweit geschult, dass sie das Eingeben neuer Informationen und Dokumente, das Einstellen neuer Seiten, Strukturänderungen u.Ä. über das Redaktions-Backend (vergl. Abb. 4) selbst vornehmen können. Durch einen im CMS integrierten Newsletter werden die Beteiligten laufend über neue Informationen, Ergebnisse oder Gutachten informiert. Die Dokumente wurden zunächst zum Download für

[74]Die Plattform wurde von der Fa. *entera* (www.*entera*.de) aus Hannover auf der Basis des OpenSource CMS „phpwcms“ (www.phpwcms.de) realisiert.

Jedermann angeboten. In einem zweiten Schritt wurde eine vorgezogene unverbindliche Beteiligung für die registrierten Institutionen durchgeführt (s.u.).

Die Gruppe der Beteiligten umfasst dabei alle Träger Öffentlicher Belange, also auch alle Bürgerinitiativen, unabhängig von ihrer inhaltlichen Ausrichtung.

Für beide Vorhaben wurde beschlossen, ergänzend zum Internetportal eine Online-Beteiligung im Raumordnungsverfahren durchzuführen. Für die A 39 ist die Beteiligung im Raumordnungsverfahren abgeschlossen, für die A 22 ist die Einleitung des Raumordnungsverfahrens für Mitte 2007 vorgesehen.

4 VORGEZOGENE UNVERBINDLICHE BETEILIGUNG

Für die Küstenautobahn A 22 wurde das Instrument der internetgestützten Beteiligung schon vor dem eigentlichen Raumordnungsverfahren bei der Entwicklung des zu untersuchenden Variantenspektrums eingesetzt und erprobt. Neben der laufenden Information aller Interessierten über das Portal kuestenautobahn.info sowie den Newsletter wurde mit Hilfe der Plattform Beteiligung-Online[75] eine vorgezogene unverbindliche Beteiligung internetgestützt realisiert.

Mit dieser frühzeitigen Online-Beteiligung waren zwei Zielsetzungen verbunden: Einerseits sollte die Technik publik gemacht werden und die Arbeit damit eingeübt werden. So konnten ggf. auftretende (Akzeptanz-)Probleme im Vorfeld des offiziellen Beteiligungsverfahrens erkannt und gelöst werden. Andererseits war es ein erklärtes Ziel, möglichst frühzeitig zu einem auf fachlichen Grundlagen entwickelten Variantenspektrum Anregungen und Hinweisen zu besonderen und ggf. auch noch nicht bekannten Problemen und Konflikten zu bekommen, um dieses Variantenspektrum zu optimieren zu können. Damit verbunden war das Interesse, einen transparenten Planungsprozess zu erreichen, in dem frühzeitig Informationen weitergeben werden, gleichzeitig aber auch Hinweise und Anregungen aus der Region eingebunden werden.

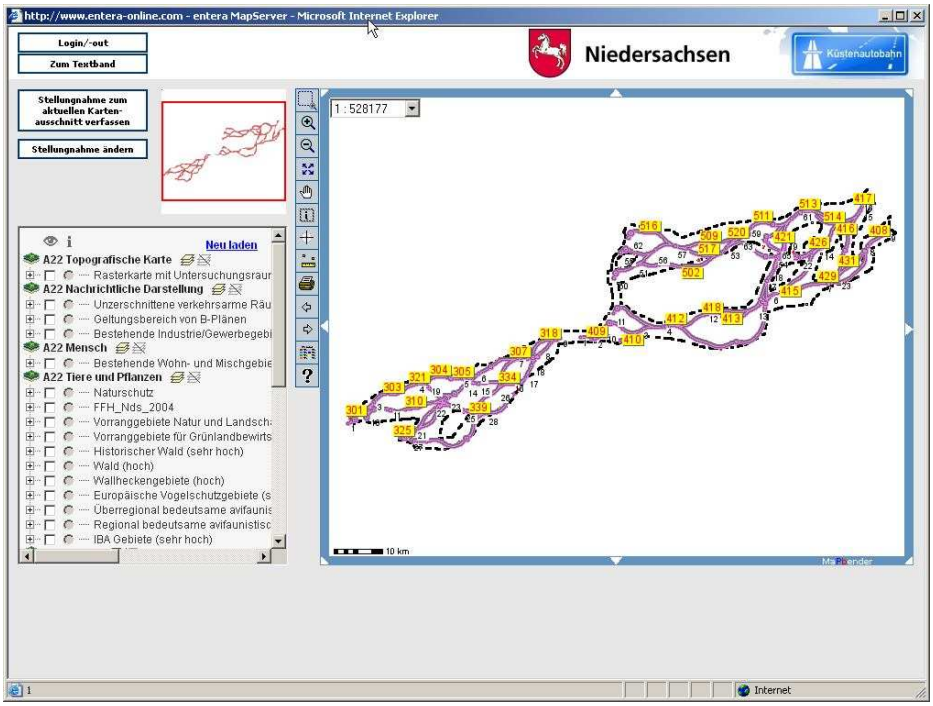

Abbildung 5: Kartendarstellung in der Online-Beteiligung zur A 22

In mehreren Informationsveranstaltungen mit den Vertretern der beteiligten Städte und Gemeinden, Träger öffentlicher Belange und Verbände wurde das Variantenspektrum in der Region vorgestellt und die Möglichkeiten der Online-Beteiligung erläutert.

[75] *Beteiligung-Online* wurde von *entera* für formelle Beteiligungsverfahren entwickelt. Insbesondere solche Verfahren, die auf umfangreiches Kartematerial zurück greifen müssen, werden durch die MapServer-basierte Anwendung optimal unterstützt.

Der Vorteile von Beteiligung-Online bestehen darin, dass die erforderlichen drei Schritte eines Beteiligungsverfahrens (Informationsbereitstellung, Einwendungserstellung, Abwägung/Beschlussfassung) damit in einer einheitlichen Umgebung ausgeführt werden können. Neben den Texten können beliebig große Karten direkt am Bildschirm visualisiert werden und stehen blattschnittfrei zur Verfügung. Alle Anregungen und Hinweise können direkt am Bildschirm erstellt werden, wobei der inhaltliche und räumliche Bezug erhalten bleibt. Auf der Verwaltungsoberfläche bestehen umfangreiche Bearbeitungs- und Auswertemöglichkeiten, die den Abwägungsprozess effizient unterstützen und dadurch verkürzen.

Den ca. 200 beteiligten Behörden (Landkreise, Städte, Samtgemeinden, Gemeinde) und sonstigen Trägern öffentlicher Belange sowie Naturschutzverbänden und Bürgerinitiativen wurde ein individueller Zugang eingerichtet. Dazu wurden jedem Beteiligten die entsprechenden Zugangsdaten auf dem Postweg übermittelt, der Verteiler wurde mit der Regierungsvertretung Lüneburg als zuständige Raumordnungsbehörde abgestimmt. Weiteren Bürgerinitiativen, die sich zwischenzeitlich bildeten, wurde auf schriftliche Anfrage hin ergänzend ebenfalls ein Zugang ermöglicht.

Die abgegebenen Anregungen und Hinweise wurden von der NLStBV jedoch nicht unmittelbar beantwortet, sondern bei der weiteren Planung entsprechend gewürdigt und berücksichtigt.

5 ERFAHRUNGEN MIT DER ONLINE-BETEILIGUNG

Im Vorfeld der Beteiligung musste zunächst „Überzeugungsarbeit“ bei der zuständigen Raumordnungsbehörde geleistet werden. Eine anfängliche Skepsis hinsichtlich der vorgezogenen unverbindlichen Beteiligung, die als nicht zwingend erforderlich und besser im Raumordnungsverfahren durchzuführen angesehen wurde, wich im Laufe der Planung. Durch eine intensive Vorstellung der Möglichkeiten der Online-Beteiligung und des gemeinsamen Nutzens in der zukünftigen Sichtung und Bearbeitung von Stellungnahmen konnten diese anfänglichen Bedenken ausgeräumt werden, auch wenn im Gegensatz zum Raumordnungsverfahren (vgl. Abbildung 1) die NLStBV und nicht die Raumordnungsbehörde die Beteiligung durchführt. Dies war zu diesem Zeitpunkt durchaus sachgerecht, weil die gesamtplanerische Vorzugslinie zunächst vom Antragsteller entwickelt und geplant wird. Der Raumordnungsbehörde wurde neben der Möglichkeit zur eigenen Stellungnahme auch die Möglichkeit eingeräumt, alle eingehenden Stellungnahmen zu sichten, so dass immer der gleiche Informationsstand gewährleistet war.

5.1 Nutzung des Online-Angebots für die A22

Von der Einrichtung des Portals www.kuestenautobahn.info im Frühjahr 2005 bis zum August 2006 erfolgten über 46.000 Zugriffe auf diese Seite. Ein deutlicher Schwerpunkt der Nutzung lag zu Beginn des Jahres 2006 (vgl. Abbildung 6), weil Ende Januar 2006 das NLSTBV das aus seiner Sicht zu untersuchende Variantenspektrum und die Ergebnisse der UVS Stufe I ins Netz gestellt hat.

Das Ergebnis der Online-Beteiligung hingegen stellt sich heterogen dar. Während die Online-Beteiligung im Rahmen der A 22 von einigen Beteiligten sehr intensiv genutzt wurde, haben viele andere diese Möglichkeit gar nicht genutzt. In der Zeit von Februar 2006 bis August 2006 wurde die Seite ca. 1800 mal besucht, wobei der monatliche Schwerpunkt auch hier im Monat Februar mit 965 Besuchen lag (vgl. Abbildung 7). Von insgesamt 85 Kommunen beteiligten sich 28 online und gaben insgesamt ca. 310 Stellungnahmen ab. Die Nutzung erfolgte teilweise sehr intensiv. Vier Städte/Kommunen gaben zwischen 10 und 20 Stellungnahmen ab, drei Kommunen sogar über 50 Stellungnahmen. Von 60 Trägern öffentlicher Belange beteiligten sich 9 online mit ca. 76 Stellungnahmen, wobei sich insbesondere die Landwirtschaft intensiv beteiligt hat. Die Beteiligung der Naturschutzverbände und Bürgerinitiativen fiel eher gering aus. Während die anerkannten Vereine die Online-Beteiligung kaum nutzten, gingen von den 10 Bürgerinitiativen insgesamt 67 Stellungnahmen ein.

Alle Stellungnahmen wurden ausgewertet und nachträglich mit zusätzlichen Schlagworten versehen. Ergänzend wurden alle analog eingegangenen Stellungnahmen mit Linienrelevanz in das System eingepflegt, um alle Stellungnahmen in einem Medium vorhalten zu können.

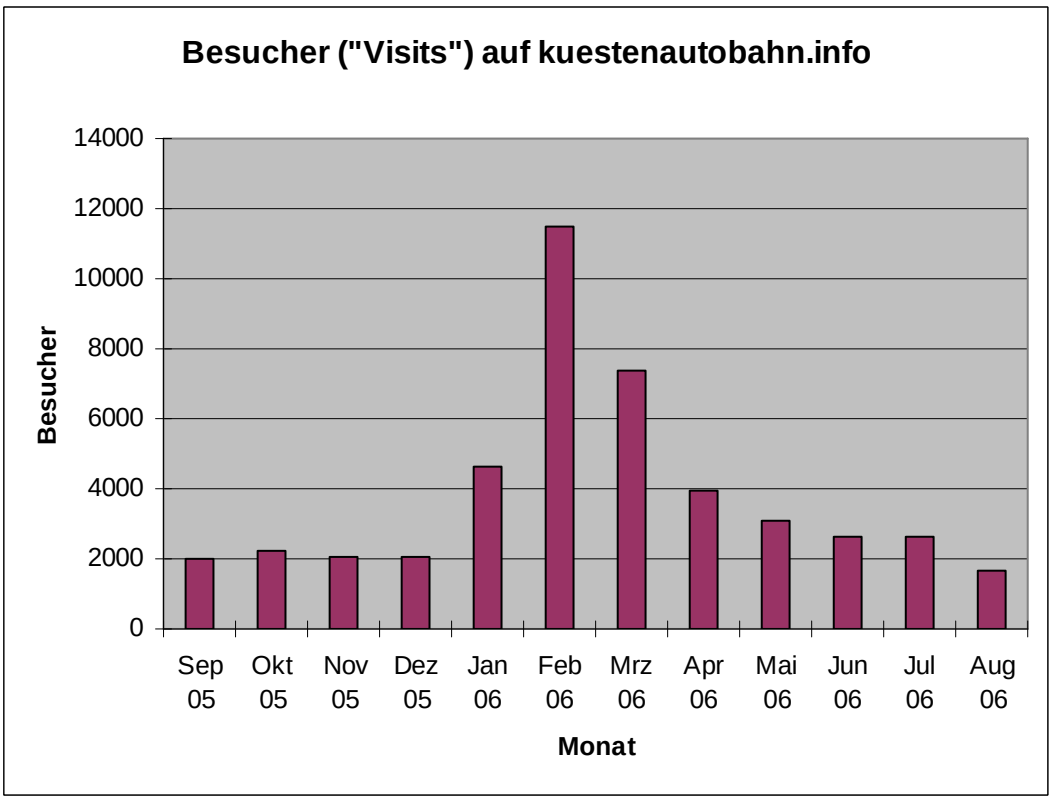

Abbildung 6: Häufigkeitsverteilung der Zugriffe auf das Portal kuestenautobahn.info

Trotz der ausdrücklichen Hinweise, dass die in dieser Stufe gewünschten Anregungen und Hinweise nicht mit den offiziellen Stellungnahmen in dem sich anschließenden Raumordnungsverfahren zu verwechseln sind, ist einigen Beteiligten und der Öffentlichkeit diese Unterscheidung nicht leicht gefallen. Viele Private haben z.B. schriftliche Einwände, Einsprüche, Stellungnahmen, Unterschriftenlisten und Briefe mit persönlichen Betroffenheiten eingereicht, die für das Verfahren nur teilweise von Bedeutung waren.

Bei der Online-Beteiligung hat es sich bewährt, dass die Stellungnahmen einzelnen Abschnitten zugeordnet wurden. Bei der Bearbeitung der Stellungnahmen war auszufüllen, auf welchen Steckenabschnitt sich die Anregung bezieht. Dadurch konnte neben der Möglichkeit der graphischen Bearbeitung von Kartenausschnitten für den Beteiligten die räumliche Zuordnung im Vergleich zu anderen Verfahren erheblich verbessert werden.

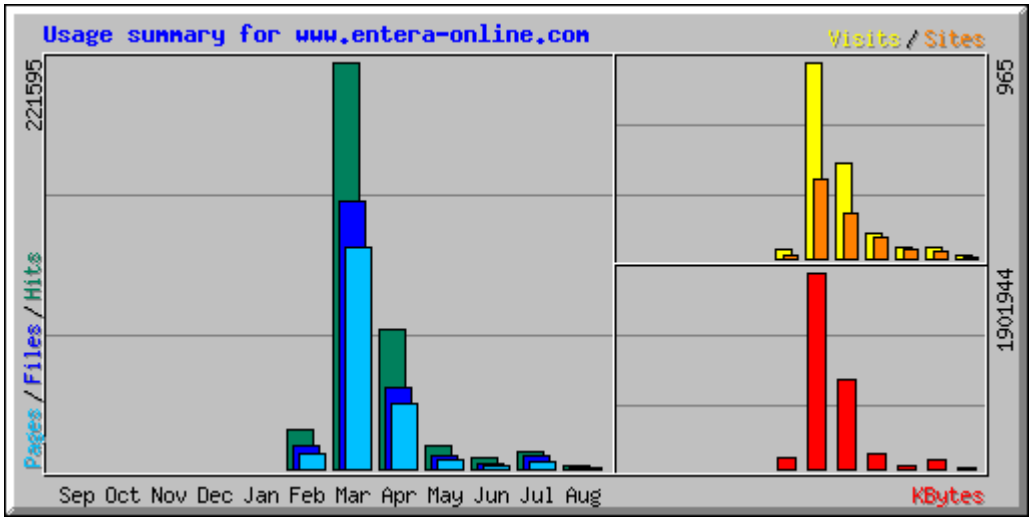

Abbildung 7: Nutzung der Online-Beteiligung für die A 22

Von einigen Beteiligten wurde positiv vermerkt, dass für die Online-Beteiligung ein relativ geringer Bedarf an technischer Ausstattung und Leistungsfähigkeit des Nutzer-PC erforderlich ist. Bei größeren PDF-Dateien

innerhalb des Internetportals bestand dagegen immer wieder das Problem der langen Download-Zeiten und teilweise auch der Kapazitäten der vorhandenen Rechner.

Im Falle der A 22 wurden die Möglichkeit der Online-Beteiligung auf mehreren Informationsveranstaltung erläutert und an Beispielen demonstriert. Die Beteiligung zu so einer frühen Phase der Planung war auch dafür gedacht, den Umgang mit dem Medium einzuüben und ggf. vorhandene Schwächen bei der formellen Verfahrenbeteilung im Raumordnungsverfahren zu beseitigen. Im eigentlichen Raumordnungsverfahren wird sich zeigen, inwieweit diese Zielsetzung erreicht wurde.

5.2 Nutzung der Online-Beteiligung für die A39

Bei der Online-Beteiligung der A 39 im Raumordnungsverfahren wurden innerhalb der von der Raumordnungsbehörde gesetzten Frist fast 10.000 Stellungnahmen abgegeben, davon allerdings nur sechs online.

Dies hat verschiedene Ursachen. Der Auftrag zur Erstellung der Online-Beteiligung und eines Digitalen Planungsordner auf DVD bzw. CD-ROM konnte erst wenige Wochen vor der offiziellen Einleitung des Raumordnungsverfahrens erteilt werden. Auf Grund des großen Umfangs[76] der Unterlagen und dem damit verbundenen zeitlichen Aufwand bei der Umsetzung für die Online-Beteiligung konnte die Online-Beteiligung jedoch erst ca. drei Wochen nach Beginn des Verfahrens freigeschaltet werden. Daher wurde von der Raumordnungsbehörde der herkömmliche, analoge Weg der Beteiligung in den Vordergrund gestellt.

Das Instrument der Online-Beteiligung wurde in diesem geografischen Raum und insbesondere für ein Raumordnungsverfahren im Autobahnneubau erstmals eingesetzt. Aufgrund des geringen Vorlaufs, der nicht vorhandenen Vorbereitung der Beteiligten und der fehlenden begleitenden Öffentlichkeitsarbeit bestand bei den Beteiligten eine gewisse Unsicherheit und Skepsis hinsichtlich Benutzung, Sicherheit und Rechtsverbindlichkeit bei der Nutzung des digitalen Verfahrens. Wie sich in anderen Online-Beteiligungsverfahren gezeigt hat, ist gerade beim erstmaligen Einsatz eine intensive und wiederholte Öffentlichkeitsarbeit auf verschiedensten Kommunikationskanälen unerlässlich, um eine entsprechende Resonanz und Benutzung dieses neuartigen Instrumentes zu erzielen.

6 BEWERTUNG UND AUSBLICK ZUR ONLINE-BETEILIGUNG

Die bisherigen Ergebnisse der Öffentlichkeitsbeteiligung über Internetportale und Online-Beteiligung sind als positiv zu bewerten, wenngleich der Umfang Nutzung der Online-Beteiligung noch steigerungsfähig ist.

Zusammenfassend werden von der NLStBV folgende Vorteile gesehen:

- Die Online-Beteiligung führte zu einer Verbesserung der Qualität der Planung durch ein frühes Erkennen von Problemen und damit zu einer Verbesserung der Planungssicherheit
- Durch die umfassende und komfortable Bereitstellung aller Planungsunterlagen im Internet konnte beim Raumordnungsverfahren zur A 39 die Anzahl der analogen Exemplare um ca. 40 % reduziert werden und damit die Reproduktionskosten insgesamt deutlich gesenkt werden.
- Die Akzeptanz für die Planung wurde durch die Online-Beteiligung erhöht, da es als unverbindliches Verfahren und Ergänzung des Verwaltungsverfahrens zu einem Zeitpunkt, an dem noch keine Entscheidung gefallen ist, durchgeführt wurde.
- Die Online-Beteiligung führt zu einer Vereinfachung und Systematisierung der Bearbeitung und Auswertung von Stellungnahmen.
- Der räumliche Bezug und die Qualität der Aussagen wurden im Vergleich zu konventionellen Verfahren deutlich verbessert
- Das Internetportal trägt erheblich zu einer sachgerechte und praktikablen Umsetzung der Anforderungen aus dem Umweltinformationsgesetz bei.

[76] Ein analoges Exemplar bestand aus 33 Aktenordnern mit rund 3.500 Seite Text sowie 350 großformatigen Karten.

- Die Bearbeitung von Stellungnahmen wird durch das datenbankbasierte System erheblich vereinfacht und beschleunigt, da beliebig viel Mitarbeiter gleichzeitig auf die Daten zugreifen können.
- Bei vielen Anfragen konnte zunächst auf die Informationen des Internetportals verwiesen werden. Damit konnte in der überwiegenden Zahl der Fälle das Informationsbedürfnis befriedigt werden.
- Im Vergleich zur üblichen Datenbereitstellung mittels PDF-Downloads ist die Online-Präsentation der Daten um ein Vielfaches schneller.

Da die Planungsgrundlagen bei größeren Verfahren in der Regel digital bearbeitet werden, ist der zusätzliche Aufwand der Bereitstellung in Form einer Plattform oder einer zusätzlichen Aufbereitung im Rahmen einer Online-Beteiligung mit vergleichsweise geringen Kosten umsetzbar. Für Einrichtung, Betrieb und Wartung der Online-Beteiligung sind je nach Dauer und Umfang des Verfahrens mit Kosten zwischen 10.000 und 20.000 € zu kalkulieren. Diese konnten im Falle der A 39 durch die eingesparten Papierexemplare mehr als kompensiert werden.

6.1 Formale Anforderungen

Grundsätzlich sind an eine Online-Beteiligung im Raumordnungsverfahren einige formale Anforderungen zu stellen. Insbesondere muss die Rechtssicherheit bei der Abgabe von Stellungnahmen im Raumordnungsverfahren sichergestellt werden. Das gilt zum Einen für die eindeutige Zuordnung der jeweiligen Stellungnahmen zu einem Absender und damit dem Ausschluss eines Missbrauches, zum Anderen auch hinsichtlich technischer und datenschutzrechtlicher Anforderungen (z.B. zur etwaigen Erfassung und Verarbeitung personenbezogener Daten für eine Auswertung elektronisch abgegebener Stellungnahmen).

Folgende formelle Anforderungen sind ausdrücklich zu benennen bzw. zu berücksichtigen:

- Gegenstand des Verfahrens und Übersicht der Unterlagen, die einsehbar sind
- Möglichkeit der Äußerung
- Zeitraum der Äußerungsmöglichkeit
- Form und Ort der Einsichtnahme in die Unterlagen und der Äußerung
- vollständige und übersichtliche Darstellung der Inhalte (Texte und Karten)
- leichte Orientierung
- Nachvollziehbar von Datenverarbeitungsabläufe für die Nutzer

Diese formalen Anforderungen wurden von der verwendeten Anwendung Beteiligung-Online vollständig realisiert.

6.2 Rechtssicherheit der Karten-Darstellung

Die eingesetzte Technik des MapServers erlaubt sehr komfortable und variable Darstellungsmöglichkeiten des umfangreichen Kartenmaterials. Dies ist zum inhaltlichen Verständnis der Planungsaussagen sehr hilfreich, kann jedoch im Zusammenhang mit einem Raumordnungsverfahren, welches ein hohes Maß an Rechtssicherheit gewährleisten muss, zu gewissen Problemen führen. da damit die Papier-Karten und die Karten im MapServer nicht mehr zwangsläufig identisch sind.

Sofern sich Beteiligte aus verschiedenen „Darstellungsebenen“ mit unterschiedlichen Elementen selbst Karten zusammenstellen können oder müssen, kann ggf. der Gegenstand des Verfahrens unklar werden und damit keine rechtlich einwandfreie Beteiligung mehr gewährleistet sein.

Von Bedeutung ist ferner, dass auf der Plattform für das „offizielle“ Beteiligungsverfahren nur die Unterlagen eingestellt werden, die tatsächlich Gegenstand der Anhörung sind (Übereinstimmung mit den zu übersendenden bzw. auszulegenden Unterlagen). Es darf hier keine Mischung mit zusätzlichen Hintergrundinformationen erfolgen, die als reine Service-Leistung für die Behörden oder die Öffentlichkeit verfügbar gemacht werden.

Aus diesen Gründen wurden beim Raumordnungsverfahren zur A 39 die Karten ausschließlich als unveränderbare Rasterdaten im MapServer visualisiert. Dieses Verfahren wird auch beim Raumordnungsverfahren zur Küstenautobahn Anwendung finden.

Insgesamt wurde die Vorgehensweise auch von den Beteiligten als positiv gewertet, wie z.B. folgende Meldung der Kreiszeitung Wesermarsch, vom 19. Februar 2005 dokumentiert:

Ein Novum wird auch die geplante Transparenz im Verlauf des Planungsverfahrens: „Das hat es in dieser Form noch nicht gegeben“, betonte Astrid Vockert, die auch Vizepräsidentin des Niedersächsischen Landtages ist. Denn jeder Planungsschritt wird vom Ministerium bereits im Internet (www.kuestenautobahn.info) veröffentlicht, das im weiteren Verfahrensverlauf auch als Plattform für Anregungen oder Einwendungen genutzt werden soll. Zu mehr Transparenz gehört zudem, dass „Verbände und Institutionen schon sehr frühzeitig in die Planungen eingebunden werden und nicht erst im Laufe der Prüfungs- und Genehmigungsverfahren“, so Astrid Vockert. „Wir wollen ihren Sachverstand nutzen.“ So findet am Montag, 14. März, eine Info-Veranstaltung mit Naturschutzverbänden im Kreishaus in Cuxhaven statt. Dort hatte bereits vor einigen Tagen die Landesbehörde für Straßenbau und Verkehr den sogenannten Trägern öffentlicher Belange die Planungen vorgestellt. Aus der Wesermarsch waren unter anderem Stadlands Bürgermeister Boris Schierhold und der Baudirektor des Landkreises Wesermarsch, Rolf-Gerhard Lange, vertreten.

🏆 *reviewed paper*

Europäische Siedlungsstrukturvergleiche auf Basis von CORINE Land Cover – Möglichkeiten und Grenzen

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1 PROBLEMSTELLUNG UND ZIEL

Weltweit beobachten Umwelt- und Planungswissenschaftler einen anhaltenden Urbanisierungsdruck und einen damit verbundenen Verlust von natürlichen Böden und belastungsarmen Landschaftsräumen (BENTO 2003; EEA 2006; LI u. SUN 2003). Die fortschreitende Bodenversiegelung wird inzwischen als Schlüsselindikator und zentrales Problem der nachhaltigen Entwicklung anerkannt (SCHULTZ & DOSCH 2005, S.5). Die Siedlungsfläche wächst in vielen Ländern jährlich um etwa 1 bis 1,5 %. Im Jahr 2003 lag die Zunahme der Siedlungs- und Verkehrsflächen (SuV) in Deutschland bei 93 ha pro Tag (Umwelt-Barometer, UBA). Der Siedlungs- und Verkehrsflächenanteil der europäischen Länder fällt dabei sehr unterschiedlich aus und beträgt zwischen 20,1 % in Belgien und 1,2 % in Lettland. Bisher waren solche Länder- und Regionenvergleiche allerdings durch das Fehlen von einheitlichen Erhebungsmethoden und Statistiken erschwert.

Für eine nachhaltige Entwicklung muss der wachsende Flächenverbrauch zurückgedrängt werden. Ein Vergleich der Flächennutzungsstruktur und insbesondere der Siedlungsstruktur europäischer Länder bietet dafür wichtige Ausgangsinformationen. Das EU-Projekt MURBANDY (Monitoring Urban Dynamics), später MOLAND (Monitoring Land Use/Cover Dynamics), zeichnete die Veränderung der Landnutzung in jeweils 4 Zeitschnitten über einen Zeitraum von 50 Jahren auf, allerdings nur für 29 ausgewählte europäische Großstädte (EEA 2006, LAVALLE et. al. 2002). Eine flächendeckende Aufnahme Europas bietet erstmals CORINE Land Cover (CLC). Dieser Vektor-Datensatz der Flächenbedeckung und –nutzung wurde für alle EU-Länder, für Beitrittskandidaten und für einige weitere Länder für die Erhebungszeitpunkte 1990 und 2000 erarbeitet. Außerdem wurde die Flächennutzungsänderung innerhalb dieses Zeitraumes erfasst (HEYMANN et. al., 1994).

Anhand von Daten aus CLC ist es möglich, die Flächennutzungsstruktur europäischer Länder raum-zeitlich zu vergleichen und ihre Entwicklung gegenüber zu stellen. Dieses ist Inhalt der vorliegenen Arbeit, wobei der Schwerpunkt der Betrachtungen auf der Entwicklung der Siedlungsfläche liegt. Verschiedene Indikatoren werden flächendeckend für Europa auf NUTS3-Ebene und für Deutschland, Frankreich und England/Wales auf LAU2-Ebene (Gemeinde) berechnet und in Kartenform visualisiert. Die Landnutzungsdaten werden in Zusammenhang gestellt mit statistischen Daten zur Bevölkerungsgröße und Wirtschaftskraft. Die Analyseergebnisse sollen zeigen, wie sich der Flächenverbrauch in den einzelnen Länder verhält und inwieweit sich Erkenntnisse aus der Verknüpfung der Flächennutzungsdaten mit demographischen bzw. ökonomischen Daten der Statistik ziehen lassen. Dabei werden auch die Möglichkeiten und Grenzen der CLC-Daten für derartige Betrachtungen reflektiert.

Die vollständigen Ergebnisse der Studie einschließlich einer Kartenserie aller Indikatoren für die europäischen Länder im Maßstab 1 : 6 000 000 wird in SCHUBERT (2007) dargestellt.

2 CORINE LAND COVER - DATENGRUNDLAGE UND METHODIK

Das Projekt CORINE Land Cover und seine Ergebnisdaten wurden schon wiederholt auch auf der CORP vorgestellt (STEINNOCHER et. al. 2006, MEINEL, HENNERSDORF 2002). Ziel von CORINE Land Cover (CLC) ist eine einheitliche Erfassung der Bodenbedeckung bzw. Landnutzung auf europäischer Ebene. Die Daten sollen der Umwelt-und Ressourcenplanung dienen. Durch CLC werden erstmals homogene Daten für die EU und einige weitere Länder bereitgestellt. IMAGE2000 lieferte die orthorektifizierten Satellitenbilder als einheitliches Mosaik für alle Teilnehmerländer, die die Grundlage für CLC2000 bilden. Damit wurde eine erhebliche Verbesserung gegenüber der Datengrundlage für CLC1990 erreicht (KEIL et al. 2003, S.1f.).

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Am CORINE Land Cover-Projekt haben alle EU-Staaten und die PHARE–Länder teilgenommen, wobei für einige Länder nicht alle CLC-Daten vorhanden sind, z. B. liegt für Liechtenstein nur CLC2000, die Schweiz lediglich CLC1990 vor, wobei hier die Nomenklatur nur bis zur zweiten Ebene geführt wurde. Eine weitere Sonderstellung haben Albanien, Bosnien-Herzegowina und Mazedonien. Bei diesen Ländern ist keine einheitliche Qualität gesichert, weil sie nicht den strengen Regeln von CLC2000 unterlagen.

Während die CLC2000-Daten in Vektor- und Rasterformat vorliegen, sind die CLC1990-Daten nur im Rasterformt mit 100 m und 250 m Rasterauflösung erhältlich. Der Datensatz der Flächennutzungsänderungen (CLC-Change) ist im Vektor- und Rasterformat erhältlich. Zu beziehen sind die Daten über die Europäische Umweltagentur EEA (http://dataservice.eea.europa.eu). Lediglich die deutschen und österreichischen Daten sind nur gesondert beim Deutschen Zentrum für Luft- und Raumfahrt (DLR) bzw. beim österreichischen Umweltbundesamt erhältlich.

CLC wurde mit einheitlichen Aufnahmemethoden erhoben, damit eine homogene Datengrundlage entsteht. Der Maßstab beträgt 1:100 000. Dabei gilt für alle aufzunehmenden Flächen eine Mindestgröße von 25 ha. Die CLC – Nomenklatur unterteilt sich in drei Ebenen, wobei auf der dritten Ebene 44 Klassen unterschieden werden. Die erste Ebene kennzeichnet die Hauptlandnutzungsklassen, die zweite Ebene ist für Maßstäbe von 1:500 000 bis 1:100 000 und die dritte Ebene für den Maßstab 1:100 000 geeignet (FERANEC et al. 2005, S.3). Einzelne Länder wie Estland, Finnland, Irland, Italien, Luxemburg und Portugal haben die Nomenklatur um weitere Ebenen ergänzt. Bei CLC1990 erfolgte die Aufnahme im wesentlichen zwischen 1986 und 1995, bei CLC2000 zwischen 1999 und 2001. Damit sind die Daten von 1990 wesentlich ungenauer und schwerer vergleichbar (EEA 2000, S. 4).

Die einheitliche Datengrundlage für CLC2000 lieferte das Satellitenbildmosaik IMAGE2000. Dadurch wurden bei CLC2000 gegenüber CLC90 wesentliche Genauigkeitsverbesserungen erreicht. Die wesentlichen Unterschiede von CLC2000 gegenüber CLC1990 sind in Tabelle 1 aufgeführt.

Anforderungen	**CLC1990**	**CLC2000**
zeitliche Genauigkeit	1990 +/-5 Jahre (1986 – 1995)	2000 +/-1 Jahr (1999-2001)
Erstellung	Photointerpretation mit Hilfe von Folien	Bildschirmdigitalisierung, in Einzelfällen Sat.bildklassifikation
geometrische Genauigkeit der Sat.bilder Thematische Landnutzungsdaten	100 m 150 m	25 m 100 m
Aufnahmezeit (Projektdauer)	10 Jahre	3 Jahre
Produktionskosten	6 EUR/km²	3 EUR/km²
Dokumentation der Daten und des Prozesses	unvollständig	Standard-Metadata
Datenzugriff	unklare Verbreitungsrichtlinien	klare Bestimmungen

Tab. 1: Unterschiede von CLC1990 und CLC2000 (Quelle: EEA 2000, S.4)

Da die Mindestflächengröße bei der CLC-Aufnahme 25 ha beträgt, werden kleinere Flächen der Nachbarfläche mit entsprechender Größe und Priorität zugeschrieben (CORINE land cover technical guide-Addendum 2000). Im Rahmen der Erstellung von CLC2000 wurden auch die Erstaufnahmen CLC1990 korrigiert, da diese z.T. erhebliche Mängel aufwiesen. Dies ist auf eine nicht einheitliche Satellitenbildgrundlage und auf die ‚traditionelle' Erfassungsmethode durch das Zeichnen von Interpretationsfolien und anschließende Digitalisierung zurückzuführen. In einigen Ländern war die Korrektur der CLC1990 Daten wesentlich aufwendiger als die Aktualisierung auf CLC2000 (BÜTTNER et al. 2004).

Ziel von CLC2000 war nicht nur die Aktualisierung der CLC1990-Daten sondern auch die Ermittlung der Veränderungen innerhalb dieser Jahre. Dazu entstand der CLC-Change Datensatz, bei dem die Mindestflächengröße auf 5 ha (sonst 25 ha) herabgesetzt wurde. Allerdings werden nicht alle Veränderungen berücksichtigt. Änderung zwischen 5 und 25 ha werden nur dann aufgenommen, wenn sie zu einem bereits bestehenden Polygon gehören. Das bedeutet, dass neue isolierte Änderungen (z. B. ein Gewerbegebiet auf

bis dahin landwirtschaftlich genutzter Fläche) nur aufgenommen werden, wenn sie größer als 25 ha sind, also der kleinsten Erhebungseinheit von CLC2000 entsprechen.

Verglichen mit den ursprünglichen CLC1990-Daten ist die geometrische Genauigkeit des korrigierten CLC1990 und damit auch von CLC2000 und CLC-Change deutlich verbessert worden. Der Lagefehler liegt unter 100 m, die thematische Genauigkeit beträgt mindestens 85 %. Qualitätskontrollen beseitigten topologische Fehler, unklassifizierte Flächen und ungültige Kodierungen, wie sie in den Originaldaten von CLC1990 z.T. noch vielfältig vorkamen (BÜTTNER et al. 2004, S.7f.).

3 METHODISCHE BETRACHTUNGEN

Die Analysen wurden auf Grundlage von Rasterdaten der Datensätze CLC1990 und CLC2000 durchgeführt. Während CLC1990 nur als Rasterdatensatz zur Verfügung steht, liegt CLC2000 auch als Vektordatensatz vor. Obwohl dieser als Quelldatensatz genauer ist, wurde mit dem Rasterdatensatz 2000 gearbeitet, denn die Lageabweichungen zwischen den Rasterdaten 1990 und den Vektordaten 2000 sind sehr groß und betragen beispielsweise für Deutschland 160 m! Sie lagen damit über der Auflösung des Rasters (100 m) und würden bei dem Vergleich mit den Vektordaten 2000 zu erheblichen Verfälschungen führen. Auch ist die Lageabweichung zwischen Vektor- und NUTS3-Grenzen höher als bei den Rasterdaten.

Tabelle 2 zeigt die unterschiedlichen Ergebnisse, die sich bei der Auswertung der Vektor- und Rasterdaten durch Lagefehler und die rasterbedingten Auflösungsunterschiede ergeben. Genutzt wurden NUTS3-Daten von GfK MACON und CLC Daten im Raster- und Vektorformat. Es ist aber zu beachten, dass einige besonders starke Abweichungen durch die Struktur der CLC-Daten bedingt sind. Die Klasse 523 (Meere/Ozeane) beispielsweise ist im Raster kaum enthalten, im Vektor jedoch sehr weitreichend in Nord- und Ostsee hinein, so dass, bedingt durch die Lageabweichung von Vektordaten und NUTS3-Daten, diese fälschlicherweise mit aufgenommen wurden. Abweichungen in den Klassen 243 (Landwirtschaft mit natürlicher Bodenbedeckung), 411 (Sümpfe), 421 (Salzwiesen), 511 (Gewässerläufe) und 522 (Mündungsgebiete) entstehen durch die Pixelstruktur des Rasters, was besonders bei diesen kleinteiligen bzw. sehr schmalen Flächen zu größeren Ungenauigkeiten führt. Außerdem liegen dort die Abweichungen teilweise bei wenigen Pixeln. Die Abweichung der Klasse 331 (Strände und Dünen) ergibt sich durch den Lagefehler, denn bei den Vektordaten wird diese im Norden Deutschlands befindliche Kategorie oft abgeschnitten.

CLC-	Flächennutzung						Flächennutzungsänderung (2000 – 1990)			
	Ausgangsdaten 1990 (ha)		2000 (ha)		Differenz Raster zu Vektor (%)		Differenz 2000 – 1990 (ha)		Differenz Raster zu Vektor	
Code	Vektor	Raster	Vektor	Raster	1990[77]	2000[78]	Vektor	Raster	ha	%[79]
111	23 072	23 105	23 110	23 144	0,14	0,15	38	39	-1	1,72
112	2 124 329	2 125 955	2 219 544	2 221 118	0,08	0,07	95 215	95 163	52	-0,05
121	248 586	248 966	306 486	306 790	0,15	0,10	57 900	57 824	76	-0,13
122	16 542	16 477	17 316	17 278	-0,39	-0,22	774	801	-27	3,34
123	10 873	10 943	10 922	10 921	0,64	-0,01	49	-22	71	323,78
124	46 660	46 658	47 364	47 378	0,00	0,03	703	720	-17	2,31
131	119 841	119 793	104 435	104 478	-0,04	0,04	-15 406	-15 315	-91	-0,60
132	17 273	17 329	17 784	17 834	0,32	0,28	512	505	7	-1,28
133	7 319	7 341	7 404	7 436	0,30	0,44	85	95	-10	10,54
141	42 307	42 340	42 569	42 597	0,08	0,07	263	257	6	-2,18
142	77 428	77 908	96 048	96 581	0,62	0,56	18 620	18 673	-53	0,28
211	13 949 658	13 947 285	13 681 405	13 677 862	-0,02	-0,03	-268 253	-269 423	1 170	0,43
212	0	0	0	0	0	0	0	0	0	0,00
213	0	0	0	0	0	0	0	0	0	0,00
221	129 047	128 961	129 197	129 109	-0,07	-0,07	149	148	1	-0,70
222	148 692	148 962	122 811	123 069	0,18	0,21	-25 882	-25 893	11	0,04
223	0	0	0	0	0	0	0	0	0	0,00
231	4 432 430	4 434 818	4 533 661	4 536 016	0,05	0,05	101 231	101 198	33	-0,03
241	0	0	0	0	0		0	0	0	0,00
242	2 071 055	2 071 057	2 061 688	2 062 207	0,00	0,03	-9 367	-8 850	-517	-5,84
243	870 992,1	873 367	867 308,8	870 029	0,27	0,31	-3 683,3	-3 338	-345	-10,34
244	0	0	0	0	0	0	0	0	0	0,00
311	2 394 483,1	2 395 652	2 399 678,4	2 400 763	0,05	0,05	5 195,3	5 111	84	-1,65
312	5 664 595,2	5 665 348	5 628 348,8	5 628 961	0,01	0,01	-36 246,4	-36 387	141	0,39
313	2 348 823,9	2 347 602	2 363 304,4	2 362 107	-0,05	-0,05	14 480,5	14 505	-25	0,17
321	196 678,4	197 123	175 495,6	175 860	0,23	0,21	-21 182,8	-21 263	80	0,38
322	56 676,4	56 746	56 023,2	56 088	0,12	0,12	-653,2	-658	5	0,72
323	0	0	0	0	0	0	0	0	0	0,00
324	143 279,9	143 123	209 078,6	209 272	-0,11	0,09	65 798,7	66 149	-350	0,53
331	10 225,9	11 993	10 089,6	11 788	17,28	16,83	-136,3	-205	69	33,52
332	16 944,3	16 574	16 944,3	16 611	-2,19	-1,97	0	37	-37	100,00
333	44 122,8	44 423	47 441,5	47 854	0,68	0,87	3 318,7	3 431	-112	3,27
334	140,2	142	0	0	1,28	0	-140,2	-142	2	1,26
335	30,0	32	30,0	32	6,55	6,55	0	0	0	0,00
411	48 267,9	49 387	48 046,1	49 286	2,32	2,58	-221,8	-101	-121	-119,61
412	89 983,0	90 097	88 385,8	88 476	0,13	0,10	-1 597,2	-1 621	24	1,47
421	14 535,4	15 741	14 890,5	16 126	8,29	8,30	355,1	385	-30	7,77
422	0	0	0	0	0	0	0	0	0	0,00
423	10 699,4	7 639	10 037,2	6 975	-28,60	-30,51	-662,2	-664	2	0,27
511	69 815,3	70 595	70 549,1	71 455	1,12	1,28	733,8	860	-126	14,67
512	265 384,0	264 463	283 507,3	282 575	-0,35	-0,33	18 123,3	18 112	11	-0,06
521	7 658,5	3 225	7 657,6	3 224	-57,89	-57,90	-0,9	-1	0	10,63
522	2 889,5	1 479	2 858,1	1 429	-48,82	-50,00	-31,4	-50	19	37,15
523	4 928,0	0	4 846,0	0	-100,0	-100,0	-82,0	0	-82	100,00
Σ	35 726 264 ,1	35 722 649	35 726 264	35 722 729						

Tab. 2: Unterschiede bei der Auswertung von CLC-Vektor- bzw. CLC-Rasterdaten am Beispiel Deutschland

[77] Berechnung: 100 – (Vektor1990*100 / Raster1990)
[78] Berechnung: 100 – (Vektor2000*100 / Raster2000)
[79] Berechnung: 100 – (Vektor(2000 – 1990)*100 / Raster(2000-1990))

Auch wenn dieses Beispiel nur für Deutschland steht, so wird es in anderen Ländern ähnlich sein, da dort ebenfalls Lageabweichungen und Auflösungsprobleme gegeben sind. So sind besonders schmale Gewässerläufe oder kleinteilige Gebiete in einem Raster schwer darstellbar und es kommt zu Über- oder Unterschätzungen. Deshalb ist es wichtig, bei detaillierten Auswertungen auch die Flächenstruktur und

-größen der einzelnen Klassen bzw. Objekttypen zu berücksichtigen.

Zur weiteren Beurteilung der Eingangsdaten wurden CLC2000 Daten auf Kreisebene aggregiert (Deutschland) und mit Flächennutzungsdaten von den Statistischen Ämtern des Bundes und der Länder (Stand: Dez. 1996) verglichen (Abb. 1). Die Daten der Statistik beruhen auf der Auswertung des bei den kommunalen Katasterämtern geführten Liegenschaftskatasters. Der Unterschied der Datensätze besteht nun darin, dass die katastergestützte Aufnahme stets das gesamte Flurstück betrachtet und nicht die tatsächliche Bebauung, die oft nur Teile des Flurstücks einnimmt.

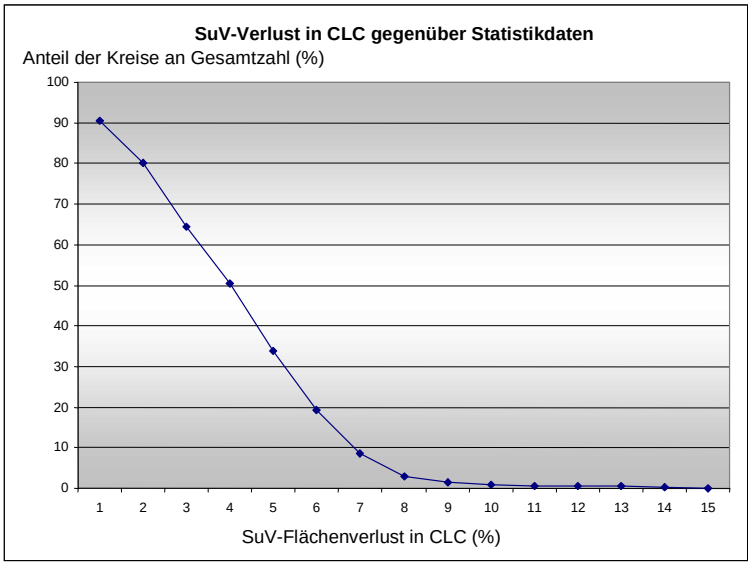

Abb. 1: Anteil der Kreise in Deutschland in Abhängigkeit der SuV-Differenz zwischen Flächenstatistik und CLC-Daten

Bei dem Vergleich zeigt sich, dass 90 % der Kreise in CLC einen Fehler von 1 %, 34 % einen Fehler von 5 % und nur noch 1 % der Kreise einen Fehler von mehr als 10 %. Kein Kreis hat mehr als 15 % Abweichung. Meist handelt es sich dabei um eine Unterschätzung der Siedlungs- und Verkehrsfläche, wie sie für CLC typisch ist.

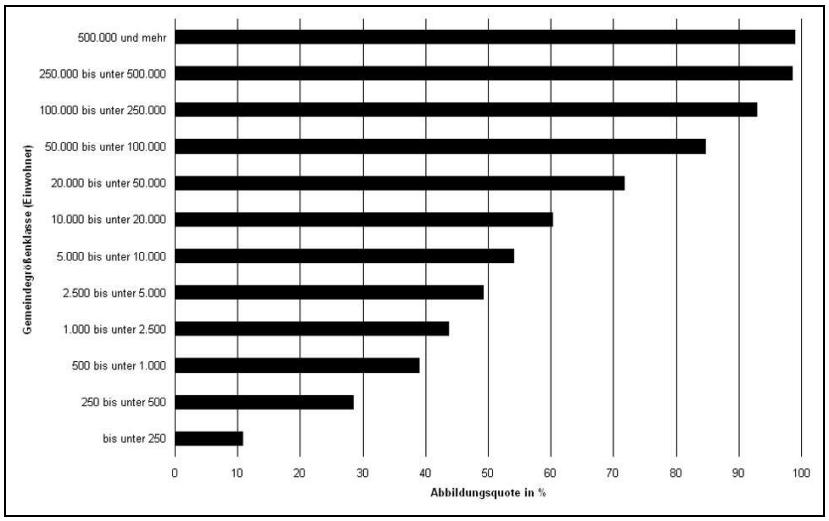

Abb. 2: Erfassung der SuV-Fläche in CLC in Abhängigkeit von der Gemeindegrößenklasse in Deutschland

Weiterhin wurde für Deutschland die Abbildungsquote von CLC nach Gemeindegrößenklassen ausgewertet (Abb. 2). Für definierte Gemeindegrößenklassen wurde der Umfang der in CLC ausgewiesenen Siedlungsflächen mit dem „amtlichen“ Bestand an Siedlungs- und Verkehrsfläche verglichen. Es wird

deutlich, dass insbesondere in Kleinstädten und ländlichen Gemeinden Untererfassungsprobleme zu konstatieren sind (Untererfassung zwischen 75 und 90 %). Dagegen kann für Großstädte davon ausgegangen werden, dass die urbane Flächennutzung nahezu vollständig in CLC abgebildet ist (Abb. 2).

In einer weiteren Untersuchung wurden die Siedlungs- und Verkehrsflächenanteile von CORINE Land Cover mit den Ortslagendaten des Basis-DLM von ATKIS auf Gemeindeebene in Deutschland verglichen, wobei Ortslagen die zusammenhängend bebaute Flächen darstellen (Objektart 2101 in ATKIS). Die Flächenanteile wurden jeweils durch Verschneidung mit den Gemeindegrenzen ermittelt. Abbildung 3 und 4 zeigen die Ergebnisse des Flächenvergleichs sortiert nach Gemeindegrößenklassen. Es wird wieder deutlich, dass bei Gemeinden mit geringer Einwohnerzahl und folglich kleinen Siedlungsflächen eine Unterschätzung der Siedlungs- und Verkehrsfläche von CLC erfolgt (Abb. 3). Diese Unterschätzung ist umso höher, je kleiner die Gemeinden nach Einwohnern und Flächen sind.

Abbildung 4 zeigt den Flächenvergleich für große Gemeinden ab 10 000 Einwohnern. Hier stimmt die CLC-Siedlungsfläche sehr genau mit der ATKIS-Ortslagenfläche überein, da die absolute Siedlungs- und Verkehrsfläche in diesen Gemeinden über 25 ha liegt. Ab einer Gemeindegrößenklasse von mehr als 20 000 Einwohnern liegt die SuV von CLC dann über der als Referenzfläche dienenden ATKIS-Fläche. Dieses ist auf den höheren Generalisierungsgrad der CLC-Kartierung (Maßstab 1 : 100 000) gegenüber der ATKIS-Kartierung im Maßstab 1 : 10 000 zurückzuführen.

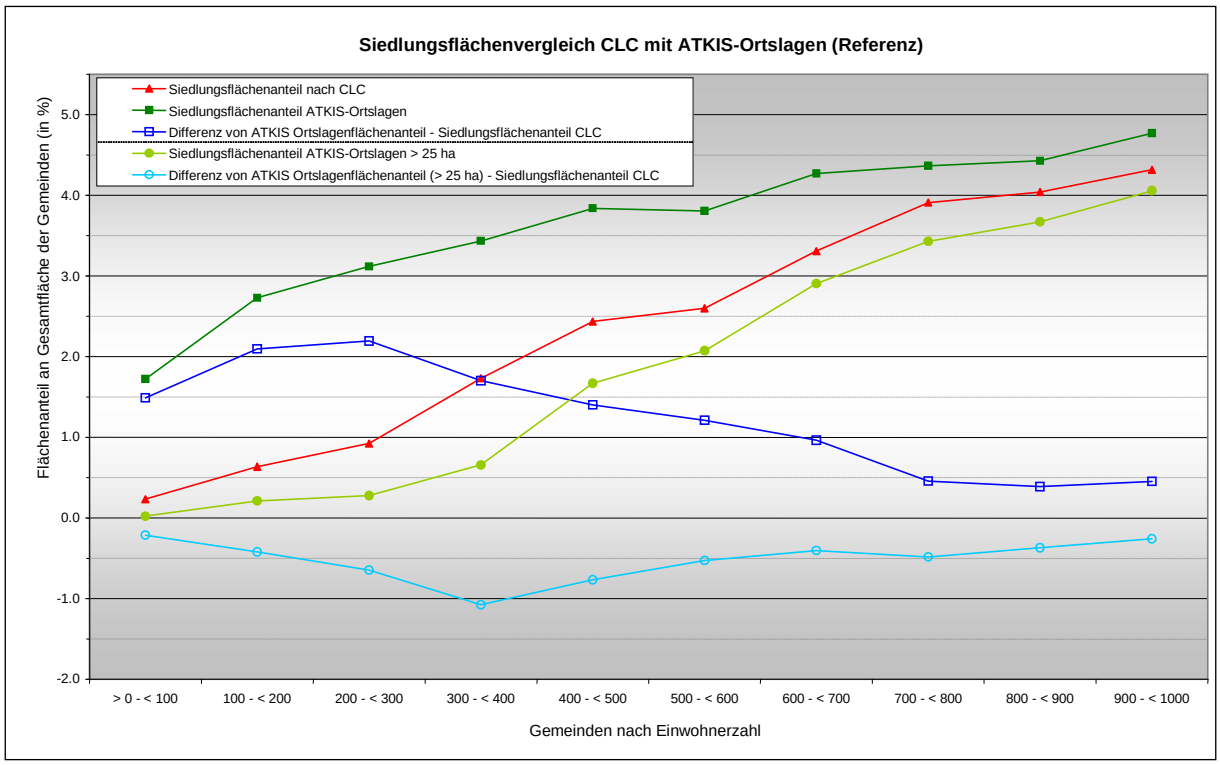

Abb. 3: Siedlungsflächenvergleich von CLC mit ATKIS bei Gemeinden unter 1 000 Einw. in Deutschland

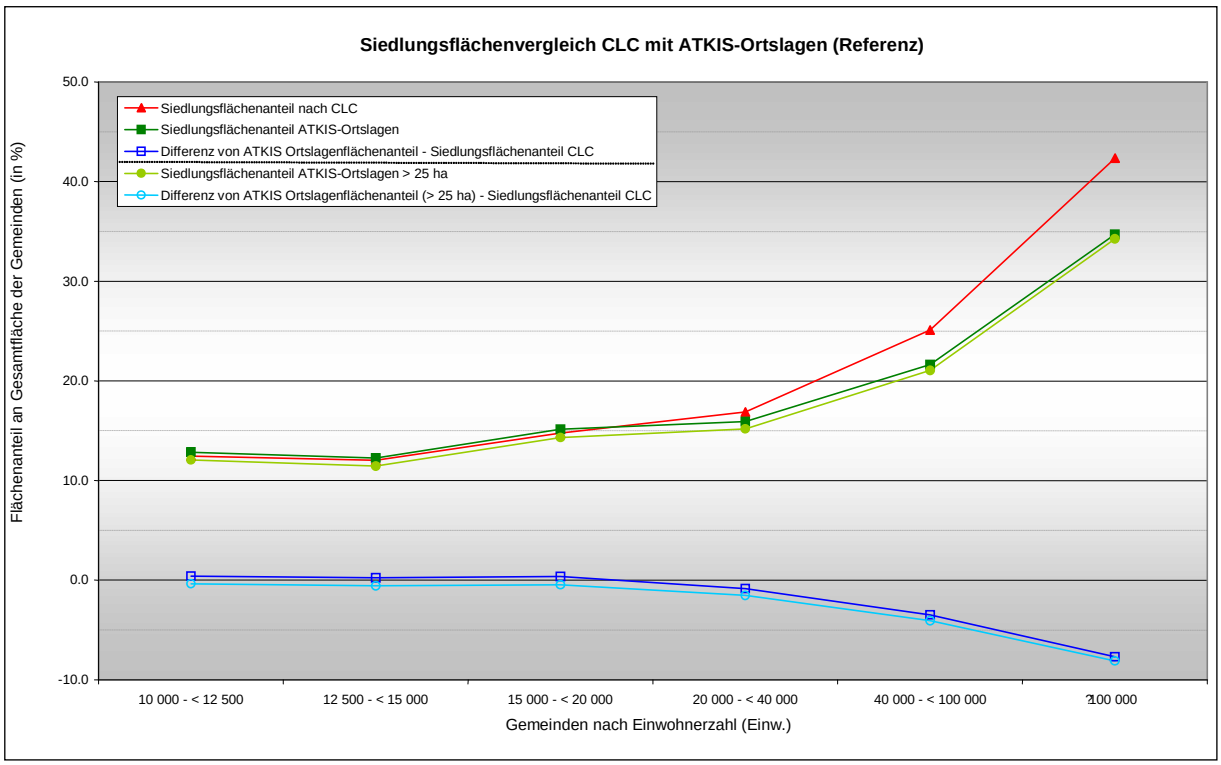

Abb. 4: Siedlungsflächenvergleich von CLC mit ATKIS bei Gemeinden über 10 000 Einw. in Deutschland

Ein weiteres Problem der CLC-Daten liegt - wie bei allen manuellen Kartierungen - in der Abgrenzung und Klassenzuordnung der Flächen. Da alle Länder 1 km über ihre Staatsgrenze hinaus kartiert wurden, sind diese doppelt erfassten Flächen für einen Homogenitätsvergleich der Länderkartierungen bestens geeignet. So zeigen sich z. B. im Grenzgebiet von Deutschland, Polen und Tschechien erhebliche Abweichungen.

4 ERGEBNISSE

4.1 Siedlungs- und Verkehrsfläche 1990

Die Auswertung der Karte der Siedlungs- und Verkehrsflächenanteile der NUTS3-Gebiete des CLC1990 Datensatzes zeigt deutlich den hohen Verstädterungsgrad in Mitteleuropa. Auffällig sind die hohen SuV-Anteile in den Großräumen Paris und London sowie in den Niederlanden, Belgien und dem Ruhrgebiet (Tab. 3). Zwar sind deutsche Städte insbesondere in ihren Zentren ebenfalls sehr dicht bebaut, doch durch Eingemeindungen umliegender kleinstädtischer oder ländlicher Gebiete haben sie einen geringeren Siedlungs- und Verkehrsflächenanteil, als die auf den urbanen Kern beschränkten NUTS3-Gebiete von Paris oder London.

Rang	NUTS3-Code	Name der NUTS3-Einheit	SuV 1990 (%)
1	FR101	Paris	97,8
2	UKI12	Inner London – East	97,8
3	UKI11	Inner London – West	96,9
4	UKD52	Liverpool	93,8
5	FR106	Seine-Saint-Denis	89,0
…	…	….	….
19	DEA55	Herne	80,2
24	DE212	München	75,4
31	DEA32	SK Gelsenkirchen	70,6
33	DEA17	SK Oberhausen	69,2
34	DE300	Berlin	68,5

Tab. 3: NUTS3-Gebiete mit den höchsten SuV-Anteilen 1990

Weiterhin zeigt sich, dass Frankreich mit nur 4 Gebieten in den ersten 100 Plätzen mit hohem SuV-Anteil vertreten ist, das Vereinigte Königreich (zumeist England) 34-mal und Deutschland 49-mal. In der visuellen Darstellung ist die „Blaue Banane“, die Regionen sehr großer wirtschaftlicher Bedeutung umschließt, als Fläche mit hohem SuV-Anteil gut erkennbar. Auffällig sind die niedrigen SuV-Anteile in Süd- und Osteuropa, dort stechen oft nur die Hauptstädte hervor. Allerdings dürfen die Siedlungs- und Verkehrsflächen in diesen Gebieten nicht unterschätzt werden. Da die Mindesterfassungsgröße auch von Siedlungen bei 25 ha liegt, werden vor allem dörflich besiedelte Gebiete in ihrer Siedlungsfläche stark unterschätzt (siehe Abschnitt 3).

4.2 Siedlungs- und Verkehrsflächenentwicklung 1990 – 2000

Zur Bestimmung der Siedlungs- und Verkehrsflächenentwicklung dienten die Rasterdaten CLC1990 und CLC2000. Mit Abstand den höchsten Zuwachs mit fast 21 % an Siedlungs- und Verkehrsfläche hat Derby in England bedingt durch ein hohes Wachstum an Industrie- und Gewerbeflächen (Tab. 4).

Rang	NUTS3-Code	Name der NUTS3-Einheit	SuV-Zunahme 1990 - 2000 (%)
1	UKF11	Derby	20,7
2	UKK11	City of Bristol	9,2
3	DE806	SK Wismar	9,2
4	UKG34	Dudley and Sandwell	8,7
5	UKJ23	Surrey	8,6
6	UKG33	Coventry	8,3
7	NL332	Agglomeratie's-Gravenhage	8,2
8	PT114	Grande Porto	8,0
9	UKK21	Bournemouth and Poole	8,0
10	UKF14	Nottingham	7,3

Tab. 4: Siedlungs- und Verkehrsflächenzunahme 1990 bis 2000

Bemerkenswert ist die Rangliste der SuV-Entwicklung, auf der 7 der ersten 10 NUTS-Einheiten mit dem höchsten SuV-Zuwachs in England liegen. In Abb. 5 sind die Siedlungs- und Verkehrsflächenanteile im Ländervergleich dargestellt. Die Beneluxländer weisen den höchsten SuV-Anteil auf, wobei Belgien mit knapp über 20 % besonders heraussticht. Auch Deutschland hat im Vergleich zu den anderen Ländern einen relativ hohen Prozentsatz an Siedlungs- und Verkehrsfläche. Der SuV-Anteil und seine Veränderung für England sind durch eine gegenüber den anderen Ländern abweichende Erhebungsmethodik allerdings im

Vergleich erschwert (keine Aufnahme aus Satellitenbildern sondern Umkartierung eines vorhandenen Datensatzes).

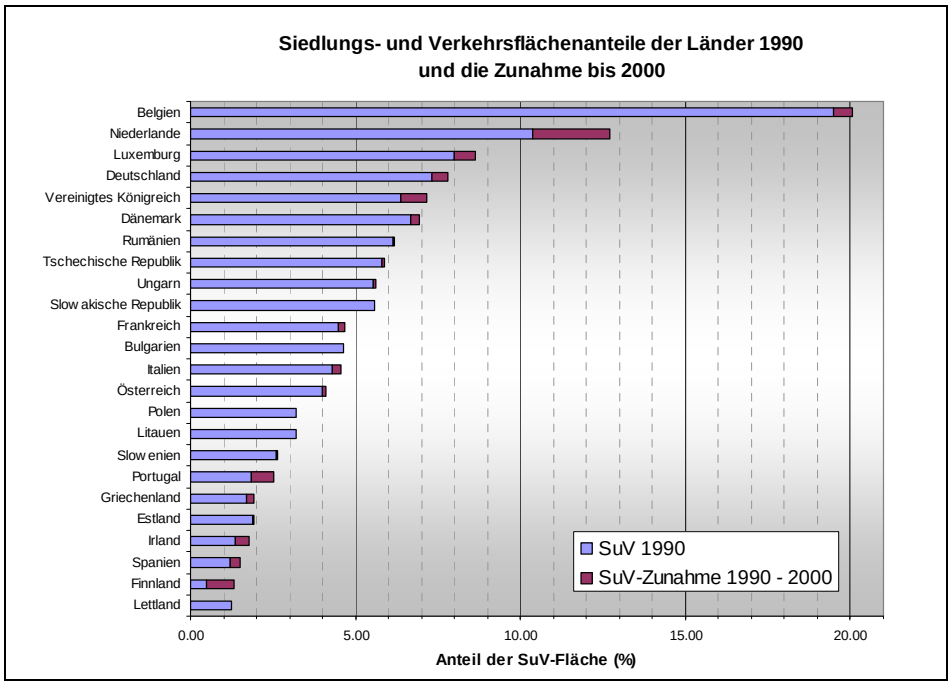

Abb. 5: SuV-Anteile europäischer Länder in den Jahren 1990 und 2000

Die Niederlande haben im gesamten Land eine hohe Zuwachsrate an Siedlungs- und Verkehrsfläche, besonders aber im Westen. Die Ursache ist hier in einer fortschreitenden Verstädterung zu sehen aber auch in der Umwandlung von Wasserflächen in künstliche Flächen (HAZEU 2003, S.49). Eine besonders hohe Zunahme ist auch für Finnland zu erkennen, besonders im südlichen Teil, ebenso für die Küste Portugals. Auch einzelne Teile Deutschlands weisen eine relativ hohe Zunahme auf. Da der Zeitraum zwischen den Aufnahmen in den einzelnen Ländern stark variiert (von 14 Jahren für die Niederlande bis zu 5 Jahren für Slowenien) wurde die Siedlungs- und Verkehrsflächenentwicklung zusätzlich linear umgerechnet auf die durchschnittliche jährliche Veränderung.

4.3 Analyse der Siedlungsdichte

Die Siedlungsdichte ergibt sich aus dem Verhältnis der Einwohnerzahl zur Siedlungs- und Verkehrsfläche. Sie wurde ebenfalls auf Basis von NUTS3-Einheiten berechnet und visualisiert. Auffällig sind die zum Teil sehr hohen Siedlungsdichten, auch in Gebieten, die sonst als eher schwach besiedelt gelten. Hier offenbaren sich erneut Untererfassungsprobleme von CORINE Land Cover, da bei einer Mindestflächengröße von 25 ha ländliche Siedlungsnutzungen häufig nicht erfasst werden. Damit wird die Bevölkerung nur auf die großen zusammenhängenden Siedlungsflächen verteilt und die Siedlungsdichte in ländlichen Regionen zwangsläufig überschätzt. In Polen beispielsweise lebt 38 % der Bevölkerung in Dörfern (BIELECKA & CIOLKOSZ 2004, S.32). In solchen Regionen ist die Berechnung der Siedlungsdichte auf Basis von CLC fehlerbehaftet.

In Ländern mit einem hohen Anteil an städtischer Bevölkerung kann hingegen davon ausgegangen werden, dass die Siedlungsdichte annähernd richtig wiedergegeben wird. So ist die Darstellung für Mitteleuropa durchaus realistisch, für Südeuropa aber eher überschätzt. Es zeigt sich eine relativ hohe Siedlungsdichte für die Niederlande und auch für die deutschen Ballungszentren Ruhrgebiet und Frankfurt/Main. Das Ost-West-Gefälle wird ebenfalls sichtbar. Fast alle Hauptstädte heben sich durch eine gegenüber ihrem Umfeld hohe Siedlungsdichte ab.

4.4 Analyse der Flächenproduktivität

Die Flächenproduktivität ergibt sich als Quotient aus Bruttowertschöpfung (BWS) und Siedlungsfläche. Eine im ökonomischen Sinne effiziente Flächennutzung ist dann erreicht, wenn eine hohe Bruttowertschöpfung auf möglichst kleiner Siedlungsfläche erreicht wird. Als Fläche wird hier im engeren Sinne die Summe aus

Industrie-, Gewerbe- und Abbaufläche als die eigentliche Produktionsfläche und im erweiterten Sinn die Siedlungs- und Verkehrsfläche insgesamt zugrunde gelegt.

Eine hohe Flächenproduktivität kann nun aus einer geringen Siedlungsfläche oder einer hohen Bruttowertschöpfung resultieren. In der Visualisierung wird vor allem der Unterschied zwischen Ost- und Westeuropa deutlich. Ein deutlicher Unterschied in der Flächenproduktivität kann zwischen West- und Osteuropa festgestellt werden, wobei sich ein sprunghafter Abfall an der Grenze zwischen den alten und neuen Bundesländern Deutschlands abzeichnet. Besonders hohe Flächenproduktivitäten zeichnen sich in Großbritannien, den Beneluxländern, Westdeutschland und teilweise Italien ab, was auch den fortgeschrittenen Tertiärisierungsprozess der dortigen Ökonomien anzeigt. Die besondere hohe Flächenproduktivität in Österreich und Irland lässt sich auf die geringe Bezugsfläche für reine Produktion zurückführen. Hervorstechend in der Flächenproduktivität sind wiederum die meisten europäischen Hauptstädte.

4.5 Analyse der Flächennutzungsintensität

Die (ökonomische) Flächennutzungsintensität wurde definiert als Quotient aus Industrie- und Gewerbefläche (CLC Klasse 121) je Einwohner bzw. je Beschäftigter. Sie ist umso höher, je weniger Industrie- und Gewerbefläche auf einen Einwohner bzw. Beschäftigten fällt. In der Visualisierung ist die relativ niedrige Flächennutzungsintensität in Nordeuropa und die sehr hohe in Polen, Österreich, Westdeutschland, dem Vereinigten Königreich und Irland auffallend. Ostdeutschland hat eine sehr geringe Nutzungsintensität in Folge des hier besonders drastischen Deindustriealisierungsprozesses. In Gebieten mit hohem Anteil landwirtschaftlicher Nutzung wie zum Beispiel in Österreich oder Teilen Spaniens und Portugals fällt die Nutzungsintensität höher aus, da in diesen Regionen meist weniger Industrie- und Gewerbefläche vorhanden ist. Ursache für geringe Nutzungsintensitäten sind Deindustrialisierungsprozesse (einhergehend mit dem Brachflächen industrieller und gewerblicher Flächennutzungen) sowie die fortschreitende Verbreitung von Fertigungs- und Distributionstechnologien mit hohem Flächenbedarf bei geringem Arbeitseinsatz. Tabelle 5 zeigt die NUTS3-Regionen mit der höchsten Flächennutzungsintensität in Europa.

Rang	Ind./Gewerbeflächenanteil [%]	NUTS3-Code	Name der NUTS3-Einheit	Flächenutzungsintensität (m²/Beschäftigter)
1	6	FR101	Paris	3,6
2	5	DK001	København og Frederiksberg kommuner	11,9
3	10	FR105	Hauts-de-Seine	21,3
4	8	UKJ31	Portsmouth	28,2
5	6	AT130	Wien	28,2
6	7	UKF21	Leicester	30,5
7	5	UKN01	Belfast	30,6
8	8	UKF14	Nottingham	31,0
9	7	DE111	SK Stuttgart	31,9
10	13	BE100	Bruxelles / Brussel	32,3

Tab. 5: Höchste Flächennutzungsintensitäten je Beschäftigter bei mind. 5 % Ind.- und Gewerbefläche in Europa

5 ZUSAMMENFASSUNG UND AUSBLICK

Bisher war es mangels einheitlicher Daten nicht möglich, die Flächennutzungsstruktur europäischer Länder zu vergleichen bzw. vergleichend zu bewerten. Durch CORINE Land Cover wird ein solcher Vergleich erstmals möglich. Durch einheitliche Aufnahme- und Arbeitsmethoden werden weitestgehend homogene Daten für die europäischen Länder zur Verfügung gestellt. Die Aggregation der Daten auf NUTS3-Ebene ermöglicht den Vergleich auf einer einheitlichen europäischen Raumbezugsebene. Durch die Zusammenfassung relevanter Klassen ist die Darstellung von Siedlungs- und Verkehrsfläche möglich und die Einbeziehung weiterer statistischer Daten wie Bevölkerungszahl, Beschäftigte und Bruttowertschöpfung erlaubt die Berechnung und Analyse wichtiger Effizienzindikatoren der Flächennutzung wie der Siedlungsdichte, der Nutzungsintensität oder der Flächenproduktivität. Die Change-Daten ermöglichen außerdem den Entwicklungsvergleich. Zur Überprüfung der Genauigkeit der Ergebnisse dient der deutsche Datensatz durch Vergleich mit Referenzwerten aus der Statistik. Die Aussagekraft der CLC-Daten wird mit ATKIS für Deutschland überprüft, welches bei einem Erfassungsmaßstab von 1 : 10 000 gegenüber dem Erfassungsmaßstab von 1 : 100 000 als Referenzdatensatz genutzt werden kann.

Die Ergebnisse dieser Arbeit zeigen, dass es durch CORINE Land Cover möglich geworden ist, für Europa einheitliche Raumanalysen durchzuführen. Besonders für die Flächenhaushaltspolitik und den Umweltschutz können sie eine wesentliche Grundlage bilden. Allerdings zeigen die Untersuchungen auch die Grenzen des CLC-Datensatzes. So wurde zwar durch die Verbesserung der CLC1990-Daten bereits eine erhebliche Aufwertung erreicht, jedoch ergeben sich durch die relativ hohe Mindesterfassungsgröße von 25 ha noch einige Probleme, die sich vor allem bei der Auswertung bemerkbar machen. Durch die Nicht- oder nur unzureichende Erfassung ländlicher Siedlungsformen werden die Ergebnisse verfälscht und sind nicht ohne zusätzliche Informationen nutzbar. CLC ist daher für siedlungsstrukturelle Analysen nicht für alle Siedlungstypen uneingeschränkt geeignet. Hier wäre es sinnvoll, weitere Daten zu sammeln und ggf. länderspezifische Korrekturfaktoren zu erarbeiten. Für letzteres fehlt derzeit noch in vielen Ländern die Datengrundlage.

Der Fortführung und Verbesserung des Projektes kommt eine große Bedeutung zu. So wäre eine Senkung der Mindesterfassungsgrenze unabdingbar, damit systematische Fehler in der Analyse verschiedener Regionen vermieden werden. Dies ist für die Zukunft geplant, jedoch frühestens ab 2010. Das Projekt CLC2006 befindet sich in Vorbereitung, allerdings werden dabei aus Kostengründen die bisherigen Grundsätze von CLC2000 beibehalten. Auch eine automatische Klassifizierung wird es frühestens in CLC2010 geben, bis dahin wird weiterhin visuell interpretiert werden (persönliche Mitteilung von R. HÖFER/DLR). Ebenso sollten alle Daten im Vektorformat zugänglich sein, da diese genauere Analysen ermöglichen als die Rasterdaten. Auch würden ein einheitliches Datenformat und einheitliche Attributbenennungen die Arbeit erleichtern.

Schließlich weist die NUT3-Gebietsgliederung noch erhebliche Probleme auf. So gibt es noch 121 Regionen mit Überschreitung der Einwohnerobergrenze von 800 000 bzw. 426 mit Unterschreitung der Einwohneruntergrenze von 150 000. Dieses ist natürlich auf die zugrundeliegenden administrativen Gebietsgliederungen der Einzelländer zurückzuführen, führt aber in der vergleichenden Auswertung zu erheblichen systematischen Differenzen. Das Problem der fehlenden Abbildung kleiner Siedlungsflächen <25 ha könnte durch länderspezifische Korrekturfaktoren gelöst werden. Dies könnte auf Basis katasterbasierter Flächenerhebungen erfolgen, was derzeit aber nur für wenige europäische Länder möglich sein dürfte.

6 LITERATUR

Bento, A. et al. (2003): The impact of urban spatial structure on travel demand in the United States. Research Policy Paper 3/007. World Bank, Washington DC.

Bielecka, E., Ciolkosz, A. (2004): CORINE Land Cover 2000 in Poland – Final Report, Institute of Geodesy and Cartography, Warschau

Büttner et al. (2004): The European Corine Land Cover 2000 project. In: EARSeL eProceedings Vol.3, No.3, European Association of Remote Sensing Laboratories, S.331-346

CORINE land cover technical guide - Addendum (2000): Technical report No 40, European Environment Agency

EEA (2000): European Environment Agency: I&CLC2000 Technical Reference Document, July 2000

EEA (2006): Urban sprawl in Europe - The ignored challenge, Publications of the European Communities, 2006, ISBN 92-9167-887-2, ISSN 1725-9177, EEA, Copenhagen

Feranec, J.; Hazeu, G.; Christensen, S.; Jaffrain, G. (2005): Corine land cover change detection in Europe (case studies of the Netherlands and Slovakia). Artikel im Druck in: Land Use Policy

Hazeu, G. W. (2003): CLC2000 Land Cover database of the Netherlands – Monitoring land cover changes between 1986 and 2000, Alterra, Green World Research, Wageningen

Heymann, Y.; Steenmans, Ch.; Croissille, G.; Brossard, M. (1994): CORINE Land Cover. Technical Guide, Office for Official Publications of the European Communities Luxemburg

Keil, M.; Mohaupt-Jahr, B.; Kiefl, R.; Strunz, G. (2003): Update of the Corine land cover Data Base in Germany. In: Proceedings Fourth International Symposium "Remote Sensing of Urban Areas", 27-29 June 2003, Regensburg, S.72-72

Lavalle, C. et. al. (2002): Monitoring, planning and forecasting dynamics in European areas - The territorial approachas key to implement European policies. CORP2002, TU Wien, S. 367-373

Li, X.; Sun, L. (1997): Driving Forces of Arable Land Conversion in China. Interim Report 97-076. International Institute for Applied Systems Analysis. Laxenburg, Austria

Meinel, G.; Hennersdorf, J. (2002): Bodenbedeckung und -nutzung, Grundinformationen für die Planung – zum Stand der europäischen Nomenklaturdebatte, CORP 2002, Wien, S. 179-188

Schubert, I. (2007): Die Flächennutzungsstruktur Europas und ihre Veränderung zwischen 1990 und 2000 – quantitative Regionalanalysen auf Basis von CORINE Land Cover (CLC) und statistischen Daten, Diplomarbeit, TU-Dresden

Schultz, B.; Dosch, F. (2005): Trends der Siedlungsflächenentwicklung und ihre Steuerung in der Schweiz und Deutschland. In: DISP (Dokumente und Informationen zur schweizerischen Orts-, Regional- und Landesplanung), Band 160, Heft Nr. 1, Zürich, Seite 5-15

Steinnocher, K; Banko, G.; Köstl, M.; Petrini-Monteferri, F. (2006): European Spatial indicators – temporal development and quality aspects, Proceedings CORP2006, Wien, S. 201-208

🏆 *reviewed paper*

Zur Qualität österreichischer Geodatensätze

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1 EINLEITUNG

Geodatensätze erfreuen sich in der Planung, in der Navigation, im Geomarketing und anderen Anwendungsbereichen zunehmender Beliebtheit. Das Angebotsspektrum wächst kontinuierlich, immer bessere und genauere Datensätze werden angeboten. Während sich die Anwender aus der Geo-Szene diesen Daten zum Teil noch kritisch nähern, wird die – zunehmende – Masse an unbedarften Nutzern die in den Daten enthaltene Information einfach übernehmen und als Realität interpretieren.

Die Genauigkeiten der untersuchten Geodaten mögen für viele Anwendungen ausreichend sein, eine Diskussion über ihre Möglichkeiten und Grenzen scheint aber doch angebracht. Wichtig ist vor allem die klare Beschreibung der Datenentstehung und eine Angabe von Qualitäten inklusive Definition. Auch die Aktualität der unterschiedlichen Datensätze ist im Falle der Kombination ein zu berücksichtigender Aspekt. Der vorliegende Beitrag illustriert die angesprochenen Grenzen der Genauigkeit anhand ausgesuchter Beispiele und zeigt Möglichkeiten auf, wie manche der Probleme gelöst werden können.

Die Untersuchung beschränkt sich dabei auf eine Auswahl von Geodatensätzen, die für Linz – Urfahr zur Verfügung steht:

- ACGeo Daten – geokodierte Postadressen
- HEROLD Firmendaten – geokodierte Firmenstandorte
- Bevölkerungsraster – 250m Raster der STATISTIK AUSTRIA
- Adresspunkte des BEV – Referenz der Registerzählung

Die angegebenen Datensätze beziehen sich alle auf Gebäude, daher wurde als Referenzdatensatz ein Gebäudemodell herangezogen, das auf Basis von Satellitenbild- und airborne laser scanning Daten erstellt worden war. Als weitere Informationsquellen wurden ein digitaler Stadtplan der Stadt Linz und Internet-Suchmaschinen verwendet.

2 DATENSÄTZE UND UNTERSUCHUNGSGEBIET

Das Untersuchungsgebiet liegt in Linz-Urfahr in Oberösterreich, unmittelbar nördlich der Donau, und hat eine Fläche von etwa 3,7 x 3,5 km2. Der größere Teil des Gebietes ist von urbanen Strukturen geprägt, die sich aus Einfamilienhäusern, Wohnblocks und Betriebsbauten zusammensetzen.

2.1 Referenzdaten

Die Referenzdaten entstammen einer gemeinsamen Klassifikation zweier Fernerkundungsdatensätze. Der erste ist ein Ausschnitt aus einer IKONOS-2 Szene, aufgenommen am 15. Juni 2002. Der Datensatz ist ein pan-sharpened Produkt, das vier multispektrale Kanäle mit einer räumlichen Auflösung von einem Meter enthält. Der zweite Datensatz wurde am 24. März 2003 mittels airborne laser scanning mit einer Punktdichte von 1 Pkt/m2 aufgenommen. Daraus wurde ein normalisiertes Oberflächenmodell abgeleitet, dass die Höhe der Objekte über Grund repräsentiert. Die gemeinsame Auswertung dieser Datensätze ergab ein Gebäudemodell, das als „real-räumliche“ Referenz zur Bewertung der Geodatensätze herangezogen wurde (Kressler & Steinnocher, 2006). Abb 1 zeigt eine Echtfarbendarstellung des IKONOS Bildes und das abgeleitete Gebäudemodell.

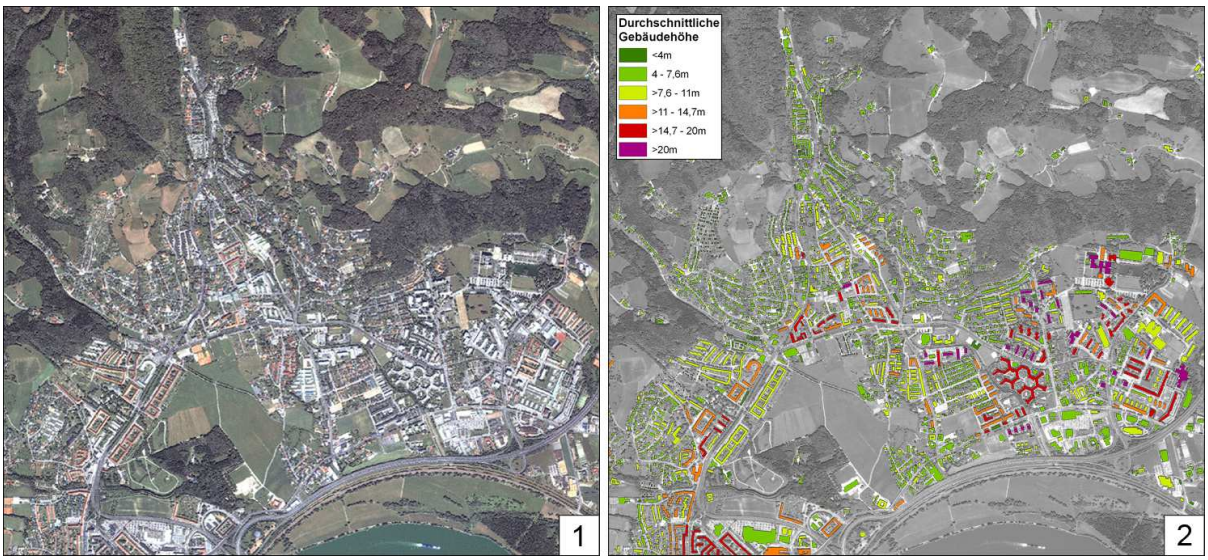

Abb. 1: Referenzdaten: IKONOS Bild (1) und Gebäudemodell (2)

2.2 Geokodierte Firmendaten

Die untersuchten Firmendaten stammen aus "ARCData/HEROLD Firmendaten", einer Datenbank mit geokodierter Firmeninformation. Die Firmennamen und Attribute entstammen den "HEROLD gelben Seiten". Die Geokodierung ist abhängig von der Verfügbarkeit und Genauigkeit von Adresskoordinaten, die jeweilige Genauigkeitsklasse wird angegeben. Der österreichweite Datensatz enthält etwa 360.000 Einträge.

Die Daten werden als Punktfile mit Attributen im ARCGIS shape Format angeboten. Folgende Attribute sind in der Datenbank enthalten:

SID	interner ID
FIRMA	Firmenname
BR	Branche
BR_ID	Branchen-ID
HIC	Herold industrial code
HIC_ID	Herold industrial code ID
STRASSE	Straße
HNR	Hausnummer
PLZ	Postleitzahl
ORT	Ort
BL	Bundesland
TELEFON	Telefonnummer
TELEFAX	Faxnummer
EMAIL	email Adresse
HTTP	Home page
MOBIL	Handynummer
ZAEHLSP_ID	Zählsprengel ID
GENAUIGKEI	Genauigkeit der Geokodierung

Die Geokodierung basiert auf dem Straßennetzwerk von Tele Atlas und dem Gebäuderegister der STATISTIK AUSTRIA (siehe Wonka, 2006). Die Kombination der beiden Datensätze erlaubt die Zuordnung von Adressen zu Straßenabschnitten. Innerhalb der Straßenabschnitte wird die Lage der einzelnen Adressen durch lineare Interpolation ermittelt. Eine Zuordnung zu Straßenseiten erfolgt nur bei höherwertigen Straßen. Wo es keine detaillierte Adressenzuordnung gibt, erfolgt die Geokodierung entweder über Straßenabschnitte, Zählsprengel oder Orte. Die Kodierung dieser Genauigkeitsklassen erfolgt nach folgender Einteilung:

GENAUIGKEIT	Geokodierung

HNR	Hausnummer. interpoliert innerhalb von Straßenabschnitten
STRAB	geometrischer Mittelpunkt des Straßenabschnittes
ORT	geometrischer Mittelpunkt des Ortes
ZSP	geometrischer Mittelpunkt des Zählsprengels

Die vorliegende Untersuchung basiert auf den "HEROLD Firmendaten" von Oberösterreich, Stand August 2005. Die Datenbasis umfasst 50.193 Firmeneinträge von denen 16.266 nach Adressen und 31.706 nach Straßenabschnitten geokodiert sind. Lediglich 4,5% der Einträge haben eine geringere Lagegenauigkeit.

Abb. 2.1 zeigt die Lage der Firmenpunkte in einem Ausschnitt des Untersuchungsgebietes. Jeder Kreis repräsentiert eine Adresse mit einem oder mehreren Firmeneinträgen. In der Mitte sieht man eine Zuordnung zu den beiden Straßenseiten, bei allen anderen Einträgen wird die Straßenachse als Referenz herangezogen.

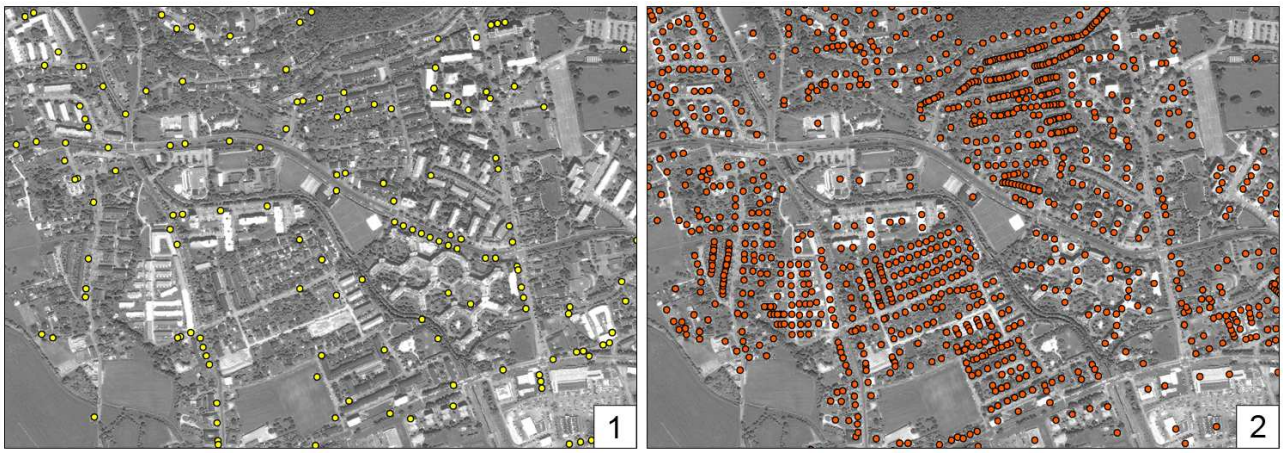

Abb. 2: Ausschnitt des Untersuchungsgebietes mit Firmendaten (1) und ACGeo Adresspunkten (2)

Abb. 3 zeigt einen Ausschnitt aus der Datenbank. Jeder Eintrag besteht aus der internen ID, dem Namen des Unternehmens, der Branche und der Adresse. Es ist offensichtlich, dass auch mehrere Firmen dieselbe Adresse aufweisen können. Die Datenbank ist nicht ganz vollständig, es fehlen einzelne, wenige Unternehmen. Die Einteilung nach Branchen erfolgt über den HEROLD industrial code (HIC), der leider nicht mit der statistischen Systematik der Wirtschaftszweige in der Europäischen Union (NACE) kompatibel ist.

Shape	Sid	Firma	Br	Strasse	
Point	105465	Boutique Choice	Boutiquen	Dornacher Straße	19
Point	284726	Christian Knott	Bäckereien	Dornacher Straße	17
Point	330815	Neussl Design GesmbH	Computer	Dornacher Straße	17
Point	106303	Maria Haase	Handarbeiten	Dornacher Straße	17
Point	199596	Dr. Wolfgang Gunnesch	Ärzte/f Allgemeinmedizir	Dornacher Straße	15
Point	533050	Mag. Xaver Remsing	Übersetzungen	Dornacher Straße	15/2
Point	353384	Dkfm. DDr. Paul Jirak	Ärzte/Fachärzte f Innere	Dornacher Straße	8
Point	285235	Konditorei-Cafe Preining	Kaffeekonditoreien	Dornacher Straße	13
Point	279315	Raiffeisenlandesbank O	Banken u Sparkassen	Dornacher Straße	13
Point	433440	Mag. Dr. Gerlinde Strobl	Psychologen	Dornacher Straße	6
Point	184149	Dr. Christian Haiböck	Ärzte/Fachärzte f Innere	Dornacher Straße	11
Point	315017	IDEEAL Werbeagentur K	Werbeagenturen	Dornacher Straße	11
Point	438884	Wellness-Institut Christine	Massagen	Dornacher Straße	11
Point	183475	Dr. Eva-Martina Hofer	Ärzte/Fachärzte f Zahn-	Dornacher Straße	9
Point	106480	Parfümerie Poldi	Parfümeriewaren/Hande	Dornacher Straße	9
Point	101677	Paracelsus Apotheke M	Apotheken	Dornacher Straße	9
Point	377796	Kindergarten	Kindergärten	Dornacher Straße	7
Point	587500	Mutterberatungsstelle	Beratungsstellen	Dornacher Straße	7

Abb.3: Auszug aus den "HEROLD Firmendaten"

2.3 Geokodierte Adressdaten

Die ACGeo Daten bestehen aus Postadressen, die mit Koordinaten versehen sind. Die Lage der Adresspunkte ist entweder das Gebäude oder die Postabgabestelle der betreffenden Adresse. Die Daten werden von der Post AG erstellt und basieren auf Digitalisierung in Orthophotos. Bezugssystem ist die Lambert'sche konforme Kegelprojektion. Eine Aktualisierung erfolgt zweimal pro Jahr, wobei neben der Hinzunahme neuer Adressen auch ungültige Adressen gelöscht werden. Da der Datensatz erst seit 2006 besteht, werden im Rahmen der Aktualisierung auch Fehler der Erstaufnahme korrigiert. Der Datensatz umfasst etwa 2 Millionen Adressen in ganz Österreich und verwendet eine standardisierte Adress-Nomenklatur. Der Vertrieb der Daten erfolgt über die Firma TeleAtlas Austria.

Die Datenbank bietet folgende Attribute an:

- Post Adress Code (PAC)
- Gemeindenummer
- Gemeindename
- Ort
- Ortsname
- Postleitzahl
- Postleitzahlname
- Ortsteil
- Straßenname
- Straßenname kurz
- Hausnummer
- Status der Erfassung
- Qualitäts Code
- Koordinaten

Abb. 2.2 zeigt einen Ausschnitt aus dem Untersuchungsgebiet, überlagert mit den Adresspunkten. Es ist offensichtlich, dass die meisten Punkte innerhalb der Gebäude oder zumindest innerhalb des Grundstückes liegen. Damit ist die räumliche Zuordnung der Adressen deutlich höher als bei den Firmendaten. In Abb. 4 ist ein Auszug aus der Datenbank dargestellt, wobei nur ein Teil der verfügbaren Attribute angezeigt wird.

PAC	PLZ	ORT	STRASSE	HAUSNR	X_LAMBERT	Y_LAMBERT	QUALCODE
100780170	4040	Linz, Donau	Dornacher Straße	1	472592	437332	2
100780171	4040	Linz, Donau	Dornacher Straße	2	472626	437449	2
100780172	4040	Linz, Donau	Dornacher Straße	3	472573	437330	2
100780173	4040	Linz, Donau	Dornacher Straße	5	472552	437338	2
100780174	4040	Linz, Donau	Dornacher Straße	6	472553	437452	2
100780175	4040	Linz, Donau	Dornacher Straße	7	472539	437354	2
100780176	4040	Linz, Donau	Dornacher Straße	8	472562	437473	2
100780177	4040	Linz, Donau	Dornacher Straße		472528	437458	2
100780178	4040	Linz, Donau	Dornacher Straße	9	472534	437378	2
100780179	4040	Linz, Donau	Dornacher Straße	10	472507	437472	2
100780180	4040	Linz, Donau	Dornacher Straße	11	472484	437392	2
100780181	4040	Linz, Donau	Dornacher Straße	12	472516	437494	2
100780182	4040	Linz, Donau	Dornacher Straße	13	472470	437375	2
100780183	4040	Linz, Donau	Dornacher Straße	14	472461	437490	2
100780184	4040	Linz, Donau	Dornacher Straße	15	472442	437375	2
100780185	4040	Linz, Donau	Dornacher Straße	16	472471	437512	2
100780186	4040	Linz, Donau	Dornacher Straße	17	472405	437374	2
100780187	4040	Linz, Donau	Dornacher Straße		472414	437379	2
100787988	4040	Linz, Donau	Dornacher Straße	18	472416	437509	2
100780188	4040	Linz, Donau	Dornacher Straße	19	472380	437361	2
100780189	4040	Linz, Donau	Dornacher Straße	21	472359	437371	2
100780190	4040	Linz, Donau	Dornacher Straße	27	472221	437548	2

Abb.4: Auszug aus den ACGeo Daten

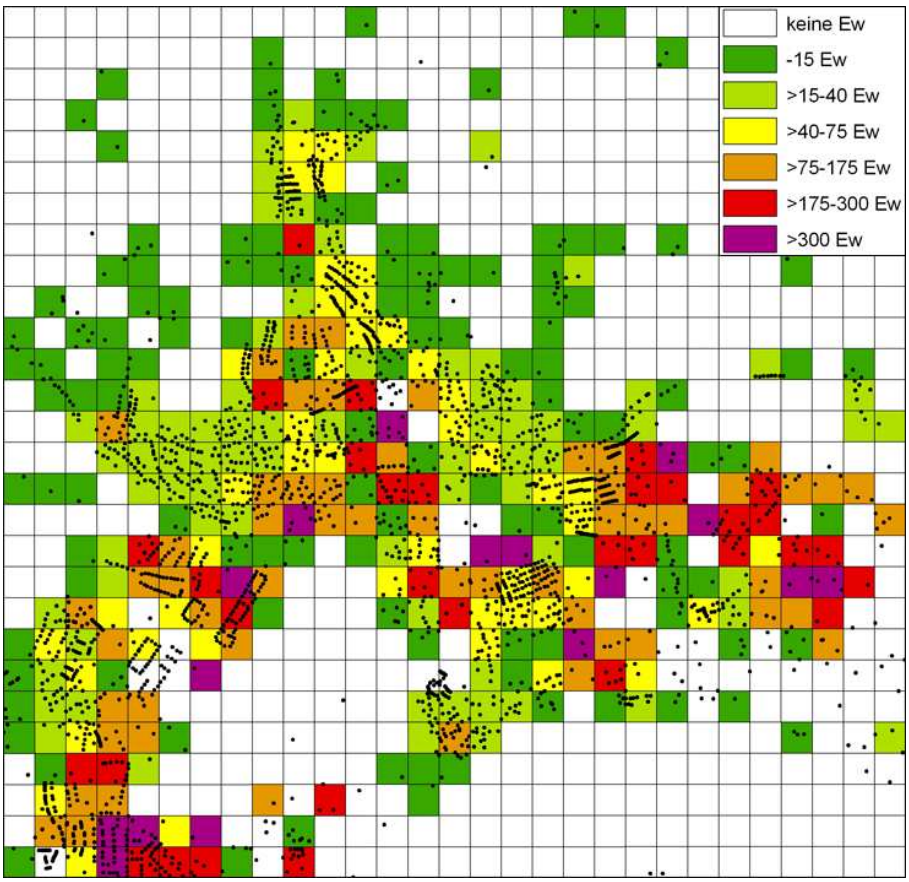

Abb.5: Bevölkerungsraster mit Gebäudepunkten

2.4 Sozio-ökonomische Rasterdaten

Basierend auf der Volkszählung werden sozio-ökonomische Daten in Österreich traditionell auf Grundlage von Zählsprengel räumlich repräsentiert. Durch den Umstieg auf die Registerzählung ist die Repräsentation der statistischen Daten auch auf Basis geographischer Raster möglich. Grundlage für den Raster sind das Adressregister des BEV und das Gebäuderegister der STATISTIK AUSTRIA. Die Geokodierung der Gebäude erfolgt durch die Gemeinden mittels einer vom BEV zur Verfügung gestellten "Geokodierungs-software", die jeder Adresse ein räumliches Koordinatenpaar zuordnet. Die Aggregation der Attributdaten – z.B. Bevölkerung oder Beschäftigte – innerhalb einer Rasterzelle erfolgt über die in der Rasterzelle liegenden Adresspunkte, im folgenden BEV-Punkte genannt (zur sprachlichen Abgrenzung gegenüber den ACGeo Punkten). Eine ausführliche Darstellung dieser Thematik findet sich in Wonka (2006).

Aus Gründen des Datenschutzes werden die statistischen Daten nur in aggregierter Form abgegeben, wobei der Grad der Aggregation von der Sensibilität der Daten abhängt. STATISTIK AUSTRIA bietet eine Reihe von Standardprodukten auf Rasterbasis an, von denen für die vorliegende Studie die Zahl der Personen und die Zahl der Gebäude pro 250m Rasterzelle verwendet wurden. Zusätzlich standen die BEV-Punkte für die Datenanalyse zur Verfügung. Abb. 5 zeigt den Bevölkerungsraster und die korrespondierenden BEV-Punkte.

3 DATENANALYSE

Wie oben beschrieben basiert die höchste Lagegenauigkeit der Firmendaten auf einer linearen Interpolation entlang von Straßenabschnitten. Dieser Ansatz geht davon aus, dass Gebäude innerhalb eines Straßenabschnittes dieselbe Länge aufweisen. Da das in der Regel nicht der Fall ist, kommt es zu unsystematischen Versetzungen in der Lage der Adressen. Abb. 6 zeigt ein Beispiel solcher Versetzungen, wobei der Pfeil auf das korrespondierende Gebäude hinweist. Es ist weiters klar, dass eine Suche nach dem nähesten Gebäude keine Lösung für dieses Problem darstellt.

Abb.6: Adressgeokodierung von Firmendaten

Eine gebäudescharfe Verortung der Firmendaten erfordert also eine genauere Adress-Geokodierung, wie sie etwa von den ACGeo Daten repräsentiert wird. Deren Genauigkeit ist hoch genug, um die meisten Adressen eindeutig einem Gebäude (oder zumindest einem Grundstück) zuordnen zu können. Die Verknüpfung der Datensätz kann dabei über die Postadresse erfolgen, die in beiden Datensätzen verfügbar ist. Voraussetzung dafür ist allerdings eine einheitliche Nomenklatur der Adressen, sodass unterschiedliche Schreibweisen oder Nummerierungen ausgeschlossen werden können.

Im konkreten Fall konnten 97% der Firmenadressen im Untersuchungsgebiet automatisch über die ACGeo Daten geokodiert werden. Voraussetzung dafür war die Zerlegung der Adressfelder in Straßenname, Hausnummer und optionalem Suffix. Diese Zerlegung erfolgte weitgehend automatisch und stellte somit kein Problem dar. Die restlichen 3% betreffen unterschiedliche Schreibweisen, fehlende Adressen oder fehlende Koordinaten. Abb. 6 zeigt ein Beispiel mit korrespondieren Einträgen in beiden Datensätzen. Es ist zu sehen, dass das Gebäude mit der Adresse Niedermayrweg 7 öffentliche Dienstleistungseinrichtungen beherbergt. Weiters ist auch der realräumliche Bezug hergestellt, da der ACGeo Adresspunkt eindeutig einem Gebäude zugeordnet werden kann, während der Firmenpunkt in der Mitte der Straße liegt.

An dieser Stelle sei noch angemerkt, dass bei der Geokodierung mittels Adresspunkten lediglich die Firmeneinträge notwendig sind, nicht aber die bisherige Geokodierung nach Straßenabschnitten. Allgemein gesprochen bedeutet das, dass jede digitale Information, die eine Postadresse aufweist, mittels der ACGeo Daten geokodiert werden kann.

Voraussetzung für eine qualitativ hochwertige Geokodierung ist eine hohe Lagegenauigkeit der Adresspunkte. Zur Überprüfung derselben wurden die ACGeo Punkte mit den Referenzdaten – dem Gebäudemodell – verglichen. Bei einer direkten Verschneidung der Punkte mit dem Gebäudelayer fallen gut 70% der Punkte in Gebäude. Bei Verwendung eines 5m bzw. 10m Buffers um die Punkte können 90% bzw. 93% der Punkte einem Gebäude zugeordnet werden, allerdings in 3 bzw. 17 Fällen nicht eindeutig. Diese "Trefferquote" ist zwar hoch, sagt aber noch nichts über die Qualität der Zuordnung aus, d.h. durch die Verschneidung muss der Adresspunkt nicht notwendigerweise dem richtigen Gebäude zugeordnet werden.

Abb.7: Lageungenauigkeiten der ACGeo Adresspunkte

Daher erfolgte zusätzlich ein visueller Vergleich mit einem digitalen Stadtplan. Dabei zeigt sich, dass der Großteil der Punkte eine gute bis sehr gute Lagegenauigkeit besitzt, einzelne Punktgruppen allerdings völlig unsystematische Versetzungen aufweisen (siehe Abb. 7). Eine Korrektur dieser Punkte kann nur interaktiv durchgeführt werden.

Da die Punkte laut Definition die Postabgabestelle lokalisieren, fallen sie nicht zwingend in Gebäudeflächen, sondern kommen – etwa bei Einfamilienhäusern – am Grundstücksrand zu liegen. Für die meisten Applikationen wird diese Genauigkeit ausreichen. Soll jedoch das betreffende Gebäude angesprochen werden, müssten auch diese Punkte lagemäßig "korrigiert" werden. Für die vorliegende Studie wurden etwa 50% der Punkte lagemäßig verändert, wobei der durchschnittliche Versatz etwa 10m betrug.

Ein interessantes Ergebnis liefert der Vergleich der Real-Gebäude aus der Fernerkundung mit den korrigierten ACGeo Adresspunkten und den BEV-Punkten. Da die Punktdatensätze nicht lagegleich sind erfolgte eine Aggregation auf Ebene des statistischen Rasters. Es wurden somit die Anzahl der Real-Gebäude, die Anzahl der Postadressen und die Anzahl der BEV-Punkte pro Rasterzelle miteinander verglichen. Interessant ist, dass dabei alle möglichen Kombinationen vorkommen: mehr ACGeo Adressen als BEV-Punkte, mehr Real-Gebäude als ACGeo Adressen, mehr BEV-Punkte als Adressen oder Real-Gebäude etc.

Die Gründe für die Differenzen sind vielfältig. Bezüglich der Real-Gebäude ist zu sagen, dass einerseits zusammenhängende Gebäude wie Reihenhäuser als ein Gebäude gewertet werden, andererseits aber auch Gebäude auftreten, die keine eigene Adresse haben, wie etwa Garagen oder Nebengebäude. Etwas schwieriger ist der Unterschied zwischen den ACGeo Adressen und den BEV-Punkten zu erklären, die im Grund genommen auch Adressen darstellen. Allerdings ist die Verortung der BEV-Punkte sehr unterschiedlich. So können für einen Wohnblock, der aus mehreren Stiegen besteht und daher mehrere Adressen aufweist, die BEV-Punkte räumlich verteilt sein oder an einer Position – scheinbar als ein Punkt – übereinander liegen. Abb. 8.1 zeigt diesen Effekt anhand mehrer Wohnblöcke, wobei sowohl die ACGeo Adresspunkte als auch die BEV-Punkte dargestellt werden. Man beachte den Block in der rechten Bildhälfte, der nur einen BEV-Punkt aufweist.

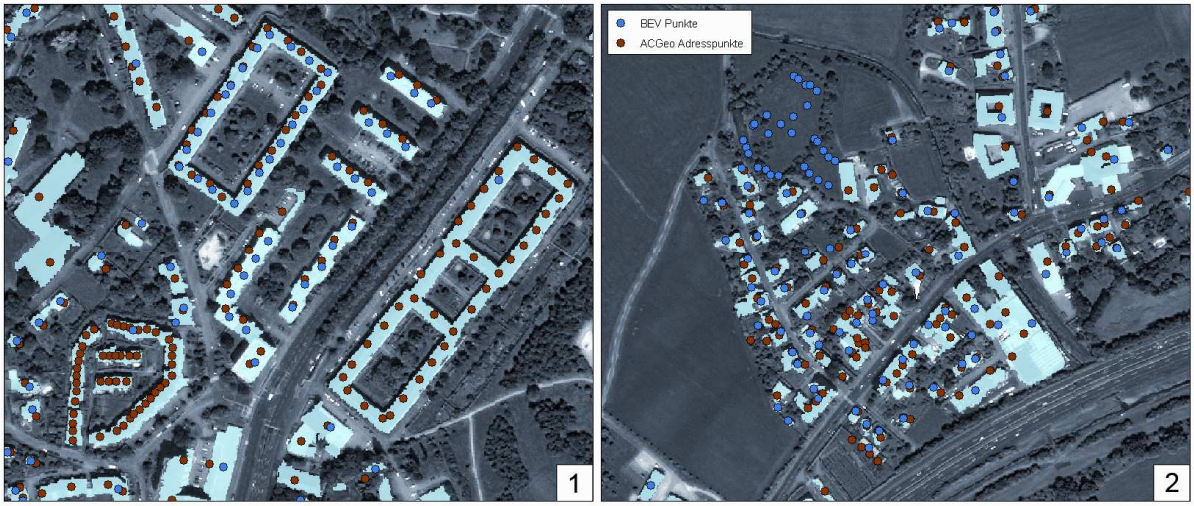

Abb.8: Vergleich der ACGeo Adressen mit den BEV-Punkten. Wohblöcke (1) und Parzellierung (2)

Ein weiterer zu berücksichtigender Parameter ist die zeitliche Dimension. Das betrifft in erster Linie Neubauten, aber auch aufgelassene Adressen oder abgerissene Gebäude. So werden bei Parzellierungen für neue Baugründe bereits Adressen seitens der Gemeinde vergeben; d.h. es existieren BEV-Punkte noch bevor Gebäude errichtet oder Postadressen angelegt werden. In Abb. 8.2 sieht man im oberen Teil ein neu parzelliertes Gebiet, in dem Bereits BEV-Punkte vergeben wurden.

Eine spezielle Auswirkung hat die unregelmäßige Verortung der BEV-Punkte auf den statistischen Raster, wie anhand der Wohnbevölkerung gezeigt werden soll. Die Anzahl der Personen wird in Bezug auf das Gebäude- und Wohnungsregister erfasst und über die BEV-Punkte verortet. Die Aggregation auf Rasterzellen erfolgt dann durch Summation über alle innerhalb der Rasterzelle liegenden BEV-Punkte (siehe Kapitel 3.4). Bei Gebäuden, die nur durch einen BEV-Punkt repräsentiert sind, wird dementsprechend die Wohnbevölkerung über diesen Punkt verortet. Geht nun dieses Gebäude über mehrere Rasterzellen, so wird die gesamte Bevölkerung derjenigen Rasterzelle zugeordnet, die den BEV-Punkt enthält, die übrigen Rasterzellen “gehen leer aus”. Bei sehr großen Wohnblöcken kann das zu signifikanten Verzerrungen der Bevölkerungsverteilung führen, die mit kleiner werdenden Rasterzellen zunehmen. Abb. 9 zeigt diesen Effekt am Beispiel der Biesenfeldsiedlung in Urfahr.

Problematisch werden solche Verzerrungen dann, wenn kleinräumige Untersuchungen etwa der Betroffenheit der Bevölkerung in Bezug auf Lärmbelastung durchgeführt werden. Geeignete Verfahren der räumlichen Disaggregation können das Problem jedoch reduzieren, wie in Aubrecht & Steinnocher (2007) gezeigt wird.

4 CONCLUSIO

Die beschriebenen Genauigkeiten von Geodaten sind für viele Anwendungen ausreichend, eine Diskussion über ihre Möglichkeiten und Grenzen ist aber doch angebracht. Wichtig ist vor allem die klare Beschreibung der Datenentstehung und eine Angabe von Qualitäten inklusive Definition derselben. Auch die Aktualität der unterschiedlichen Datensätze ist im Falle der Kombination ein zu berücksichtigender Aspekt.

Die ACGeo Adresspunkte bieten sich für die Geokodierung jeglicher mit Adressen versehener Daten an. Ihre Lagegenauigkeit ist hoch – entweder gebäudescharf oder zumindest grundstücksgenau –, die Gruppen unsystematisch versetzter Punkte sollten im Zuge der Aktualisierung korrigiert werden.

Die Geokodierung der HEROLD Firmendaten zeichnet sich durch eine geringeren Genauigkeit aus, die aber durch Verknüpfung mit den ACGeo Adresspunkten verbessert werden kann. Beschränkungen inhaltlicher Natur sind das Fehlen einzelner Betriebe und die Inkompatibilität mit dem NACE Code.

Der Übergang auf rasterbasierte Regionalstatistik stellt einen wichtigen Schritt in Richtung kleinräumiger Modellierung dar. Die von der STATISTIK AUSTRIA entwickelten Rasterprodukte bilden dafür eine wertvolle Grundlage, wobei aber darauf geachtet werden muss, wie wie sie im Detail zu interpretieren sind.

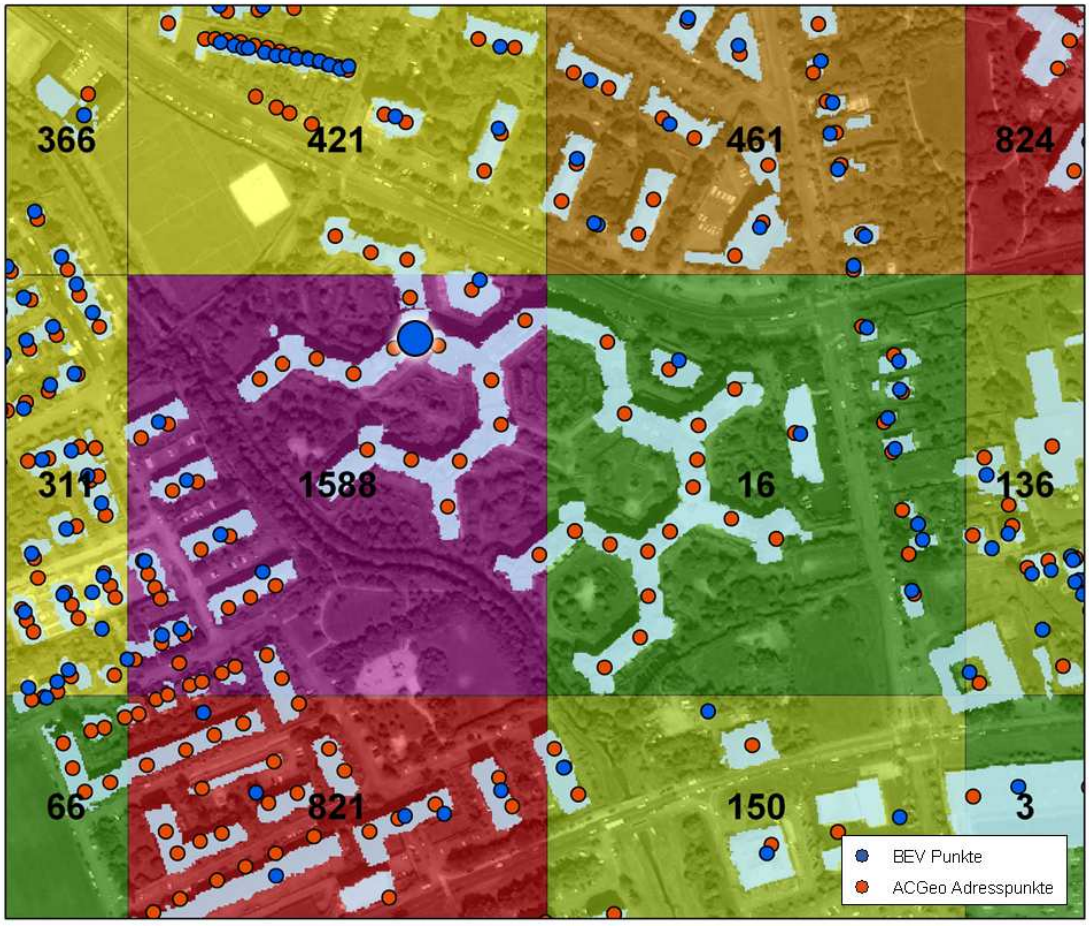

Abb.9: Verzerrung der Bevölkerungsverteilung am Beispiel der Biesenfeldsiedlung: die Bevölkerung der linken Rasterzelle beträgt 1588 Personen, die der rechten nur 16 Personen. Verantwortlich dafür ist der groß dargestellte blaue BEV-Punkt in der linken Zelle, der alle Adressen des Wohnblocks enthält. Dementsprechend wird die gesamte Wohnbevölkerung dieser Rasterzelle zugeordnet.

Zusammenfassend kann gesagt werden, dass die untersuchten Geodaten eine hohe Qualität aufweisen und unter Berücksichtigung ihrer Genauigkeiten besonders in Kombination eine hervorragende Datengrundlage für kleinräumige Modellierungen bilden.

5 REFERENZEN

Aubrecht C. & Steinnocher K. (2007): Der Übergang von Bodenbedeckung über urbane Struktur zu urbaner Funktion – ein integrativer Ansatz von Fernerkundung und GIS. In: Manfred Schrenk (Hrsg.): CORP2007: 12. internationale Konferenz zu Stadtplanung und Regionalentwicklung in der Informationsgesellschaft, Wien, Mai 2007. Conference Proceedings, CD-ROM.

Kressler F. P. & Steinnocher K. (2006): Image Data and Lidar – An ideal combination matched by object-oriented analysis. In: Lang, Blaschke & Schöpfer (Hrsg.): Bridging remote sensing and GIS. 1st International Conference on Object-based Image Analysis, Universität Salzburg, 4.-5. Juli 2006. Conference Proceedings, CD-ROM.

Wonka E. (2006): Regionalstatistik in Österreich; Salzburger geographische Arbeiten, Band 39 (Josef Strobl Hrsg.). Salzburg 2006.

6 DANKSAGUNG

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🏆 *reviewed paper*

Der Übergang von Bodenbedeckung über urbane Struktur zu urbaner Funktion – ein integrativer Ansatz von Fernerkundung und GIS

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1 KURZFASSUNG

Die integrative Analyse von Fernerkundungsdaten und sozioökonomischer Information ermöglicht den Übergang von Bodenbedeckung, und in weiterer Folge urbaner Struktur, zu detaillierter urbaner Funktion. Dies birgt vor allem für Raumplaner und Entscheidungsträger im städtischen Raum großes Potential in sich.

In dieser Arbeit wird gezeigt, wie zunächst mittels objekt-orientierter Analyse von Fernerkundungsdaten eine erste Klassifikation urbaner Strukturen erfolgt. Durch Einsatz von LiDAR (engl.: Light Detection And Ranging) kann die Klassifizierung von optischen Bilddaten sowohl hinsichtlich Genauigkeit, als auch hinsichtlich Automatisierung wesentlich verbessert werden. Landbedeckungstypen werden anhand ihrer relativen Höhe über Grund zusätzlich differenziert, nach Herausfiltern der Gebäude ist das Resultat ein 3D-Gebäudemodell.

Dieses Modell bildet die Basis für die Integration von sozioökonomischen Daten (Flächenwidmungsdaten, geokodierte Adressdaten, Firmendaten und Bevölkerungsdaten) mit dem Ziel urbane Funktion auszuweisen. Eine erste funktionale Gliederung der Gebäude erfolgt durch Verschneidung mit aggregierten Flächenwidmungsdaten. Mittels geokodierter Adress-Punktdaten werden die Gebäude durch Bildung von Thiessen-Polygonen in Gebäudeteile zerlegt. Im nächsten Schritt können diese durch ihre Adressinformation mit Firmendaten verknüpft werden, was einer wesentlichen Verbesserung und Verfeinerung der funktionalen Gliederung bzw. einer ersten detaillierten Anzeige der Gebäudenutzung entspricht.

Als letzter Schritt wird eine Methode der räumlichen Disaggregation von Bevölkerung präsentiert, wobei mit steigender Komplexität die Ergebnisse einen dementsprechend höheren Genauigkeitsgrad aufweisen. Auf Rasterbasis vorliegende Volkszählungsdaten werden insofern verfeinert, dass Bevölkerung auf potentielle Wohngebäude verteilt wird. Zur Abschätzung der Einwohner pro Gebäude bzw. Gebäudeteil wird nicht die zweidimensionale Grundfläche als Referenz angenommen, sondern unter Miteinbeziehung der Höheninformation aus den Laser-Scanning-Daten das Gebäudevolumen. Der relevante potentielle Wohnraum wird durch Gewichtung des Volumens unter Berücksichtigung der Nutzung ausgewiesen. Diese zusätzlichen Informationen garantieren einen hohen Genauigkeitsgrad der Disaggregation und resultieren in einer zusätzlichen Aufwertung des funktionellen 3D-Gebäudemodells.

2 EINLEITUNG

Modellierung von Städten als komplexe Systeme erfordert Informationen unterschiedlichster Art, wie sozioökonomische und demographische Daten, als auch Realdaten. Letzteres steht für die Darstellung physischer Objekte wie Gebäude, Infrastruktur und Vegetation – allgemein Landbedeckung – Information, die meist durch Fernerkundungsanalysen oder terrestrische Erhebungen gewonnen und in raumbezogenen Datenbanken gespeichert wird. Sozioökonomische Daten andererseits entstammen statistischen Quellen wie der Volkszählung und beziehen sich, vor der Aggregation auf räumliche Basiseinheiten, auf einzelne Darsteller wie Personen oder Firmen.

Obwohl sich viele Komponenten des Fernerkundungs- und des GIS-Bereichs in den letzten Jahren separat voneinander entwickelt haben, ist ein Zusammenspiel im Rahmen von integrierten Ansätzen ein idealer Weg, um fortschrittliche räumliche Informationsprodukte für den urbanen Raum zu erstellen. Einerseits kann durch die Kombination der unterschiedlichen Daten statistische Information durch räumliche Disaggregation aufgewertet werden (Steinnocher et al. 2006). Andererseits kann durch die Integration von sozioökonomischen Daten bei der Bildauswertung ein Übergang von reiner Landbedeckung zu Landnutzung vollzogen werden (Mesev 2005). Dieser Ansatz wird in der vorliegenden Arbeit noch ausgeweitet, mit dem Ziel detaillierte urbane Funktion auszuweisen.

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3 UNTERSUCHUNGSGEBIET UND DATEN

Das Untersuchungsgebiet (UG) liegt in Linz-Urfahr in Oberösterreich, unmittelbar nördlich der Donau, und hat eine Fläche von etwa 3,7 x 3,5 km. Vor allem im nördlichen Teil des UG, am Stadtrand, sind weite Teile von Wald und Feldern bedeckt. Das beginnende Stadtgebiet ist im Süden großteils von gemischtem Wohngebiet und Geschäftsvierteln, sowie vom Schul- und Universitätskomplex im Osten geprägt.

Zur Analyse von Bodenbedeckung/urbaner Struktur wurden zwei Fernerkundungsdatensätze herangezogen:

- IKONOS 2-Satellitenbild: Pansharpened von 4 m auf 1 m Auflösung, mit vier multispektralen Kanälen inklusive nahem Infrarot (Aufnahme: 15.06.2002) – Abb. 2/1.
- Normalisiertes Digitales Oberflächenmodell (engl.: normalized Digital Surface Model, nDSM): Generiert aus ALS-Daten (engl.: Airborne Laser-Scanning) bei einer Flughöhe über Grund von 1 000 m und einer Punktdichte von 1 Pkt./m2, zeigt es Höheninformation über Grund. (Aufnahme: 24.03.2003) – Abb. 2/2.
- Zur weiterführenden Analyse der urbanen Funktion erfolgte eine Integration von statistischen und sozioökonomischen Daten, sowie Adress-Daten. Steinnocher und Köstl (2007) präsentieren eine genaue Beschreibung dieser Daten, auch hinsichtlich Qualität und auftauchender Probleme bei Verschneidungen.
- Flächenwidmung: Für das vorliegende Projekt wurde die Vielzahl von Kategorien und Ebenen des Originaldatensatzes (Flächenwidmungsplan FWP, definiert im Oberösterreichischen Raumordnungsgesetz) auf die in Abb. 3/1 gezeigten fünf Klassen aggregiert.
- Gebäude-Adressdaten: Die sogenannten ACGeo-Daten bestehen aus Postadressen verknüpft mit genauen Geo-Koordinaten. Die Position des Punktes entspricht entweder dem Gebäude oder dem Eingang des Gebäudes, die dazugehörige Adresse ist als Attribut gespeichert. Die Daten werden von der Post AG aus Orthofotos digitalisiert, von Tele Atlas Austria kommerziell vertrieben und zwei Mal jährlich aktualisiert (vgl. Abb. 3/2).
- Herold-Firmendaten: Basierend auf den „HEROLD Gelben Seiten“, werden diese Daten ebenfalls zwei Mal im Jahr aktualisiert und liefern grundlegende Firmen-Informationen wie Name, Adresse, Branche und wirtschaftlicher Sektor. Die auf der Straßengeometrie basierende Geokodierung ist abhängig von der Verfügbarkeit der Adress-Koordinaten, wobei die Qualität für jeden Eintrag quantitativ klassifiziert ist.
- Statistik Austria-Raster: Die verwendeten Daten beruhen auf dem Zensus 2001 (Volkszählung, Gebäude- und Wohnungszählung, Arbeitsstättenzählung). Zensusdaten sind über die Adresse geokodiert, was bedeutet, dass jede eindeutige Adresse geographisch koordinativ verortet ist. Dieser Adress-Punkt-Datensatz wird vom Bundesamt für Eich- und Vermessungwesen (BEV) erstellt und aktualisiert. Aus Datenschutzgründen erfolgt von Statistik Austria eine Aggregierung auf ein regelmäßiges Raster, wobei bei der höchsten verfügbaren Auflösung (nur in Stadtgebieten) die Rastergröße 125 x 125 m beträgt. Das Raster enthält als Information unter anderem die im vorliegenden Projekt als Basis verwendete „Einwohneranzahl pro räumlicher Einheit“.

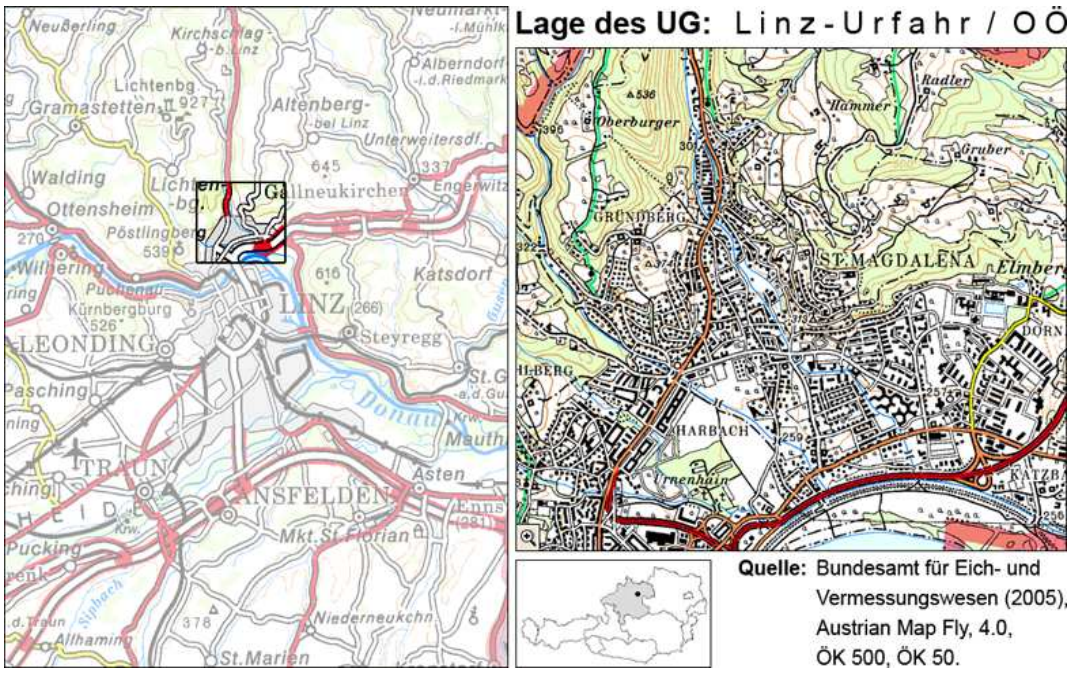

Abb. 1: Lage des Untersuchungsgebiets in Linz-Urfahr, Oberösterreich.

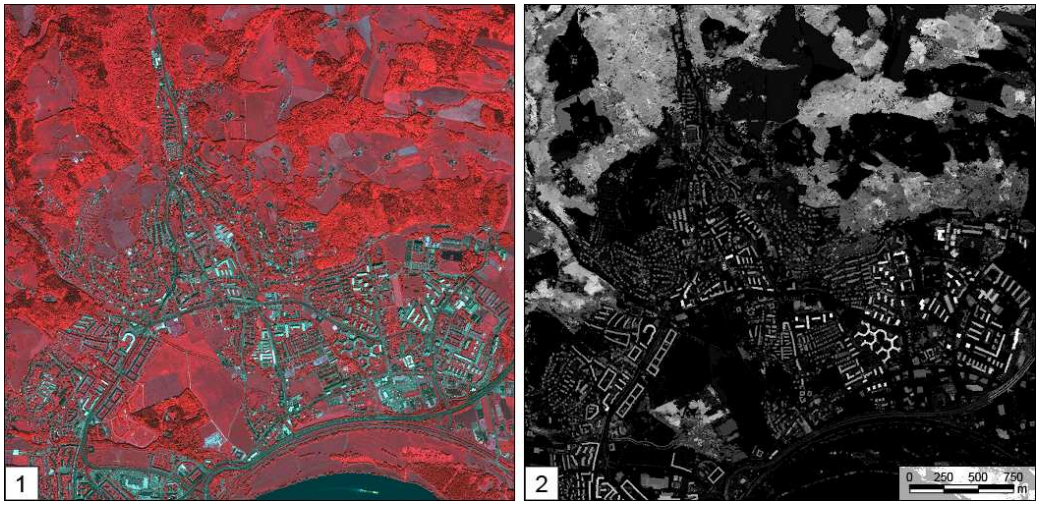

Abb. 2: Falschfarben-Infrarot IKONOS 2-Zusammenstellung (1) und normalisiertes Digitales Oberflächenmodell (2).

Abb. 3: Aggregierte Flächenwidmung (1), ACGeo-Adressdaten (2), Herold-Firmendaten (3), Statistik Austria-Bevölkerungsraster und BEV-Adressdaten (4).

4 METHODIK UND DATEN-ANALYSE

4.1 Detaillierte Landbedeckung und urbane Struktur

Aufgrund der hohen Auflösung der Datensätze und ihrer unterschiedlichen Eigenschaften bietet sich ein objekt-orientierter Ansatz, implementiert im Softwarepaket Definiens Professional 5.0 (früher bekannt als eCognition Professional)[80],, zur gemeinsamen Analyse des Satellitenbildes und der LiDAR-Daten an. Prinzipiell sind dabei drei Bearbeitungsschritte zu unterscheiden: (1) Die Segmentierung der Daten, (2) die Klassifizierung der resultierenden Segmente und (3) eine manuelle Nachbearbeitung. Die ersten beiden Verfahren können wechselweise eingesetzt werden, Klassifizierungsresultate dienen dann als Basis für weitere Segmentierungen. Eine detaillierte Beschreibung zu Segmentierung und Klassifizierung liefern Kressler und Steinnocher (2006a,b). Andere Ansätze zur Erstellung von komplexen 3D-Stadtmodellen präsentieren Ulm (2005) und Poli (2006), sowie Kocaman et al. (2006).

Durch die gemeinsame Analyse der VHR (engl.: very high resolution) Satellitenbilddaten und der LiDAR-Daten können Klassifikationen erstellt werden, die über klassische Landbedeckungs-Klassifikationen hinausgehen. Verschiedene räumliche Stukturen suburbaner Zonen sind in hochauflösenden Satellitenbilddaten direkt ersichtlich und können durch die kombinierte Analyse mit Höhendaten berücksichtigt werden. Dieser Prozess stellt einen Schritt von der Ermittlung reiner Landbedeckung in Richtung Landnutzung dar.

Unterschiedliche Landbedeckungstypen, wie Vegetation, Wasser und versiegelte Flächen, können allein aus den Informationen des IKONOS-Bildes unterschieden werden. Anhand der Höheninformation aus den ALS-Daten erfolgt eine weitere Differenzierung der verbauten Gebiete (und auch der Vegetation), unter anderem ist eine exaktere Abgrenzung von Gebäuden und Straßen möglich. Die Zuweisung zu definierten Klassen

[80] DEFINIENS - The Image Intelligence Company - www.definiens.com (Stand: März 2007)

erfolgt anhand von Merkmalen wie Helligkeit, mittlere spektrale Werte einzelner Bänder und NDVI (engl.: Normalized Difference Vegetation Index), basierend auf unscharfen Zugehörigkeitsfunktionen (engl.: fuzzy membership functions) (vgl. Kressler und Steinnocher 2006a,b). Letztlich werden sechs Klassen unterschieden: Gebäude, Straßen, flaches unbebautes Gebiet, Bäume/Wald, Gebüsche und Wasser. Schatten und eine Klasse für nicht klassifizierbare Segmente werden extra ausgewiesen.

Besonderes Augenmerk wurde in Hinblick auf den weiteren Projektverlauf auf die Auswertung und Beschreibung der Gebäude gelegt. Aus den ALS-Daten kann für jedes Objekt eine durchschnittliche Höhe ermittelt werden. Abb. 4/2 zeigt eine Klassifizierung nach durchschnittlicher Stockwerkshöhe. Resultat des Hinzufügens der dritten Dimension ist der Übergang von Landbedeckung zu urbaner Struktur. In einem zusätzlichen Bearbeitungsschritt wurden die Gebäudeumrisse mittels eines an der TU Wien neu entwickelten halb-automatischen Generalisierungs-Algorithmus vereinfacht. Dadurch wird eine wesentliche Verbesserung der Lesbarkeit und Anschaulichkeit für Visualisierungen in 2D und 3D erreicht (Aubrecht et al. 2007).

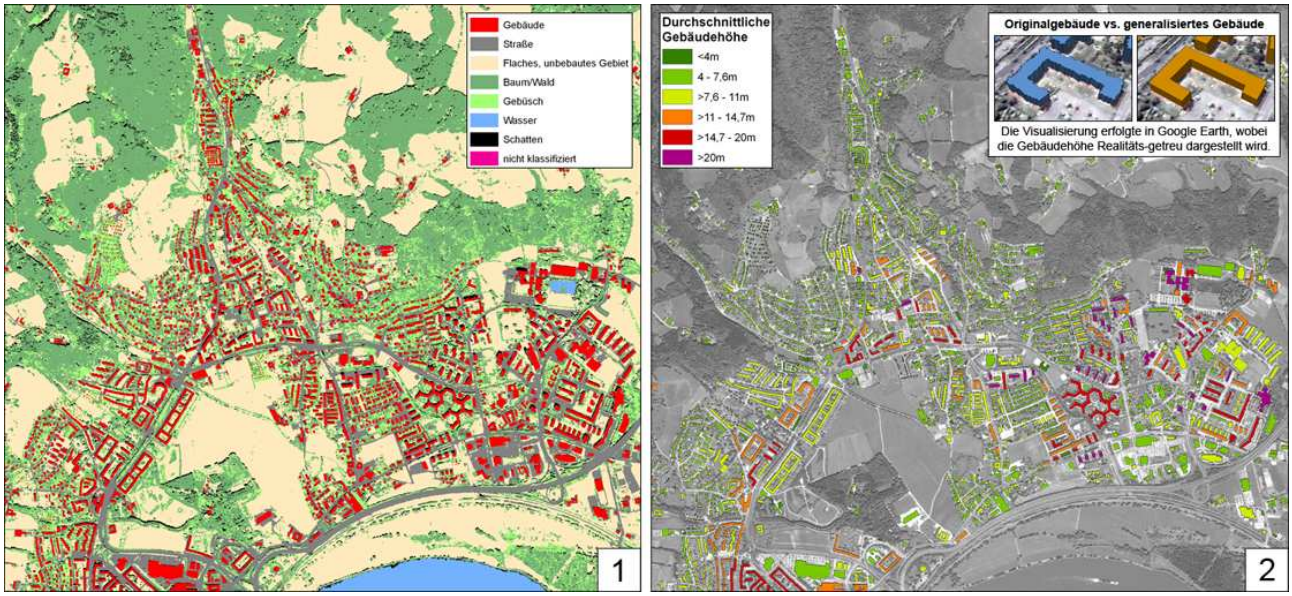

Abb. 4: Landbedeckung (1) und urbane Struktur/generalisiertes Gebäudemodell (2).

4.2 Urbane Funktion

Um den Übergang von urbaner Struktur zu urbaner Funktion vollziehen zu können, erfolgt eine Integration des Resultats aus der Analyse der Fernerkundungsdatensätze (3D-Gebäude-Modell) mit diversen statistisch-demographischen und sozioökonomischen Daten, sowie mit Adress- und Firmendaten (vgl. Kap. 3). Bis zu diesem Punkt ist nur Information über Lage, Größe und Höhe der einzelnen Gebäude verfügbar. Unter Einbeziehung der aggregierten Flächenwidmungsinformation (vgl. Kap. 3, Abb. 3/1) und nach Kontrolle und Überarbeitung mittels eines digitalen Stadtplans[81] wurde jedem der 2 254 Objekte eine der folgenden potentiellen Nutzungsarten zugewiesen (vgl. Abb. 5):

- Wohngebäude (1 722)
- Gemischte Nutzung (209)
- Kleingartenhaus (44)
- Öffentliche Nutzung (241)
- Sonstige Nutzung (38)

Nach der Verschneidung des Gebäudemodells mit dem FWP wurde die Zusatzinformation aus dem digitalen Stadtplan integriert. Erstens wurden Industrie- und Gewerbegebiete zur Klasse „Sonstige Nutzung“ zusammengefasst. Weiters wurden Gebäude mit öffentlicher Nutzung aus der im FWP ausgewiesenen „Gemischten Nutzung“ ausgenommen (vgl. Abb. 5). Aus der Klasse „Grünland“ wurden Erholungsgebiete und Sportstätten zur Klasse „Sonstige Nutzung“ hinzugefügt, Kleingartensiedlungen wurden extra klassifiziert. Wohngebiet wurde als solches übernommen. Gebäude außerhalb des im FWP definierten

[81] Digitaler Kommunalfinder der Stadt Linz - www.gisdat.at/website/linz (Stand: März 2007)

Bereichs wurden vorläufig als Wohngebäude klassifiziert. Meist sind dies freistehende landwirtschaftliche Höfe mit diversen Nebengebäuden (vor allem im Nordosten des UG), oder Gebäude deren Zentrum bei der Verschneidung auf Straßen liegt.

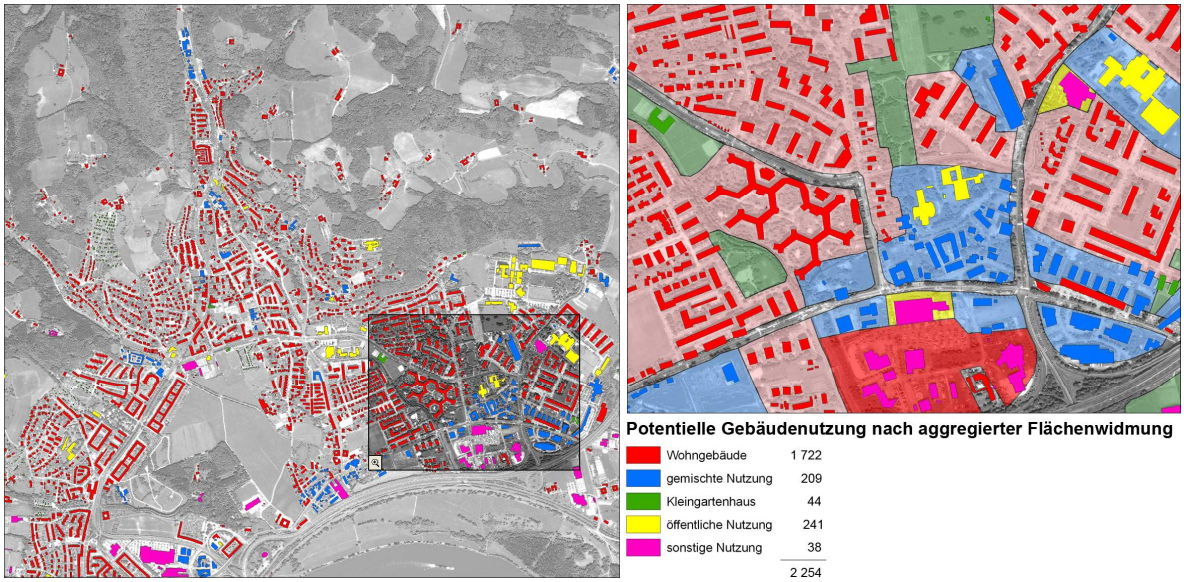

Abb. 5: Ausweisung einer potentiellen Gebäudenutzung durch Verschneidung mit aggregierter Flächenwidmungsinformation.

Durch die Miteinbeziehung der Flächenwidmung ergibt sich ein Indikator für die vorrangige Nutzung eines Gebäudes, lokale Unterschiede werden jedoch nicht berücksichtigt. Zur genaueren funktionellen Gliederung werden Firmendaten (auf Adress-Ebene) in die Analyse integriert. Mittels der geokodierten ACGeo-Adressen wird die Verbindung zu den Gebäuden hergestellt. Aufgrund der teils schlechten Lagegenauigkeit musste ein Teil dieser Punktdaten geometrisch korrigiert werden, wonach jeder Adresspunkt eindeutig einem Gebäude zuzuordnen war. Durch die Generierung von Thiessen-Polygonen und anschließender Verschneidung mit den Gebäudepolygonen konnten Gebäude mit mehreren Adressen (z. B. Wohnblöcke mit mehreren Eingängen oder Reihenhäuser) in Gebäudeteile mit eindeutiger Adresse zerschnitten werden. Somit bezieht sich jeder Herold-Eintrag über den Konnex der Adresse eindeutig auf einen spezifischen Gebäudeteil.

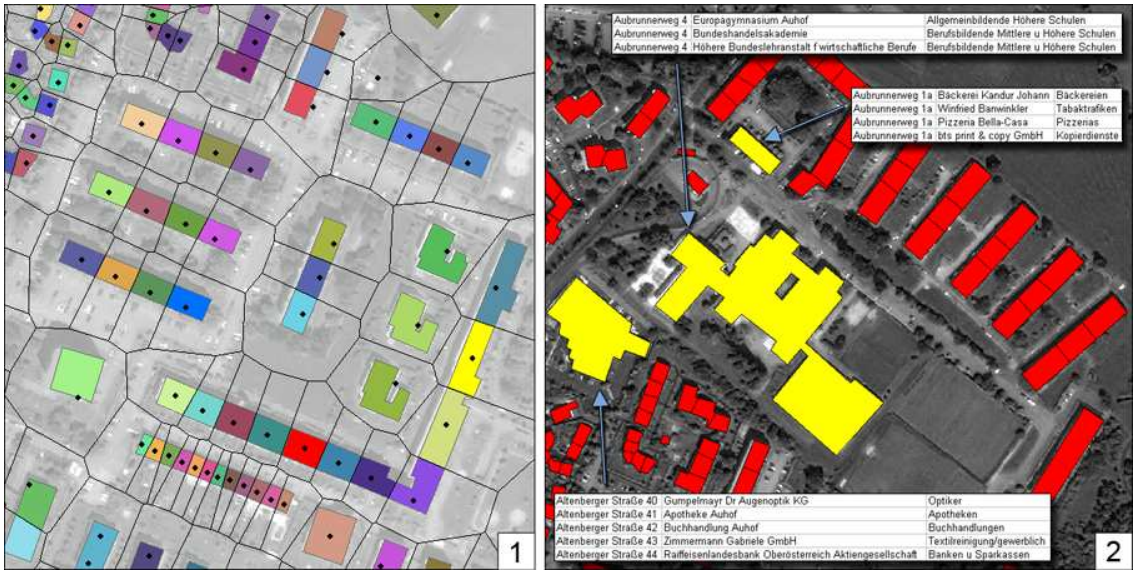

Abb. 6: Generierung des Gebäudeteilmodells mittels Thiessen-Polygonen aus den ACGeo-Punktdaten(1)und Beispiel für die Verbindung von Herold-Firmendaten mit dem Gebäudemodell (2).

604 der 642 Herold-Einträge konnten mit 497 der insgesamt 3 630 Gebäudeteile verbunden werden. Das heißt also, dass 94 % der Firmendaten eine verwertbare Information zur Generierung eines detaillierten funktionellen Gebäudemodells darstellen. Bei der Betrachtung ganzer Gebäude werden 415 Objekte (18.4 % von 2 254) zumindest zum Teil für wirtschaftliche Tätigkeiten genutzt. Auf 86 % der betroffenen Gebäude entfällt nur ein einziger Herold-Eintrag, nur ein Mal kommen mehr als vier Einträge in einem Gebäude vor.

Dies ist mit der Biesenfeldsiedlung auch das bei weitem größte Gebäude im UG und setzt sich aus einer Vielzahl von Gebäudeteilen zusammen. Die Mehrheit der Einträge findet sich in Wohngebäuden. Das war vielleicht zuvor nicht erwartet worden, ist aber durch die Vielzahl an kleinen Dienstleistungsanbietern einfach zu erklären.

Mittels eines hierarchischen Ansatzes, auf den hier nicht näher eingegangen wird, wurde die umfassende und sehr heterogene Information zur Gebäudenutzung aus den Herold-Daten auf 12 Klassen aggregiert. Diese Klassen werden in Bezug auf die jeweils dominante Nutzung auf Gebäudeteilebene zugewiesen, was ein funktionelles Gebäudemodell auf Adressebene als Resultat hat.

Abb. 5 zeigt einen Ausschnitt des UG, der eine große Heterogenität an Nutzungklassen aufweist.

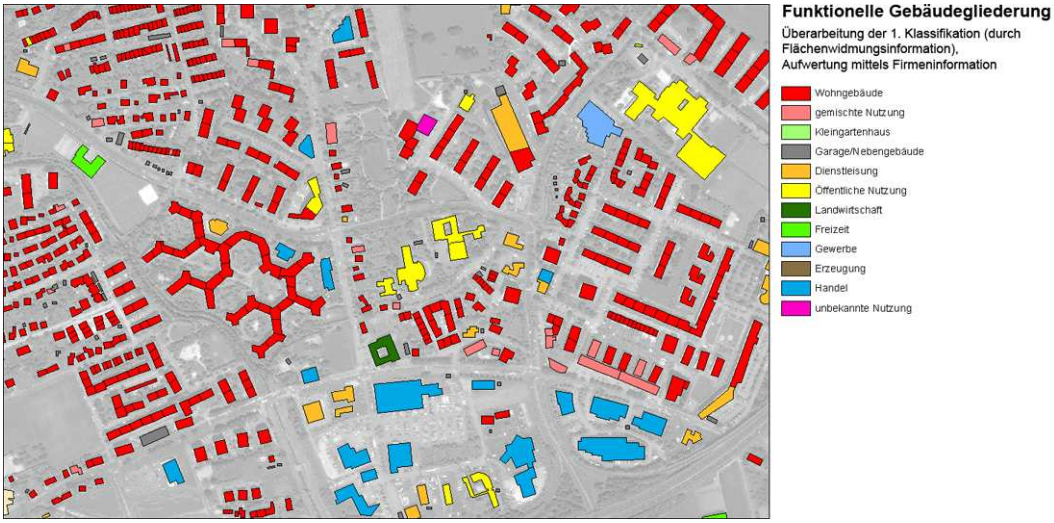

Abb. 7: Funktionelle Gebäudegliederung nach Aufwertung mittels Firmeninformation.

4.2.1 Räumliche Disaggregation von Bevölkerung

Um zusätzliche Information in das funktionelle Gebäudemodell zu integrieren, wird eine möglichst realitätsgetreue Bevölkerungsverteilung angestrebt. Als Basis fungiert der Bevölkerungs-Raster von Statistik Austria, der Information über die Einwohnerzahl in einer Auflösung von 125 x 125 m liefert.

Räumliche Disaggregation basiert auf der Annahme, dass regional vorhandene Daten mittels lokaler Parameter innerhalb der Region verteilt werden können. Die räumliche Aufteilung erfolgt dabei normalerweise durch eine gewichtete Summe. Eine Voraussetzung für diesen Ansatz ist ein klarer Zusammenhang zwischen den regionalen und den lokalen Parametern. Regionaler Parameter ist bei vorliegendem Projekt die Gesamtbevölkerung einer Region (in diesem Fall einer Rasterzelle), lokaler Parameter ist die aus der Fernerkundung abgeleitete Gebäudedichte innerhalb dieser Region. Die Verwendung der Gebäudedichte als Annäherung für die Bevölkerungsdichte erlaubt eine Abschätzung der lokalen Bevölkerungsverteilung (nach Steinnocher et al. 2006).

Die im vorliegenden Projekt angewandte Methode basiert auf der Größe der Einzelgebäude bzw. Gebäudeteile. Aufgrund der Höheninformation aus den LiDAR-Daten ist die Gebäudegröße nicht auf die Grundfläche beschränkt, stattdessen wird das Gebäudevolumen herangezogen. Unter der Annahme, dass sich die Anzahl der Einwohner nicht nur mit der Grundfläche sondern auch mit der Höhe eines Gebäudes erhöht, ist anzunehmen, dass dies eine wesentlich genauere Methode zur Bevölkerungsverteilung darstellt.

Um Bevölkerung aus dem Raster auf Gebäude oder Gebäudeteile zu verteilen, muss jedes Objekt eindeutig einer Rasterzelle zuweisbar sein. Je kleiner die Rasterzellen (also je höher die Auflösung), desto größer ist die Wahrscheinlichkeit, dass sich Gebäude über mehrere Zellen erstrecken und nicht mehr eindeutig zuzuordnen sind. Gebäude müssen also auf einen eindeutig koordinativ bestimmbaren Punkt reduziert werden. Dafür gibt es mehrere Möglichkeiten, wobei es in erster Linie auf die zur Verfügung stehenden Daten ankommt:

- Es sind keine geokodierten Adress-Punktdaten vorhanden, es gibt also keine Möglichkeit Gebäude in Subteile aufzuspalten:
    - Die Objekte können auf ihren Schwerpunkt reduziert werden.

- Im Vergleich dazu gibt es sogenannte Labelpunkte. Sie haben den Vorteil, dass sie auf jeden Fall innerhalb des jeweiligen Polygons platziert werden. Ein Labelpunkt entspricht grundsätzlich dem Schwerpunkt. Liegt dieser jedoch außerhalb des Objekts, wird er über die kürzest nötige Distanz ins Polygon verschoben.

- Mittels vorhandener Adress-Punktdaten können Gebäudeteile spezifisch unterschieden werden:
  - Die ACGeo-Adresspunkte können als eindeutiger Bezugspunkt herangezogen werden. Ihre geometrische Qualität ist realitv hoch, wodurch sie sich sehr gut eignen, um Gebäudeteile zu bilden. Der einzige Nachteil hinsichtlich der Disaggregation ist, dass sie nicht die eigentliche Basis im Bottom-Up-Verfahren der Statistik Austria für die Erstellung des Bevölkerungsrasters darstellen. Diese Tatsache kann zu ungewollten falschen Beziehungen führen.
  - Wie in Kap. 3 beschrieben, basiert der Bevölkerungsraster auf dem Zensus-Adress-Punktdatensatz des BEV. Bevölkerung, die bei der Volkszählung über ihre Adresse diesen Punkten zugewiesen wurde, wird später aus Datenschutzgründen auf Rasterebene aggregriert. Es ist also auf jeden Fall die genaueste Methode für die Disaggregation, wieder auf diese BEV-Punkte zurückzugreifen, um die Gebäudeteile eindeutig zuzuordnen. Die Verbindung erfolgt über die ACGeo-Adressinformation, da diese Daten eine höhere geometrische Genauigkeit als die BEV-Punkte aufweisen.

Für die Disaggregation von Bevölkerung auf Gebäudeteile wurden zunächst die gewichteten Volumina aller Gebäude innerhalb einer Rasterzelle aufsummiert. Die Gewichtung war zuvor bei jedem Gebäude hinsichtlich seiner Relevanz als Wohngebäude erfolgt, abhängig unter anderem von der Anzahl und Art an Firmeneinträgen pro Gebäudeteil. Als nächstes wurde die mittlere gewichtete Volumendichte für das Raster berechnet, indem die gesamte Bevölkerung einer Rasterzelle auf das aufsummierte Einwohner-relevante Gebäudeteilvolumen dieser Zelle bezogen wurde. Die berechnete Einwohnerzahl pro Gebäudeteil ergibt sich demnach aus der Multiplikation der mittleren gewichteten Volumendichte mit dem gewichteten Einwohner-relevanten Volumen eines Gebäudeteils (vgl. Abb. 6).

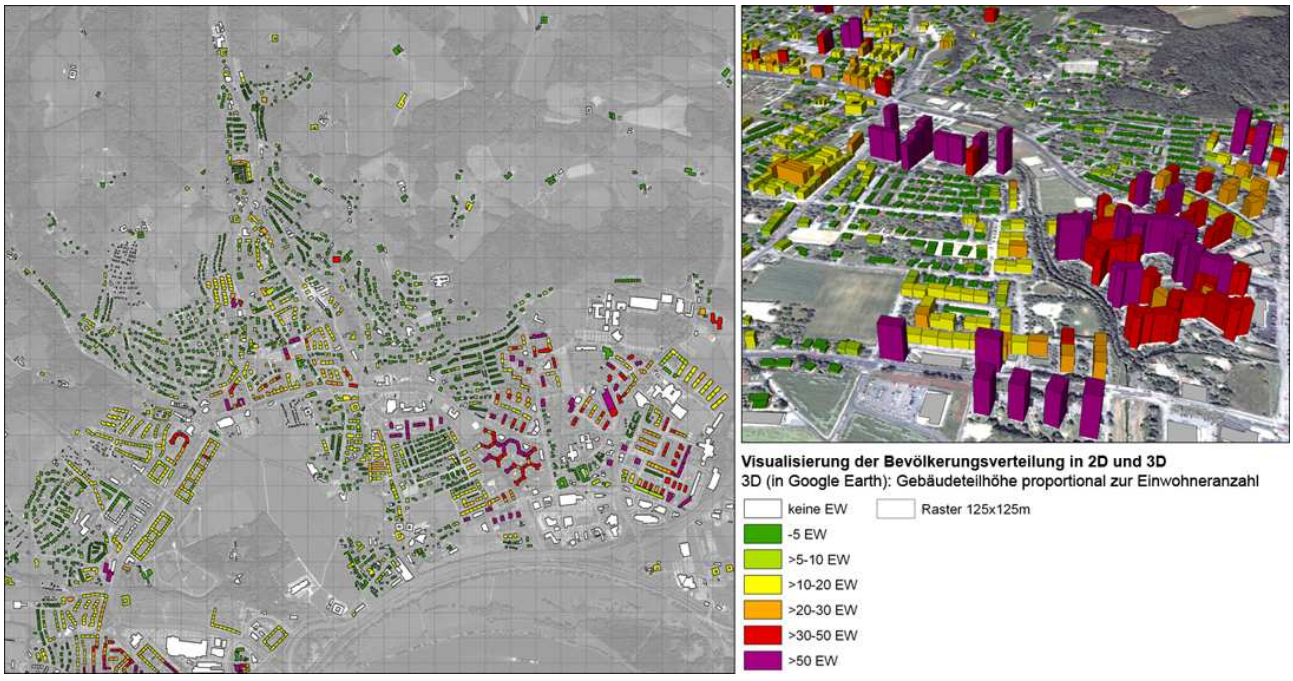

Abb. 8: Bevölkerungsverteilung nach der räumlichen Disaggregation.

4.2.2 Resultate mit unterschiedlichem Genauigkeitsgrad

Bei der Disaggregation von Bevölkerung können die Resultate einen unterschiedlichen Genauigkeitsgrad aufweisen, je nachdem welche Methode angewandt wird bzw. welche Basisdaten für die Berechnung zur Verfügung stehen. Im Folgenden werden drei Möglichkeiten mit steigender Komplexität kurz angesprochen. Für das vorliegende Projekt wurde aufgrund der Verfügbarkeit aller benötigten Daten die letzte Methode, mit dem höchsten zu erwartenden Genauigkeitsgrad (LOD, engl.: level of detail), angewandt.

- LOD 1: Gebäude (Fläche) – Nutzung: FWP – Schwerpunkte

  Es ist keine Gebäudehöheninformation verfügbar, sowie keine Firmendaten zur detaillierten Ausweisung der Gebäudenutzung. Geokodierte Adresspunktdaten sind ebenfalls nicht vorhanden.

  Für die eindeutige Zuweisung der Gebäude zu einer Rasterzelle werden Gebäudeschwerpunkte gebildet (vgl. Kap. 4.2.1). Die Nutzungsinformation kommt rein aus aggregierten Flächenwidmungsdaten. Für die Einwohnerverteilung wird nur die potentielle Wohnfläche von Wohngebäuden und Gebäuden gemischter Nutzung in die Berechnung miteinbezogen.

- LOD 2: Gebäude (Volumen) – Nutzung: FWP, digitaler Stadtplan – Labelpunkte

  Für die eindeutige Identifikation von Gebäuden werden die, im Vergleich zu den Schwerpunkten theoretisch genaueren bzw. aussagekräftigeren, Labelpunkte erzeugt (vgl. Kap. 4.2.1). Die Gebäudenutzung aus der Flächenwidmung wird mit Hilfe eines digitalen Stadtplans grob überarbeitet, wodurch vor allem Objekte der vage definierten Klasse „gemischte Nutzung“ reduziert werden können. Außerdem stehen Gebäudehöheninformationen zur Verfügung, wodurch das potentielle Wohnvolumen bei der Disaggregation berücksichtigt werden kann.

- LOD 3: Gebäudeteile (Volumen) – Nutzung: FWP, digitaler Stadtplan, Firmendaten – BEV Punkte

Mittels geokodierter Adressdaten können Gebäudteile gebildet werden, die sich über BEV-Punkte eindeutig einzelnen Rasterzellen zuweisen lassen. Die mittels Stadtplan überarbeitete Nutzung aus der Flächenwidmung wird mit Firmendaten aufgewertet. Das unter Berücksichtigung der dominanten Nutzung gewichtete Gebäudeteilvolumen wird als potentieller Wohnraum herangezogen.Mittels geokodierter Adressdaten können Gebäudteile gebildet werden, die sich über BEV-Punkte eindeutig einzelnen Rasterzellen zuweisen lassen. Die mittels Stadtplan überarbeitete Nutzung aus der Flächenwidmung wird mit Firmendaten aufgewertet. Das unter Berücksichtigung der dominanten Nutzung gewichtete Gebäudeteilvolumen wird als potentieller Wohnraum herangezogen.

Bei den drei eben angesprochenen Methoden wurde nicht auf die in unterschiedlicher Auflösung verfügbaren Bevölkerungsbasisdaten eingegangen. Neben der im vorliegenden Projekt zur Anwendung gekommenen, und nur in Stadtgebieten verfügbaren, Auflösung von 125 x 125 m, bietet Statistik Austria die Daten als Raster auf höherem Aggregationsniveau (250 x 250 m, 500 x 500 m), sowie auf Zählsprengelebene, für ganz Österreich an.

5 CONCLUSIO

Der vorliegende Beitrag zeigt einen integrativen Ansatz von Fernerkundung und GIS, um den Übergang von reiner Landbedeckung zu Landnutzung und in weiterer Folge über urbane Struktur zu urbaner Funktion zu vollziehen. Durch die gemeinsame Analyse von sozioökonomischer Information, Adress-Daten und Fernerkundungsdaten war es möglich, ein detailliertes funktionelles 3D-Gebäudemodell zu erstellen, wobei die geokodierte Adressinformation den grundlegenden Link zwischen den unterschiedlichen Datensätzen herstellt.

Das Endprodukt zeigt Gebäudeteile auf Adressbasis als Polygone in einer GIS-Datenbank, mit der durchschnittlichen Gebäudehöhe und dem abgeleiteten Gebäudevolumen als physische Attribute. Weiters ist jedem Gebäudeteil eine dominante Nutzungsart zugewiesen bzw. im Fall einer gemischten Nutzung seine potentielle Relevanz als Wohngebäude. Eine direkte Verbindung mit der Herold-Datenbank ermöglicht die Lokalisierung von spezifischen Firmen bzw. von bestimmten Wirtschaftszweigen. Zusätzlich wurde mittels räumlicher Disaggregation, unter Berücksichtigung des im funktionellen Modell ausgewiesenen potentiellen Wohnraums, Bevölkerung auf die Gebäudeteile verteilt, wodurch für jedes Objekt eine geschätzte Einwohneranzahl angegeben werden kann.

Funktionelle 3D-Gebäudemodelle des urbanen Raums stellen in einer GIS-Umgebung eine wertvolle Basis für eine Vielzahl von Anwendungen, wie Risikoanalysen und Katastrophen-Simulationen, sowie für Verkehrsmodellierungen und vor allem auch für Geomarketinganalysen dar. Im Bereich der Stadt- und Umweltplanung wird ihre Bedeutung in Zukunft mit Sicherheit noch zunehmen.

6 LITERATUR/QUELLEN

Aubrecht C., Dutter M., Hollaus M., Steinnocher K. (2007): Objekt-orientierte Analyse von Fernerkundungsdaten mit anschließender Gebäudegeneralisierung als Basis für 3D-Visualisierungen im urbanen Raum. In: Strobl, Blaschke & Griesebner (Hrsg): Angewandte Geoinformatik 2007. Beiträge zum 19. AGIT-Symposium Salzburg. Herbert Wichmann Verlag, Karlsruhe (in Druck).

BEV - Bundesamt für Eich- und Vermessungswesen (2005): Austrian Map Fly, Version 4.0. ÖK 500 und ÖK 50.

DEFINIENS - The Image Intelligence Company (2007): www.definiens.com (Stand: März 2007).

GISDAT - Geographische Datenservice GmbH (2007): Kommunalfinder Linz. www.gisdat.at/website/linz (Stand: März 2007).

Kocaman S., Zhang L., Gruen A., Poli D. (2006): 3D city modeling from high-resolution satellite images. ISPRS Workshop on Topographic Mapping from Space, Ankara.

Kressler F. P. & Steinnocher K. (2006a): Image Data and Lidar – An ideal combination matched by object-oriented analysis. In: Lang, Blaschke & Schöpfer (Hrsg.): Bridging remote sensing and GIS. 1st International Conference on Object-based Image Analysis, Universität Salzburg, 4.-5. Juli 2006. Conference Proceedings. CD-Rom.

Kressler F. P. & Steinnocher K. (2006b): Image classification with LiDAR and GIS-data – moving from land cover to land use. SPIE Europe Remote Sensing 2006, Stockholm, 11.-14. September. CD-Rom.

Mesev V. (2005): Identification and characterisation of urban building patterns using IKONOS imagery and point-based postal data. Computers, Environment and Urban Systems, Volume 29, 541-557.

Poli D. (2006): Reality-based 3D City Models from Aerial and Satellite Data. GEOInformatics, März 2006, Volume 9, 8-11.

Steinnocher K., Weichselbaum J., Köstl M. (2006): Linking remote sensing and demographic analysis in urbanised areas. In: Hostert, Damm & Schiefer (Hrsg.): First Workshop of the EARSeL SIG on Urban Remote Sensing "Challenges and Solutions", Berlin, 2.-3. März 2006, CD-Rom.

Steinnocher K. & Köstl M. (2007): Zur Qualität österreichischer Geodatensätze. In: Manfred Schrenk (Hrsg.): CORP2007: 12. Internationale Konferenz zu Stadtplanung und Regionalentwicklung in der Informationsgesellschaft, Tagungsband (in Druck).

Ulm K. (2005): 3D City Models from Aerial Imagery - Integrating Images and the Landscape. GEOInformatics, Jänner/Februar 2005, Volume 8, 18-21.

7 DANKSAGUNG

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🏆 *reviewed paper*

Indikatoren zur Landschaftszerschneidung
Untersuchungen zur Einsetzbarkeit in der strategischen Verkehrsplanung

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1 ZUSAMMENFASSUNG

Die Zerschneidung der Landschaft durch Straßen- und Bahnlinien trägt in beträchtlichem Maße zum fortschreitenden Verlust an Arten- und Lebensraumvielfalt bei. Um dieser Entwicklung entgegenwirken zu können, muss die Zerschneidungswirkung bei der strategischen Planung von Verkehrswegen in Zukunft verstärkt berücksichtigt werden. Die strukturellen Landschaftsveränderungen, die mit der Landschaftszerschneidung einhergehen, können anhand von Landschaftsstrukturmaßen (engl. landscape metrics) messbar gemacht werden und so in die Bewertung unterschiedlicher Planungsszenarien einfließen. Im Rahmen dieser Studie wurden vier verschiedene Ansätze zur Quanitfizierung der Landschaftszerschneidung auf ihre konkrete Einsetzbarkeit in Strategischen Umweltprüfungen am Beispiel der SP-V Marchfeld Straße untersucht. Bei der Bewertung der Planfälle erwies sich vor allem die effektive Maschenweite als ein gut einsetzbarer, da nachvollziehbarer und einfach handhabbarer Indikator. Neben den Vorteilen, die eine quantitative Erfassung des Zerschneidungsgrades mit sich bringt, sind die Messergebnisse jedoch kritisch zu betrachten und nur mit ausreichender Sachkenntnis in die Bewertung mit einzubeziehen.

2 EINLEITUNG

2.1 Das Problem der zunehmenden Landschaftszerschneidung

Das Verkehrsaufkommen auf Österreichs Straßen ist sowohl im Personen- wie auch im Güterverkehr in den vergangenen Jahrzehnten stark gestiegen und wird allen Prognosen nach auch in Zukunft hohe Wachstumsraten verzeichnen. Der mit dieser Entwicklung verbundene Ausbau der Verkehrsinfrastruktur hat neben einem nicht zu unterschätzenden Flächenverbrauch, die fortschreitende Zerschneidung von ursprünglich zusammenhängenden Lebensräumen und bestehenden ökologischen Vernetzungen zur Folge. Das bedeutet, dass Landschaftsräume, die wild lebenden Tier- und Pflanzenarten als Lebensräume dienen, nicht nur verkleinert, sondern auch voneinander isoliert werden, was die Überlebenswahrscheinlichkeit von Wildtierpopulationen zum Teil dramatisch sinken lässt. Die zahlreichen Negativfolgen der Landschaftszerschneidung tragen somit zum fortschreitenden Verlust der Arten- und Lebensraumvielfalt bei. Die Auswirkungen betreffen jedoch nicht nur die Tier- und Pflanzenwelt, sondern auch den Menschen, da die Erholungsqualität der Landschaft u. a. durch die von den Verkehrswegen ausgehenden Lärm- und Abgasemissionen vermindert wird.

Will man im Sinne einer nachhaltigen Entwicklung dem schleichenden Voranschreiten der Landschaftszerschneidung Einhalt gebieten und die noch verbleibenden, unzerschnittenen Freiräume erhalten, muss das Problem bereits in der Phase der strategischen Planung von Verkehrswegen verstärkt berücksichtigt werden (siehe Penn-Bressel, 2005).

2.2 Die Strategische Prüfung im Verkehrsbereich (SP-V) als Antwort auf die SUP-Richtlinie

Die Strategische Umweltprüfung (SUP) wurde 2001 durch die EU-Richtlinie über die Prüfung der Umweltauswirkungen bestimmter Pläne und Programme (kurz SUP-Richtlinie) ins Leben gerufen. Den Anstoß dazu gab die Erkenntnis, dass es für die Berücksichtigung von Umweltbelagen meist zu spät ist, wenn bereits fertig ausgearbeitete Projekte zur Genehmigung eingereicht werden (ÖGUT, o. J.). Umweltrelevante Entscheidungen werden vielfach schon auf einer der Projektebene vorgelagerten Planungsebene getroffen, auf der Grundsatzüberlegungen wie Kapazitäts- und Bedarfsfragen und Alternativprüfungen im Mittelpunkt stehen. Die SUP ermöglicht bereits im Stadium der strategischen Planungsüberlegungen die Prüfung und Bewertung nachteiliger Umweltauswirkungen.

Das Bundesgesetz über die Strategische Prüfung im Verkehrsbereich (SP-V-Gesetz) vom 11. August 2005 setzt die Bestimmungen der SUP-Richtlinie in nationales Recht um. Im SP-V Gesetz ist festgelegt, dass jede Änderung im hochrangigen Bundesverkehrswegenetz mit voraussichtlich erheblichen Umweltauswirkungen

einer Strategischen Prüfung im Verkehrsbereich (SP-V) zu unterziehen ist. Die Ergebnisse einer SP-V bilden eine Entscheidungsgrundlage bei der Durchführung von Verkehrsinfrastrukturprojekten.

Das Problem der zunehmenden Landschaftszerschneidung und die damit verbundenen strukturellen Landschaftsveränderungen wurde in den bisher durchgeführten SP-Vs nicht ausreichend bzw. überhaupt nicht berücksichtigt. Um künftig die Zerschneidungswirkung unterschiedlicher Planungsszenarien abschätzen und in die Bewertung einbeziehen zu können, muss sie anhand von Indikatoren messbar gemacht werden. Hier bietet sich der Einsatz von speziellen Landschaftsstrukturmaßen (engl. landscape metrics) an, die den Grad der Landschaftszerschneidung quantitativ erfassen können (Lang & Blaschke, 2007).

3 METHODIK

Zur quantitativen Erfassung der Landschaftszerschneidung gibt es in der Fachliteratur eine Reihe von Ansätzen. Viele Maßzahlen (z. B. Anzahl und durchschnittliche Größe der verbleibenden Flächen) weisen jedoch mehr oder weniger erhebliche Mängel auf oder sind nur unter engen Einschränkungen gültig (vgl. Jaeger 2002). Im Rahmen dieser Studie wurden vier verschiedene Ansätze zur Quantifizierung der Landschaftszerschneidung hinsichtlich ihrer Einsetzbarkeit bei der SP-V untersucht: (1) die Verkehrsnetzdichte, (2) der Ansatz der unzerschnittenen verkehrsarmen Räume (UZVR), (3) die effektive Maschenweite (meff) und (4) der Contagion-Index.

Die Verkehrsnetzdichte ergibt sich aus der Länge des Verkehrsnetzes (Bundes- und Landesstraßen sowie Bahnlinien) bezogen auf die Fläche des Untersuchungsgebiets.

Unzerschnittene verkehrsarme Räumen sind per definitionem Gebiete, die eine Mindestflächengröße von 100 km² besitzen und von keiner Straße mit einer Verkehrsmenge von mehr als 1.000 Kfz im 24-Stundenmittel oder einer Eisenbahnlinie durchschnitten werden (vgl. Lassen 1990). Die Schwellenwerte für die Mindestflächengröße und die höchstzulässige Verkehrsdichte wurden im Hinblick auf die Gewährleistung einer „ungestörten, naturnahen Erholung“ (Lassen 1987, S. 12) innerhalb dieser Gebiete festgelegt. Diese Definition kann jedoch auch abgeändert werden. So können in stark zerschnittenen Landschaften bereits Räume mit weniger als 100 km² als UZVR gelten. Ebenso können zur Abgrenzung der UZVR anstelle des DTV-Wertes[82] auch bestimmte Kategorien von Straßen – ohne Berücksichtigung der Verkehrsdichte – herangezogen werden. Neben der Anzahl der unzerschnittenen verkehrsarmen Räume sollte zur Beurteilung des Zerschneidungsgrades auch die von ihnen eingenommene Fläche herangezogen werden.

Die Definition der effektiven Maschenweite (siehe Jaeger 2002) basiert auf der Wahrscheinlichkeit, mit der zwei zufällig in einem Gebiet gewählte Punkte auch nach der Zerschneidung des Gebiets noch gemeinsam innerhalb derselben Fläche liegen und nicht durch Barrieren (z. B. Straßen) voneinander getrennt sind. Diese Wahrscheinlichkeit, die auch als die Begegnungswahrscheinlichkeit von zwei Tieren derselben Art interpretiert werden kann, wird als Kohärenzgrad einer Landschaft bezeichnet (ebd.):

$$COH = \sum_{i=1}^{n} \left(\frac{F_i}{F_{total}} \right)^2 ,$$

wobei n = Zahl der verbleibenden unzerschnittenen Flächen, Fi = Größe der Fläche i (i = 1, …, n) und F_{total} = Gesamtfläche des Untersuchungsgebiets.

Je mehr Barrieren in einer Landschaft vorhanden sind, d. h. je stärker diese zerschnitten ist, umso geringer ist diese Wahrscheinlichkeit. Durch eine Multiplikation mit der Gesamtgröße des Gebiets (Ftotal) kann der Kohärenzgrad COH in eine Flächengröße – die effektive Maschenweite – umgerechnet werden. In Worten ist meff definiert als die Größe der Flächen, die man erhält, wenn ein Gebiet bei gegebenem Kohärenzgrad in gleich große Flächen zerschnitten wird, so dass sich der Kohärenzgrad des untersuchten Gebiets ergibt. Der Wert der effektiven Maschenweite liegt zwischen 0 km² (total zerschnitten oder überbaut) und der Gesamtgröße des Gebiets (völlig unzerschnitten). Wird ein Gebiet in gleich große Teile zertrennt, so ist der Wert von meff gleich der Größe dieser Teilräume. Im Allgemeinen entspricht meff jedoch nicht der Durchschnittsgröße der verbleibenden Flächen.

[82] Wert der durchschnittlichen täglichen Verkehrsbelastung

Der Contagion-Index misst das Ausmaß, indem Landschaftselemente (engl. patches) räumlich konzentriert auftreten (O'Neill et al. 1988). Er gibt folglich den „Verklumpungsgrad" (engl. degree of clumping, vgl. Riitters et al. 1996) einer Landschaft wieder. Besteht diese aus wenigen großen, zusammenhängenden Patches, nimmt der Index einen relativ hohen Wert an. Niedrigere Werte treten dahingegen dann auf, wenn die Untersuchungslandschaft stark fragmentiert ist, sich also aus vielen kleinen, verstreut liegenden Patches zusammensetzt. Anders als die bisher diskutierten Zerschneidungsmaße ist Contagion nur auf Raster daten anwendbar, da er das paarweise Auftreten von Klassen in angrenzenden Rasterzellen betrachtet. Entscheidend dabei ist die Häufigkeit, mit der die jeweils vorkommenden Klassenkombinationen als benachbarte Zellen auftreten (einschließlich jener Fälle, in denen zwei Zellen gleicher Klasse aneinander grenzen). Je häufiger bestimmte Kombinationen auftreten, umso höher ist der Verklumpungsgrad (Lang & Blaschke, 2007).

Die Einsetzbarkeit dieser Indikatoren zur Landschaftszerschneidung wurde am Beispiel der SP-V Marchfeld Straße untersucht, deren Gegenstand die Errichtung einer hochrangigen Straßenverbindung zwischen der Landesgrenze von Wien bzw. Niederösterreich und der österreichisch-slowakischen Staatsgrenze bei Marchegg bzw. Angern ist. Dabei wurden fünf Varianten eines Verkehrsinfrastrukturausbaus auf ihre zerschneidende Wirkung hin analysiert und bewertet: zwei Planfälle, die den Bau einer höherwertigen zweistreifigen Straßenverbindung einschließlich lokaler Ortsumfahrungen vorsehen und drei weitere Planfälle, die den Bau einer Schnellstraße einbeziehen (siehe Abbildung 1). Die Zerschneidungseffekte der unterschiedlichen Varianten wurden in Bezug auf einen Referenzfall bewertet, der den Ist-Zustand, d. h. den Zustand ohne Ausbaumaßnahmen im Straßennetz, darstellt. Den Untersuchungsraum bildet ein ca. 30 km x 30 km großer Landschaftssausschnitt im Bereich des Marchfelds (Niederösterreich).

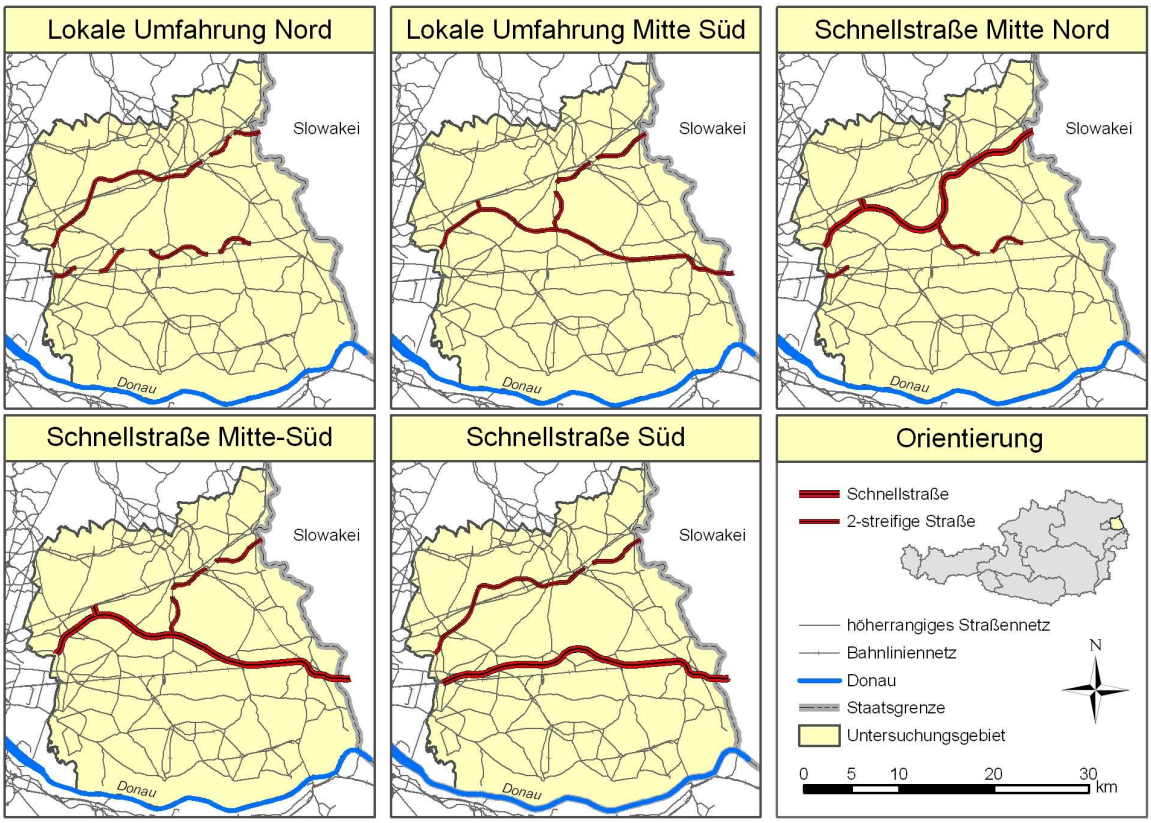

Abbildung 1: SP-V Marchfeld Straße: geplante Varianten eines Verkehrsinfrastrukturausbaus (Quelle: eigener Entwurf).

Ausgangsbasis für die Ermittlung der Zerschneidungsmaße war die Festlegung, welche Landschaftselemente eine zerschneidende Wirkung besitzen. Dabei wurden sowohl geogene als auch anthropogene Strukturen gewählt, von denen starke Barriere- und/oder Lärmwirkungen ausgehen. Konkret handelte es sich um:

- Siedlungsflächen,
- Fließgewässer ab einer Breite von fünf Metern,
- stehende Gewässer,

- das höherrangige Straßennetz (Bundes- und Landesstraßen),
- in Betrieb befindliche Bahnlinien sowie
- die Trasse des jeweiligen Planfalls.

Diese linearen und polygonalen Trennelemente wurden für jeden Planfall GIS-gestützt zu einer Zerschneidungsgeometrie vereinigt, die die Berechnungsgrundlage der Indikatoren bildete[83].. Zu den verwendeten Vektordatensätzen zählen: das höherrangige Straßennetz im Maßstab 1:50.000, worin Bundesstraßen (Autobahnen und Schnellstraßen) und Landesstraßen enthalten sind, das Bahnliniennetz, Siedlungsflächen, Fließgewässer und stehenden Gewässer jeweils im Maßstab 1:10.000 und die digitalisierten Trassenverläufe der geplanten Ausbauvarianten. Verkehrswege wurden in verschiedenen Szenarien zum einen als eindimensionale Linien, aber auch als Polygone in die Zerschneidungsgeometrien eingebunden. Die Repräsentation durch Polygone hat den Vorteil, dass sowohl der direkte wie auch der indirekte[84] Flächenverbrauch durch die Straßen berücksichtigt werden kann.

4 ERGEBNISSE

4.1 Verkehrsnetzdichte

Die Berechnungsergebnisse der Verkehrsnetzdichte sind in Abbildung 2 grafisch darstellt. Die Variante Lokale Umfahrung Nord weist mit 796,9 m pro Quadratkilometer im Vergleich zu den anderen Planfällen die geringste Verkehrsnetzdichte auf und trägt damit rechnerisch am wenigsten zur Zerschneidung der Landschaft bei.

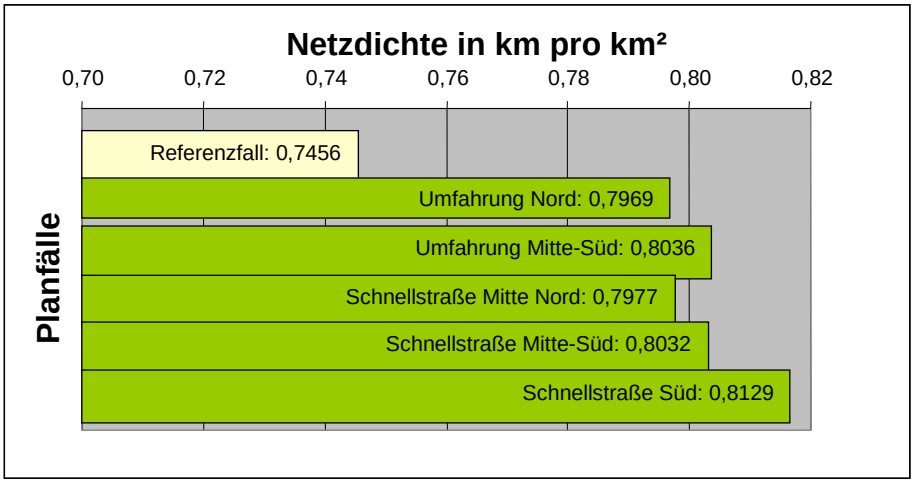

Abbildung 2: Verkehrsnetzdichte (angegeben in km pro km²).

Neben der Verkehrsnetzdichte wurde auch der Flächenverbrauch durch die Verkehrsträger bezogen auf die Fläche des Untersuchungsgebiets ermittelt (angegeben in ha/km²). Die Gegenüberstellung der resultierenden Werte führte wenig überraschend zu dem Ergebnis, dass die drei „Schnellstraßen-Varianten“ stärker zum Flächenverbrauch beitragen, als die beiden Planfälle, die den Bau einer höherwertigen zwei-streifigen Straßenverbindung vorsehen.

4.2 Ansatz der unzerschnittenen verkehrsarmen Räume

Die erstellten Zerschneidungsgeometrien beinhalten sämtliche unzerschnittenen Flächen im Untersuchungsgebiet[85]. In Abbildung 3 werden sie am Beispiel des Referenzfalls dargestellt. Den größten Freiraum bilden mit 97,97 km² die Donauauen im Süden des Untersuchungsraums. Die bewaldeten Ausläufer des Weinviertler Hügellandes nördlich von Bockfließ, die Weikendorfer Remise und die Marchauen im Osten des Untersuchungsgebiets sind weitere große unzerschnittene Räume.

[83] Mit Ausnahme der Verkehrsnetzdichte, die nur das Verkehrsnetz selbst berücksichtigt.
[84] Damit gemeint ist jener Bereich, der durch die von den Verkehrswegen ausgehenden Störwirkungen (Lärm, Schadstoffe etc.) beeinträchtigt ist. Die Reichweiten dieser Wirkungen, die u. a. vom Verkehrsaufkommen abhängig sind, wurden aus Rassmus et al., 2003 entnommen.
[85] Dazu werden auch jene Flächen gezählt, die nur zum Teil innerhalb des Untersuchungsraumes liegen.

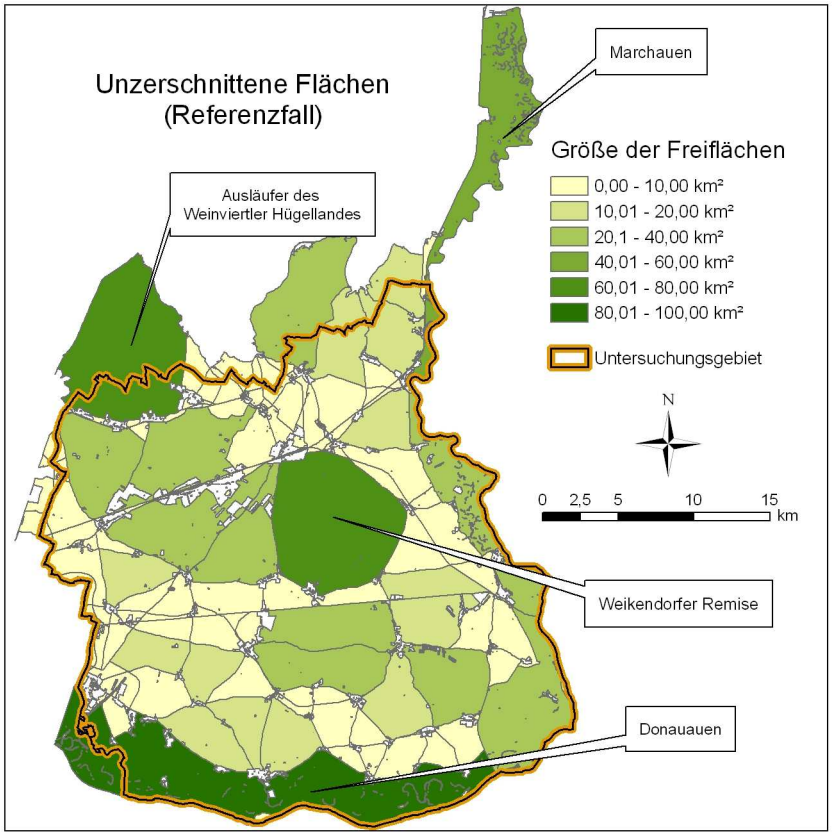

Abbildung 3: Darstellung der unzerschnittenen Flächen zum Zeitpunkt vor der geplanten Netzveränderung (Referenzfall). Verkehrswege und Fließgewässer gingen als Linien in die Zerschneidungsgeometrie ein (Quelle: eigener Entwurf).

Um die Zerschneidungswirkung der unterschiedlichen Planfälle beurteilen zu können, wurden aus den Zerschneidungsgeometrien alle UZVR selektiert und hinsichtlich ihrer Anzahl und Größe gegenübergestellt. Der ursprünglich für die Mindestgröße der UZVR festgelegte Schwellenwert von 100 km² wurde dabei auf 40 km² herabgesetzt, da ansonsten keine Aussagen über den Zerschneidungsgrad des relativ stark fragmentierten Untersuchungsgebiets möglich gewesen wären. Weiters wurden auch Anzahl und Flächenanteil der UZVR > 20 km² ermittelt, um zu verdeutlichen, welchen Einfluss die Schwellenwertsetzung auf die Ergebnisse besitzt.

Tabelle 1 gibt einen Überblick, wie sich der geplante Ausbau der Verkehrsinfrastruktur auf die Anzahl und Fläche der UZVR auswirkt. Bei Betrachtung der ermittelten Werte wird deutlich, dass sich die Anzahl der Flächen über 40 km² trotz der jeweiligen Ausbaumaßnahmen nicht verändert und daher auch nicht zwischen den verschiedenen Ausbauvarianten differenziert werden kann. Erst anhand der Fläche, die diese Räume einnehmen, wird eine Aussage über die Zerschneidungswirkung des jeweiligen Planfalls möglich. Demnach stellt die Variante Lokale Umfahrung Nord die günstigste Alternative dar (wie auch schon bei der Analyse der Verkehrsnetzlänge), gefolgt von der Variante Schnellstraße Süd. Zum selben Ergebnis kommt man auch bei Betrachtung der UZVR > 20 km², allerdings bleibt hier die Anzahl der UZVR verglichen mit dem Referenzfall nur in zwei Fällen konstant und nimmt bei den übrigen Szenarien auf 12 ab.

Die Berücksichtigung der direkten Flächeninanspruchnahme durch linienhafte Zerschneidungselemente bei der Erstellung der Zerschneidungsgeometrien hat keine Auswirkungen auf die Reihung der Szenarien hinsichtlich ihrer Zerschneidungswirkung. Auch der Einbezug des indirekten Flächenbedarfs der Verkehrswege bringt abgesehen von einer starken Flächenreduktion keine Änderung mit sich, sofern man die Anzahl und Fläche der UZVR > 40 km² betrachtet. Überraschend ist, dass man anhand der UZVR > 20 km² zu einem völlig anderen Ergebnis kommt: Hier liegen jene Varianten, die ansonsten die geringste Zerschneidungswirkung besitzen (Lokale Umfahrung Nord und Schnellstraße Süd) an letzter bzw. vorletzter Stelle (siehe Tabelle 1, hervorgehobene Werte). Dieser Fall macht deutlich, dass durch unterschiedliche Schwellenwertsetzung sehr unterschiedliche Ergebnisse erzielt werden können.

Planfall	Linien		Polygone (indirekter Flächenbedarf)	
	UZVR > 40 km²	UZVR > 20 km²	UZVR > 40 km²	UZVR > 20 km²

	Anzahl	Fläche	Anzahl	Fläche	Anzahl	Fläche	Anzahl	Fläche
Referenzszenario	4	266,24	14	538,96	3	188,61	6	267,75
Umfahrung Nord	4	263,37	14	526,93	3	181,83	**5**	**239,75**
Schnellstraße Süd	4	261,95	14	525,26	3	180,33	**5**	**237,13**
Schnellstraße Mitte-Nord	4	260,58	12	482,65	3	179,79	6	257,95
Umfahrung Mitte-Süd	4	256,06	12	477,93	3	174,00	6	251,87
Schnellstraße Mitte-Süd	4	256,06	12	477,93	2	132,96	6	250,69

Tab. 1: Anzahl und Fläche der UZVR mit mehr als 40 bzw. 20 km² unter Berücksichtigung der Verkehrswege und Fließgewässer als Linien bzw. des indirekten Flächenbedarfs der Verkehrswege bei der Erstellung der Zerschneidungsgeometrie.

4.3 Effektive Maschenweite

Die effektive Maschenweite meff kann mit der entsprechenden mathematischen Formel schrittweise in jedem Tabellenkalkulationprogramm (z. B. Microsoft Excel) ermittelt werden, wobei die Flächen der unzerschnittenen Polygone der Zerschneidungsgeometrien die Berechnungsgrundlage bilden. Es existieren aber auch verschiedene Programmerweiterungen (engl. extensions) für ArcView bzw. ArcGIS, die Berechnung von m_{eff} unterstützen[86]..

Die effektive Maschenweite beträgt für den Fall, dass die Verkehrsinfrastruktur im Marchfeld nicht erweitert wird (Referenzfall), 35,79 km². Abbildung 4 fasst zusammen, wie sich die jeweils geplanten Ausbaumaßnahmen auf diesen Wert auswirken. Die Variante Lokale Umfahrung Nord (m_{eff}: 34,73 km²) weist verglichen mit den übrigen Planfällen zum wiederholten Male die geringste Zerschneidungswirkung auf, gefolgt von den beiden „Schnellstraße-Varianten“ Süd (m_{eff}: 34,40 km²) und Mitte-Nord (m_{eff}: 34,01 km²).

Wird bei der Erstellung der Zerschneidungsgeometrien auch der (direkte) Flächenbedarf der Verkehrswege und Fließgewässer einbezogen, nimmt der Wert der effektiven Maschenweite erwartungsgemäß ab. Beim Vergleich der Planfälle zeigt sich, dass nach wie vor die Varianten Schnellstraße Süd und Lokale Umfahrung Nord zu den Favoriten zählen, allerdings hat diese Mal die „Schnellstraßen-Variante“ die geringere Zerschneidungswirkung. Die übrige Reihenfolge ist unverändert. Die Berücksichtigung der indirekten Flächeninanspruchnahme führt zu einer weiteren generellen Abnahme der effektiven Maschenweite, ansonsten sind die Ergebnisse aber mit jenen der vorangehenden Untersuchungen vergleichbar.

[86] Dazu zählen u. a. die ArcView Extension Meff , entwickelt am Institut für Landschaftsplanung und Ökologie (ILPÖ) der Universität Stuttgart sowie die für ArcGIS entwickelte Erweiterung V-LATE (Vector-based Landscape Analysis Tools Extension), ein vektorbasiertes Tool zur quantitativen Landschaftsstrukturanalyse, entwickelt von der Landscape Analysis and Ressource Management Research Group (LARG) an der Universität Salzburg .

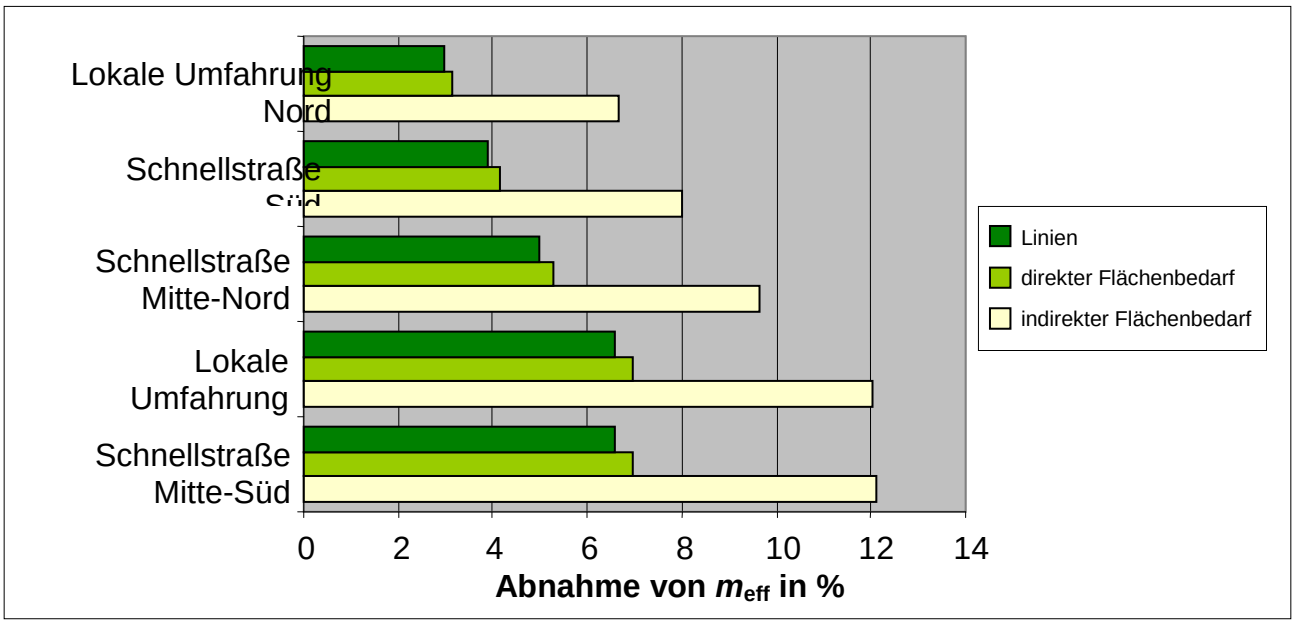

Abb. 4:Reaktion der effektiven Maschenweite auf die geplanten Ausbaumaßnahmen (in Bezug auf den Referenzfall). Die Verkehrswege wurden sowohl als Linien als auch als Polygone (direkter und indirekter Flächenbedarf) in die Zerschneidungsgeometrien einbezogen.

4.4 Contagion-Index

Die Berechnung des Contagion-Index erfolgte in der Softwareumgebung von FRAGSTATS 3.3 (MCGARIGAL & MARKS, 2002) . Da es sich um eine rasterbasierte Maßzahl handelt, mussten die erstellten Zerschneidungsgeometrien zuvor in Rasterdaten umgewandelt werden. Bei der Konvertierung wurden die Vektordaten in zwei Klassen zusammengefasst: Die Klasse „0“ beinhaltet alle Zellen, die das Attribut „unzerschnitten“ besitzen und der Klasse „1“ werden jene Zellen zugeordnet, die als fragmentierend gelten.

Da Linien in Rasterdatenform oft nur als unterbrochene Abschnitte wiedergegeben werden, wurden nur jene Zerschneidungsgeometrien analysiert, die den direkten oder indirekten Flächenbedarf der Verkehrswege und Fließgewässer beinhalten. In Abbildung 5 sind die Messergebnisse für jene Datensätze abgebildet, die die indirekte Flächeninanspruchnahme durch die Verkehrsträger berücksichtigen. Um festzustellen, welchen Einfluss die gewählte Pixelgröße auf die Resultate besitzt, wurde diese in verschiedenen Szenarien mit 20, 50 und 100 m festgelegt. Erwartungsgemäß liegen bei der feineren räumlichen Auflösung (20 Meter) die Werte des Index höher als bei den gröberen Auflösungen. Die Reihung der Planfälle verändert sich durch die unterschiedlich gewählte Auflösungen nicht wesentlich. Wiederum erweist sich die Variante Lokale Umfahrung Nord als jene mit der geringsten Zerschneidungswirkung und auch die übrige Reihenfolge stimmt mit den bisher erzielten Ergebnissen überein. Generell liegen die Werte für die einzelnen Alternativen sehr nahe beieinander.

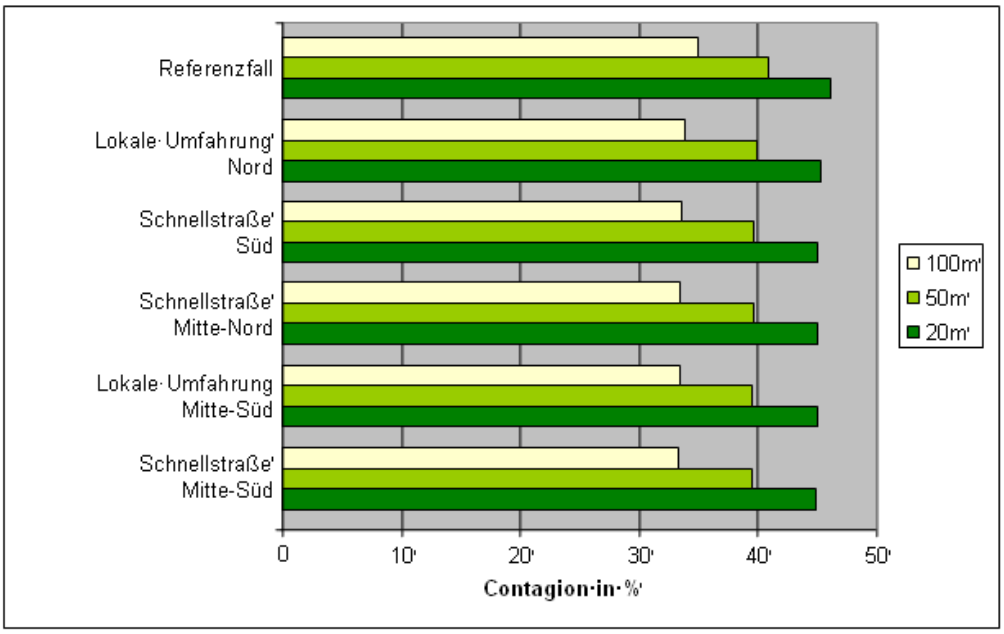

Abbildung 5: Ergebniswerte des Contagion-Index bei unterschiedlich gewählter Rasterauflösung (unter Einbezug des indirekten Flächenbedarfs der Verkehrswege bei der Erstellung der Zerschneidungsgeometrien).

5 DISKUSSION UND AUSBLICK

Die Untersuchungen, die im Rahmen dieser Studie am Beispiel der SP-V Marchfeld Straße durchgeführt wurden, zeigen, dass sich die verschiedenen Ansätze zur Quantifizierung der Landschaftszerschneidung unterschiedlich gut eignen, um strukturellen Landschaftsveränderungen zu beschreiben.

Die Verkehrsnetzdichte ist ein sehr intuitives, aber auch sehr grobes und dadurch nur eingeschränkt anwendbares Zerschneidungsmaß. Der große Nachteil besteht darin, dass es strukturelle Unterschiede zwischen verschiedenen Zerschneidungsmustern nicht zum Ausdruck bringen kann, da es keine Informationen über die Verteilung der Verkehrswege in der Landschaft enthält. Über die Größe der verbleibenden ungestörten Flächen kann somit nur wenig ausgesagt werden. Um neben der direkten und indirekten Flächeninanspruchnahme durch die Verkehrsflächen auch den strukturellen Aspekt der Landschaftsveränderungen wiedergeben zu können, müssen andere Maße herangezogen werden.

Die unzerschnittenen verkehrsarmen Räume (UZVR) sind konkrete, vor Ort identifizierbare und in Karten darstellbare Teilräume, die von der Bevölkerung gut erlebt werden können (Schupp 2005). Zahl und Flächenanteil der UVZR eignen sich daher besonders zu Kommunikations- und Illustrationszwecken. Als Messgröße für den Zerschneidungsgrad sind sie allerdings relativ schlecht geeignet, da sie nicht ausreichend sensitiv sind. Vor allem Veränderungen bzw. Entwicklungen, die sich ober- und unterhalb des jeweils festgelegten Schwellenwertes abspielen, werden nicht angezeigt.

Die effektive Maschenweite bezieht hingegen alle verbleibenden Flächen in die Beurteilung ein und ermöglicht so auch für dicht besiedelte Gebiete quantitative Aussagen zur Entwicklung der Landschaftszerschneidung. Im Gegensatz zur Verkehrsnetzdichte reagiert sie auch auf eine Zunahme der Siedlungsflächen, da die verbleibenden Flächen durch die Überbauung verkleinert werden. Insgesamt ist die effektive Maschenweite ein aussagekräftiger Indikator, der die Anforderungen an Zerschneidungsmaße (z. B. Anschaulichkeit, geringer Datenbedarf, mathematische Einfachheit) zu einem sehr hohen Grade erfüllt (siehe Jaeger 2002). Da die unzerschnittenen verkehrsarmen Räume bei der Berechnung der effektiven Maschenweite automatisch mit ermittelt werden, bietet es sich an, beide Werte anzugeben, wobei die effektive Maschenweite den eigentlichen, belastbaren Indikator darstellt, während der Flächenanteil der UZVR zusätzlich zur Veranschaulichung und als Kommunikationshilfe dient (Jaeger 2004). Bei der kombinierten Anwendung der beiden Zerschneidungsindikatoren ist jedoch zu beachten, dass diese exakt dieselben Zerschneidungselemente berücksichtigen.

Zusätzlich zu den bereits genannten Vorteilen besitzt die Methode der effektiven Maschenweite ein hohes Entwicklungspotential. Sie kann beispielsweise so erweitert werden, dass neben den Größen der

verbleibenden Flächen auch die Topologie, d. h. die relative Lage der Flächen zueinander, berücksichtigt wird. Damit wird es möglich, die Auswirkungen der Anordnung der Flächen auf den Zerschneidungsgrad quantitativ darzustellen. Die Nachbarschaftsbeziehungen der Flächen sind dann relevant, wenn die vorhandenen Barrieren von der betrachteten Tierart (bzw. dem Erholungsuchenden) überquert werden können. Auf diesem Wege können außerdem unterschiedliche Trennstärken von Infrastrukturanlagen berücksichtigt werden (Jaeger 2002). Des Weiteren kann die Methode rechnerisch mit Daten zur Qualität von Lebensräumen verknüpft werden, indem die Flächengrößen mit einem Qualitätsfaktor multipliziert werden. Dieser Faktor kann in Abhängigkeit von der betrachteten Tierart eine Wertigkeit der Fläche angeben (ebd.), z.B. die Habitateignung (engl. habitat suitability, siehe z.B. Spellerberg, 1992). Außerdem könnten mithilfe der effektiven Maschenweite in Zukunft regionenspezifische Grenz- oder Richtwerte für einen „noch tolerierbaren Zerschneidungsgrad“ entwickelt werden.

Der Contagion-Index ist ein topologiesensitives Maß, das auf steigende Fragmentierung mit Abnahme des Wertes reagiert. Die Abnahme erfolgt allerdings nur solange die Klasse der verbleibenden unzerschnittenen Flächen größenmäßig überwiegt. Ist dies nicht mehr der Fall, kippt der Indikator und nimmt bei weiterer Fragmentierung rechnerisch wieder zu. Ein weiteres Problem bei der Anwendung des rasterbasierten Contagion-Index liegt in der häufig unzureichenden Berücksichtigung linienhafter Zerschneidungselemente. Diese können nur durch eine ausreichend niedrig gewählte Rasterauflösung oder eine entsprechende Vorprozessierung (Blow & Shrink Algorithmen) adäquat repräsentiert werden. Ebenso ist zu beachten, dass die erzielten Ergebnisse sehr stark von der gewählten Rasterauflösung abhängen und aus diesem Grund mit Vorsicht zu interpretieren sind.

Generell stellt der Einsatz von Landschaftsstrukturmaßen in Planungsprozessen meist eine sinnvolle Ergänzung oder Erweiterung zu vorhandenen Methoden dar, da sie die Erfassung und Bewertung des Landschaftszustandes ermöglichen. Durch die einfache Ermittlung und Darstellung der Trendentwicklung erleichtern Zerschneidungsindikatoren das im Rahmen einer SP-V verpflichtend durchzuführende Monitoring. So kann belegt werden, ob die bei der Planung erwarteten Umweltfolgen eingetreten sind, und ob Entschneidungsmaßnahmen (z. B. der Bau von Grünbrücken) erfolgreich durchgeführt wurden (Penn-Bressel 2005).

Bei der Anwendung von Landschaftsstrukturmaßen tritt aber auch das Problem auf, dass die absoluten Werte quantitativer Maße oft nur schwer zu interpretieren sind. Ein unreflektierter Umgang kann durchaus zu Fehlinterpretationen bzw. zu einer irreführenden Verwendung führen. Der Vergleich von Messergebnissen ist nur dann möglich, wenn bei der Berechnung der Maße die gleichen Datengrundlagen (im Hinblick auf Maßstab, Qualität, räumliche Auflösung etc.) herangezogen wurden. Die ermittelten Werte quantitativer Landschaftsstrukturmaße sollten stets mit großer Sorgfalt interpretiert und nur mit Vorsicht und viel Sachkenntnis in Bewertungen einbezogen werden (vgl. Blaschke 1999). Die quantitativen Angaben müssen stets durch qualitative Aussagen eingebunden und ergänzt werden, da ein so komplexer Betrachtungsgegenstand wie die Landschaft niemals rein quantitativ erfasst werden kann. Eine Beschränkung auf quantitative Aspekte läuft Gefahr, die spezifische Situation eines Gebietes gegebenenfalls zu vernachlässigen. Außerdem können die verwendeten quantitativen Maße nur aufgrund von qualitativen Überlegungen kritisiert und revidiert werden (Jaeger 2002). Qualitative Betrachtungen bleiben also auch bei einer Ausweitung quantitativer Methoden die unentbehrliche Grundlage (ebd.).

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7 LITERATURANGABEN

BLASCHKE, T. (1999): Quantifizierung der Struktur einer Landschaft mit GIS: Potential und Probleme. In: WALZ, U. (Hrsg.): Erfassung und Bewertung der Landschaftsstruktur. Auswertung mit GIS und Fernerkundung. – Dresden, (= IÖR-Schriften, 29), S. 9-24.

JAEGER, J. (2002): Landschaftszerschneidung. Eine transdisziplinäre Studie gemäß dem Konzept der Umweltgefährdung. - Stuttgart.

JAEGER, J. (2004): VII-12 Zerschneidung der Landschaft durch Verkehrswege und Siedlungsgebiete. In: KONOLD, W., R. BÖCKER und U. HAMPICKE (Hrsg.): Handbuch Naturschutz und Landschaftspflege. Landsberg.

LANG, S. & T. BLASCHKE (2007): Landschaftsanalyse mit GIS. – Stuttgart.

LASSEN, D. (1990): Unzerschnittene verkehrsarme Räume über 100 km² - eine Ressource für die ruhige Erholung. - In: Natur und Landschaft, 65/6, S. 326-327.

LASSEN, D. (1987): Unzerschnittene verkehrsarme Räume über 100 km² Flächengröße in der Bundesrepublik Deutschland. In: Natur und Landschaft, 62/12, S. 532-535.

McGARIGAL, K. & B. J. MARKS (1995): FRAGSTATS: Spatial pattern analysis program for quantifying landscape structure. Dolores.

ÖGUT (Österreichische Gesellschaft für Umwelt und Technik) (o. J.): Strategische Umweltprüfung Basiswissen. URL: http://www.oegut.at/de/themen/partizipation/strategische-umweltpruefung-basiswissen.php (15.03.2007).

O'NEILL, R.V. et al. (1988): Indices of landscape pattern. – In: Landscape Ecology, 1/3, S. 153-162.

PENN-BRESSEL, G. (2005): Begrenzung der Landschaftszerschneidung bei der Planung von Verkehrswegen. – In: GAIA, 14/2, S. 130-134.

RASSMUS, J. (2003): Methodische Anforderungen an Wirkungsprognosen in der Eingriffsregelung. In: Bundesamt für Naturschutz (Hrsg.): Angewandte Landschaftsökologie Heft 51. – Münster.

SCHUPP, D. (2005): Umweltindikator Landschaftszerschneidung. Ein zentrales Element zur Verknüpfung von Wissenschaft und Politik. – In: GAIA, 14/2, S. 101-106.

RIITTERS, K. H. et al. (1996): A note on contagion indices for landscape analysis. – In: Landscape Ecology, 11/4, S. 197-202.

SCHWARZ-v. RAUMER, H. G. (2006): Indicating landscape fragmentation using Patency Index. Arbeitspapier unveröffentlicht, Institut für Landschaftsplanung und Ökologie der Universität Stuttgart. URL: http://www.ilpoe.uni-stuttgart.de/team/svr/svr.html (15.03.2007).

SPELLERBERG, I. F. (1992): Evaluation and assessment for conservation. Ecological guidelines for determining priorities for nature conservation. – London.

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Grenzen überschreiten: Konzept einer GIS-basierten Wohnungsmarktbeobachtung

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1 EINLEITUNG

Akteure der Stadt- und Raumplanung und der Immobilienwirtschaft waren schon immer auf raumbezogene Informationen angewiesen. Bislang bilden Statistiken, die interpretatorisch auf administrative Ebenen (statistische Bezirke) übertragen werden, die Grundlage von Planungs- und Investitionsentscheidungen.

Entscheidend für immobilienwirtschaftliche und zunehmend auch für stadtplanerische Entscheidungen ist dabei die Frage der Marktakzeptanz auf der Nachfrageseite (z.B. Mieter oder Käufer von Wohnungen). Die Marktakzeptanz sowie die Wertschätzung einzelner Stadtquartiere spiegelt sich besonders in den Preisen wieder: Hohe Preise stehen für eine hohe Wertschätzung und Marktakzeptanz, geringe Preise für das Gegenteil. Allerdings waren Preisinformationen bisher für einzelne Objekte nicht in einem statistisch relevanten Umfang verfügbar, sondern ausschließlich in zusammengefasster Form für administrative Ebenen (z.B. statistische Bezirke). Immobilien sind zwar immobil, aber im Raum nicht gleich verteilt. Der Bezug auf administrative Erhebungseinheiten erschwert die präzise Beschreibung der strukturellen Situation, da diese nur selten mit sozioökonomischen, baulichen und topographischen Strukturen übereinstimmen. Heterogenitäten werden durch die Aggregation auf administrative Ebenen zu Homogenitäten umgewandelt. Eine Folge der mangelnden Aussagekraft verfügbarer Daten und unzureichender Abbildung bestehender räumlicher Strukturen und Entwicklungen, ist die fehlende Transparenz für die Teilnehmer am Immobilienmarkt.

An dieser Problematik anknüpfend wurde in Kooperation mit der Firma empirica ein Konzept entwickelt, das spezifischere Bewertungen in räumlicher wie auch in zeitlicher Hinsicht ermöglichen soll. Mit den Techniken geographischer Informationssysteme kann die Darstellung und Analyse raumspezifischer Wohnungsmarktinformationen unabhängig von administrativen Einheiten realisiert werden. Datengrundlage der Analyse bildet die empirica-Preisdatenbank.

Im Folgenden wird das Grundkonzept eines GIS-basierten Informationssystems vorgestellt, mit dem detaillierte Beobachtungen von Wohnungsmarktstrukturen ermöglicht werden. Nach der konzeptionellen Beschreibung wird das methodische Vorgehen theoretisch erläutert und das Ergebnis am Fallbeispiel Wuppertal vorgestellt. Abschließend werden ergänzende Faktoren aufgeführt, die auf Basis der bisherigen Auswertungen von Angebotspreisen die Entwicklung eines hedonischen Preisindex ermöglichen.

2 GEOGRAPHISCHE INFORMATIONSSYSTEME (FUNKTION UND ANWENDUNG)

Bevor wir das theoretische Konzept im Detail vorstellen, soll zunächst der Begriff Informationssystem geklärt werden. In diesem Zusammenhang soll das Informationssystem als die Schnittstelle eines Datenbanksystems mit externen Kommunikationsmedien und der Einbindung von anwendungsspezifischen Methoden verstanden werden. Das Datenbanksystem besteht aus einem Datenbankmanagementsystem und einer Datenbank. Die aufgeführte Architektur wurde über die Anbindung einer Datenbank an ein geographisches Informationssystem und die Erweiterung der Analysemethoden über die Statistiksoftware R realisiert. Das GIS bietet sowohl Management-, als auch Kommunikationsfunktionen (vgl. Konzept). Die Datenbank beinhaltet Informationen über die angebotenen Wohnungsmarktobjekte und R ermöglicht komplexe statistische Operationen.

Geographische Informationssysteme sind seit einiger Zeit auch bei den Akteuren der Stadt- und Raumplanung und des Immobilienmarktes in Anwendung, wodurch sich die Kommunizierbarkeit von statistischen Informationen verbessert hat. In digitalen Karten können Raumverhältnisse besser nachvollzogen, Rauminformationen in multivariaten Darstellungen miteinander verschnitten und somit Informationen prägnant dargestellt werden. Die Vorteile eines geographischen Informationssystems für die Wohnungsmarktbeobachtung können nach Borchert (2006) wie folgt zusammengefasst werden:

1. Kommunikationsfunktion: Übermittlung des räumlichen Wissens an andere Personen. Ergebnisse werden präsentiert, sollen überzeugen.

2. Soziale Funktion: Alle Handlungen, die nicht räumliche, sondern soziale Aktionen bewirken. Darunter fallen beispielsweise Karten, die positiv wirkende Umfeldfaktoren graphisch überbetonen, um eine größere Begehrlichkeit nach einer Immobilie zu wecken und eine Besichtigung auszulösen, die sich sonst nicht ergeben würde.

3. Kognitive Funktion: Gewinnung, Optimierung und Erweiterung räumlichen Wissens. Bei diesem explorativen Ansatz dient die Karte der Ideengewinnung, der Hypothesenbildung und -bestätigung. In der Synthese können Zusammenhänge aufgezeigt, mehrere Fragen beantwortet und generalisierte Aussagen gewonnen werden.

4. Entscheidungsunterstützende Funktion: Räumliche Analyseergebnisse werden zur Entscheidungsfindung genutzt.

Trotz enormer Verbesserungen in der kommunikations- und der sozialen Funktion durch die Einführung geographischer Informationssysteme, werden die Potentiale der kognitiven- und entscheidungsstützenden Funktionen noch nicht ausgeschöpft. Bezüglich der Wohnungsmarktbeobachtung kann dies auf schlechte Datenverfügbarkeit, aber auch auf die Projektion der verfügbaren Daten auf administrative Ebenen und der damit verbundenen Generalisierung von Informationen zurückgeführt werden. Ein weiterer Nachteil dieser Objektaggregation ist die Vernachlässigung von Nachbarschaftsverhältnissen (engl. Neighborhood = Umfeldbeziehungen).

3 KONZEPT GIS-BASIERTER WOHNUNGSMARKTBEOBACHTUNG

Nachbarschaftsverhältnisse (Umfeldbeziehungen) stellen einen entscheidenden Faktor in der Stadtforschung, sowohl in der Stadtökonmie als auch in der Stadtgeographie und der Stadtsoziologie dar. Besonders durch Galster sind im Bereich der Soziologie die Wirkungen von Nachbarschaften hervorgehoben worden: “The value of the object depends on the value of adjacent objects in the neighborhood and the image of the neighborhood” (Galster, in Friedrichs und Blasius 2006). Auch die lagebezogene Einbettung von Immobilien in Nachbarschaften hat in Kombination mit dem Einkommen einen Einfluss auf die Wohnentscheidung von Haushalten. Vorwiegend vier Nachbarschaftsfaktoren führen zu positiven oder negativen externen Effekten auf die Anwohner bzw. den Immobilienmarkt (vgl. Can 1998):

1) Zugänglichkeit des Geländes
2) Physische Charakteristika des Objektbestands
3) Sozialer, ökonomischer und demographischer Kontext
4) Bereitstellung der öffentlichen Versorgung

Aus den nachbarschaftlichen Unterschieden bezüglich dieser Dimensionen, resultiert eine systematische Variation in der Verteilung von Immobilienbedarf, -produktion, -dispersion und -finanzierung im Raum. Diese räumliche Struktur wird über Immobilienpreise charakterisiert.

Nachbarschaftverhältnisse werden im Folgenden, in Anlehnung an Galster (2003) als Objektinterdependenzen zunächst auf Basis der Objekteigenschaften beschrieben. Zunächst soll nun das Datenaggregationsverfahren auf administrative Ebenen und die o. g. Einschränkungen dieser Verfahren illustriert werden (Abb.1). Weiterhin wird das Konzept objektbasierter Datenaggregationsverfahren vorgestellt, welche sich durch räumliche Interpolationsverfahren realisieren lassen (Abb.2).

In Abbildung 1 sind sowohl Interdependenzen von Nachbarschaften als auch Datenaggregationsverfahren schematisch dargestellt. Die gestrichelten Linien symbolisieren Stadtteilgrenzen der Stadtteile 1, 2 und 3. Die Farben Grün, Gelb und Rot stehen für das Preisniveau der einzelnen Stadtteile. Grün symbolisiert ein hohes, Gelb ein mittleres und Rot ein niedriges Preisniveau. Die Preisniveaus der einzelnen Stadtteile (administrative Grenze) werden durch übliche statistische Verfahren (Mittelwert, Median) aus den Objekten (A, B, C) berechnet. A, B und C stehen für Angebotspreise der Objekte. A steht dabei für ein Objekt hohen, B für ein Objekt mittleren und C für ein Objekt niedrigen Preisniveaus. Stadtteil 1 wird durch die Aggregation (Mittelung) seiner Objekte ein hohes Preisniveaus (A) zugewiesen. Die Angebotspreise der Objekte weisen überwiegend ein hohes Niveau auf. Stadtteil 2 erhält entsprechend Preisniveau B, der Stadtteil 3 Preisniveau C.

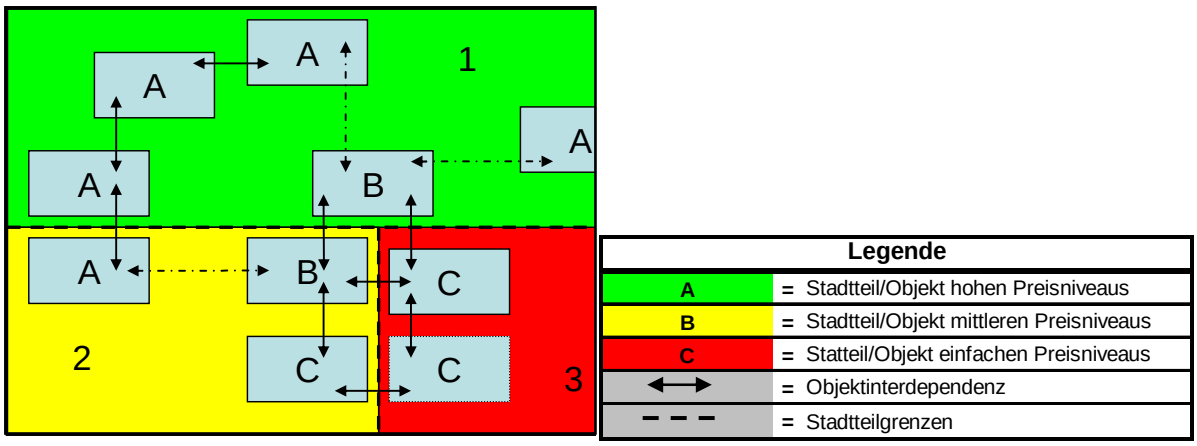


Abb. 1: Schematische Darstellung von Datenaggregationsverfahren und Interdependenz zwischen benachbarten Objekten.

Bei diesem Verfahren der Datenaggregation werden die Daten also administrativen Grenzen zugeordnet, wobei der umgekehrte Weg, die Grenzen an die Daten anzupassen, ein detaillierteres Bild von der räumlichen Situation ergibt (vgl. Abb. 2). Bei dieser Anpassung müssen die Distanzen zwischen den Objekten berücksichtigt werden. In bisherigen Verfahren der Wohnungsmarktbeobachtung werden diese noch nicht angemessen berücksichtigt, obwohl die Distanz zwischen Objekten einen Einfluss auf die Stärke von Objektinterdependenzen hat. In Abbildung 1 sind diese Interdependenzen als Pfeile zwischen den Objekten dargestellt. Dabei ist die Interdependenz über geringe Objektdistanzen stärker (gefüllte Pfeile) als über großen Objektdistanzen (gestrichelte Pfeile). Bei gleichen Objektvoraussetzungen könnte so zum Beispiel das Preisniveau von Objekten an der Südgrenze von Stadtteil 1 (B) über Interdependenzen mit Objekten im Stadtteil 3 (C) erklärt werden.

Die Berechnung von Grenzen, innerhalb derer sich Objekte mit gleichen Objekteigenschaften befinden, lässt sich über Interpolationsverfahren durchführen. Ein weiterer Vorteil dieser Verfahren ist die Möglichkeit, Nachbarschaftsinteraktionen und Objektinterdependenzen in das Verfahren einfließen zu lassen.

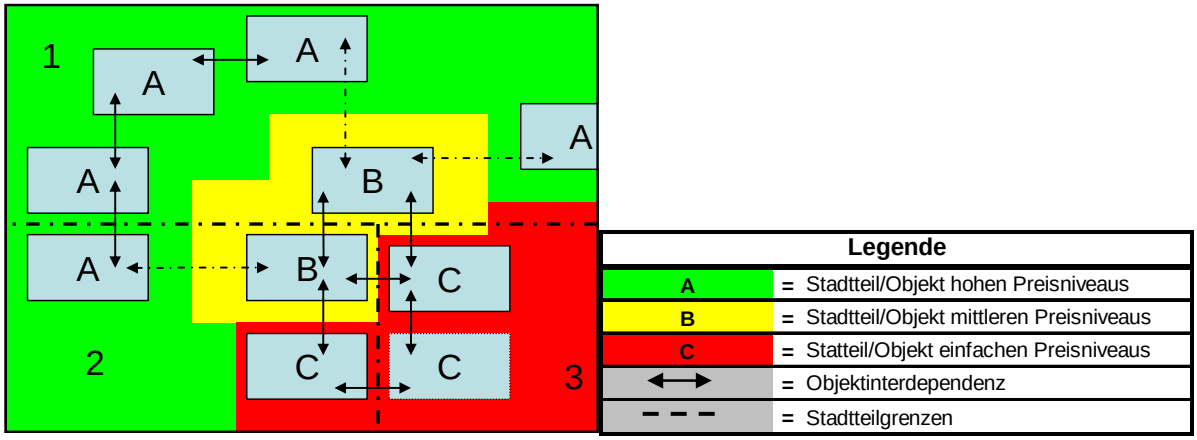


Abb. 2: Schematische Darstellung von Datenaggregationsverfahren über Interpolation.

In Abbildung 2 ist nun das Schema eines Datenaggregationsverfahren auf Basis einer Interpolation vorgestellt. Die Symbolik der Grafik entspricht der in Abb. 1 verwendeten. Über diesen objektbasierten Ansatz ergibt sich im Vergleich zu Abbildung 1 ein völlig neues Bild. Hier wird im Gegensatz zum Top-down-Prinzip des Interpretationsverfahrens in Abbildung 1, ein Bottom-up-Ansatz verfolgt. Das Resultat kann als Zonen ähnlichen Preisniveaus beschrieben werden. In dieser vereinfachten Darstellung lässt sich der Effekt einer objektbasierten Datenaggregation leicht nachvollziehen. Die administrativen Begrenzungen haben keinen Einfluss mehr auf die interpretatorische Projektion von Daten im Raum. So besteht z.B. Stadtteil 2 nun aus drei verschiedenen Wertebereichen. Die Stärke der nachbarschaftlichen Objektinterdependenzen kann in verschiedenen Interpolationsverfahren in die Datenaggregation einbezogen und auf unterschiedliche Art und Weise gewichtet werden. So wird z.B. bei der Implikation der Objektinterdependenz nicht nur die Distanz zwischen den Objekten in räumlicher Hinsicht, sondern auch die Distanz zwischen den Objekten in preislicher Hinsicht berücksichtigt (vgl. Methodik).

Durch die Beachtung der Distanzen zwischen den Objekten werden drei der wesentlichen Nachbarschaftsfaktoren nach Can, bereits berücksichtigt. Die Zugänglichkeit des Geländes, ist bei benachbarten Objekten in der Regel ähnlich. Ebenso verhält es sich mit dem sozialen, ökonomischen und demographischen Kontext, denn die Wohnentscheidung von Haushalten wird neben der lagebezogene Einbettung von Immobilien in Nachbarschaften, durch das Einkommen bestimmt. Auch die Bereitstellung der öffentlichen Versorgung unterscheidet sich innerhalb einer Nachbarschaft nur wenig. Die physischen Eigenschaften der Objekte, ebenso wie ergänzende Merkmale (z.B. die Sichtbeziehungen), die den Wert einer Immobilie bestimmen, können über hedonische Analysen bestimmt werden.

Zusammenfassend lässt sich das Konzept einer GIS basierten Wohnungsmarktbeobachtung folgendermaßen charakterisieren:

- Datenbank: Preisdaten (vgl. Methodik) mit Preis- und Objektinformationen
    - Verfügbarkeit von Immobilienpreisdaten in statistisch relevantem Umfang
    - zeitnahe Objektdatenverfügbarkeit, zur Abbildung von Marktstimmungen
- Datenbankmanagementsystem (erweitertes geographisches Informationssystem)
    - Kommunikationsfunktion
    - soziale Funktion
    - kongnitive Funktion
    - entscheidungsunterstüzenden Funktion (Decision-Support System)

Besonders die letzten drei Aspekte sind hervorzuheben. Bezüglich der kognitiven Funktion (Gewinnung, Optimierung und Erweiterung räumlichen Wissens) wird der explorative Ansatz durch detaillierte Darstellungen optimiert. Somit erhält die Karte, als Instrument der Ideengewinnung als auch der Hypothesenbildung und –bestätigung, eine höhere Aussagekraft. Auch bezüglich der entscheidungsunterstützenden Funktion ergeben sich erhebliche Verbesserungen; wie vorangehend erläutert, können Rauminformation realitätsnäher dargestellt werden.

4 DATENBANKSTRUKTUR

Datengrundlage für die ersten Auswertungsschritte ist die empirica-Preisdatenbank (IDN ImmoDaten GmbH), die Immobilienangebote sämtlicher Segmente und Angebotsarten beinhaltet. Diese basiert auf den im Internet abrufbaren Immobilienangeboten und umfasst sowohl Informationen zur Baustruktur als auch zu den Angebotspreisen. Insgesamt beinhaltet sie ca. 85 Mio. Angebote für ganz Deutschland aus den letzten fünf Jahren. Neben den Angebotspreisen sind außerdem weitere Faktoren, wie z.B. Baujahr, Größe und Ausstattung darin abrufbar.

Der Angebotspreis für Immobilien spiegelt indirekt die Zahlungsbereitschaft der Nachfrager für die Eigenschaften der Lage und der Gebäudestruktur (Größe, Qualität, Zustand) wieder. Die Angebotspreise entsprechen nicht immer den tatsächlich erzielten Marktpreisen, sie repräsentieren vielmehr die erwarteten Marktpreise. Abgesehen von der besseren Verfügbarkeit haben Angebotspreise den Vorteil Marktstimmungen abbilden zu können. Immobilienpreisunterschiede gleichen die Unterschiede in der Qualität der Lage oder der Gebäudestruktur aus. Preisunterschiede können demnach als kompensierende Differentiale mit der Folge eines räumlichen Gleichgewichts verstanden werden. Im nachfolgenden Schritt soll die Schätzung des Lageparameters aus den Angebotsdaten über räumliche Interpolation erörtert werden.

Ein Problem bei der Beobachtung des Wohnungsmarktes besteht darin, dass die betrachteten Untersuchungsgebiete (z.B. Städte) zwar eine stetige Veränderung der Objekteigenschaften besitzen, also die thematischen Attribute sich nicht sprunghaft-diskret sondern mit glatten Werte-Übergängen ändern, aber diese Eigenschaften nur an einigen wenigen Orten erfasst werden können. Räumliche Interpolationsverfahren basieren auf der Annahme, dass sich benachbarte Faktoren (z.B. auch Immobilienpreise) gegenseitig beeinflussen: "Everything is related to everything else, but near things are more related than distant things" (Tobler 1970). Prinzipiell wird bei der Untersuchung von Werteoberflächen im Raum das Feld-Konzept zugrunde gelegt. Bei Interpolationen geht es um die Ermittelung des kompletten Feldes aus einer endlichen Anzahl von Stützstellen (also bekannten Funktionswerten); im 2D-Fall die

komplette Funktion f(x,y). Im Sinne der Statistik liegt hier eine Stichprobe des Untersuchungsgebietes vor, das als Grundgesamtheit über sehr viele Orte (die Lagen sämtlicher Immobilien) definiert ist. Es wird versucht, mit Hilfe eines numerischen oder statistischen Modells die stetige Veränderung der Werte im Raum nachzubilden. Auch die Qualität der Lage einer Immobilie kann, diesem Ansatz folgend, über orts-spezifische Mittelung geschätzt werden.

Dafür wurden zuerst die Angebotspreise, die die verschieden Segmente des Immobilienmarktes abdecken, für die Einbindung in das GIS aufbereitet. Die bisherigen Auswertungen beschränken sich auf die Segmente: Wohnungen und Häuser, die zusätzlich nach Kauf und Miete differenziert werden. Um die vier Objektklassen vergleichbar zu machen, wurde eine Normierung über die Quadratmeterpreise durchgeführt. Schwierigkeiten ergaben sich speziell für die Objektklasse der zum Kauf angebotenen Häuser, bei der zusätzlich zur Wohnfläche die Grundfläche berücksichtigt werden muss. Über eine Typ-spezifische Median Berechnung konnte jedoch jeder Adresse ein standardisierter Indikator für das Preisniveau des Angebots zugewiesen werden. Die Bildung dieses Indikators ermöglicht die einheitliche Betrachtung sämtlicher Segmente in weiteren Schritten.

Entscheidend für die Verarbeitbarkeit in geographischen Informationssystemen ist der eindeutige Raumbezug der einzelnen Objekte. Jedem Punkt (Haus) muss seine ihm eigene geographische Position zugewiesen werden. Diese Referenzierung auf ein spezifisches Koordinatensystem, auch als Georeferenzierung bezeichnet, ist äußerst aufwendig hat aber den Vorteil, von administrativen Grenzen unabhängige Ergebnisse zu liefern. So können Strukturen auch auf der Mikroebene von einzelnen Haushalten analysiert werden.

Bezüglich des Anspruchs der Standardisierbarkeit des Verfahrens wurden verschiedene räumliche Interpolationsansätze miteinander verglichen. Im Weiteren sollen eine deterministische und eine geostatistische bzw. stochastische Interpolationstechnik vorgestellt und deren Eignung bezüglich einer Immobilienmarktbeobachtung kurz diskutiert werden.

5 DATENMANAGEMENT (INTERPOLATION)

Es gibt eine Vielzahl von Methoden, bei denen der Wert einer Beobachtungsvariablen an einem unbeprobten Ort, durch ein gewichtetes Mittel der benachbarten gemessenen Werte, geschätzt wird. Die Inverse-Distance-Weighting Methode ist die bedeutsamste dieser Gewichtungsmethoden und ist dadurch gekennzeichnet, dass die interpolierten Schätzwerte nur über den inversen Abstand des Schätzortes zu nah benachbarten Objekten gewichtet, ermittelt werden. Der Schätzer ist ein gewichtetes Mittel aus den Nachbarwerten und wird deshalb linear genannt. IDW ist eine lokale, exakte, deterministische und stetige Interpolationsmethode. Mathematisch formuliert bedeutet dies:

Es seien $z(u_1)$, ... , $z(u_n)$ Werte der Beobachtungsvariable an den Orten u_1, ... , u_n. An dem unbeprobten Ort u_0 wird der Wert der Beobachtungsvariablen durch

$$z(\mathbf{u_0}) = \frac{\sum \frac{1}{d_i} z(\mathbf{u_i})}{\sum \frac{1}{d_i}}$$

über alle beprobten Orte summiert, geschätzt. di bezeichnet den Abstand zwischen den Orten u0 und ui. Die Annahme über die Art des Zusammenhangs (die Ähnlichkeit) zwischen den Werten der Beobachtungsvariablen ist intuitiv und unabhängig von der Beobachtungsvariable. Das IDW-Verfahren ist geeignet, wenn die Datenpunkte gleichmäßig verteilt sind und nicht geballt vorkommen.

Für die Interpolation punktuell gemessener Daten mit Raumbezug muss eine Annahme über den räumlichen Zusammenhang getroffen werden. Dies erfolg bei nichtstatistischen Interpolationsverfahren (vgl. IDW) intuitiv, d.h. ohne Bezug zu den realen Daten. Qualitative Mängel bei der Interpolation von Wohnungsmarktobjekten sind die Folge. Ziel ist es deshalb, ein Verfahren vorzustellen, das die Annahmen über deren räumlichen Zusammenhang unter Berücksichtigung der vorliegenden Daten trifft.

Konzeptionell handelt es sich dabei um geostatistische bzw. stochastische Methodik. Auf der für einen räumlichen Prozess geschätzten theoretischen Variogramm-Funktion basiert das hoch entwickelte Kriging-Konzept. Eigentlich handelt es sich dabei ebenfalls um gewichtete arithmetische Mittel, wobei die für jeden

Interpolationspunkt spezifischen Gewichte mit Hilfe der Variogramm-Funktion lokal optimiert werden. Dabei lassen sich lokale Schätzfehler-Varianzen ermitteln, die man zur Berechnung von Konfidenzintervallen für die interpolierten Werte nutzen kann.

Es seien $z(u_1)$, ..., $z(u_n)$ Werte der Beobachtungsvariable an den beprobten Orten u_1, ..., u_n. Diese werden als Realisationen der Zufallsvariabeln $Z(u_1)$, ..., $Z(u_n)$ angesehen. Auch für die unbeprobten Orte werden Zufallsvariablen angenommen. In räumlichen Interpolationen werden Realisationen dieser Zufallsvariablen aus den bekannten Realisationen geschätzt. Die Menge aller dieser Zufallsvariablen Z = {Z(u), u in Untersuchungsgebiet} wird stochastischer Prozess oder geostatistisches Modell genannt. Es gibt verschiedene Möglichkeiten, räumliche Zusammenhänge der raumbezogenen Daten innerhalb dieses geostatistischen Modells zu beschreiben. Alle beruhen auf der Annahme, dass der räumliche Zusammenhang der Daten nicht von der absoluten (geometrischen) Lage des Ortes abhängt, sondern nur von der relativen räumlichen Lage der betrachteten Orte zueinander (Distanz, Richtung). Diese Annahme wird als Eigenschaft des stochastischen Prozesses formuliert.

Ein stochastischer Prozess wird (intrinsisch) stationär genannt, falls

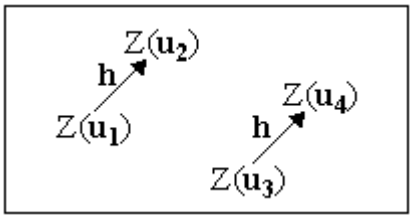
1) der Erwartungswert aller Zufallsvariablen des Stochastischen Prozesses gleich ist, also

$E[Z(u)] = m$ für alle u im Untersuchungsgebiet.

2) der räumliche Zusammenhang zwischen zwei Zufallsvariablen dieses Prozesses nicht von deren absoluter Lage, sondern nur von deren Abstandsvektor abhängt, also

$Zus[Z(u), Z(v)] = g(h)$, wobei $h = v - u$ und u, v im Untersuchungsgebiet.

Folgende Skizze verdeutlicht die Eigenschaft der Stationarität (vgl. auch Kapitel 3):



→ $Zus[Z(u_1), Z(u_2)] = Zus[Z(u_3), Z(u_4)]$

Bei der Interpolation über das Kriging-Modell wird ein unbekannter Wert durch ein gewichtetes Mittel der bekannten Nachbarwerte geschätzt. Die Gewichte werden im geostatistischen Modell aber so optimiert, dass der Schätzer im Mittel den wahren Wert schätzt und systematischen Fehler reduziert. Grundlage für den Schätzer ist dabei das geostatistische Modell und das Variogramm, das den räumlichen Zusammenhang des Prozesses beschreibt. Das Variogramm wird zunächst empirisch bzw. experimentell bestimmt und charakterisiert somit den räumlichen Zusammenhang der Stichprobe. Da das Variogramm aber den gesamten Prozess charakterisieren soll, muss es in einem weiteren Schritt auch für solche Abstandsvektoren modelliert werden, die nicht in der Stichprobe vorkommen. Dazu nimmt man an, dass das empirische Variogramm den groben Verlauf des räumlichen Zusammenhangs im gesamten Untersuchungsgebiet widerspiegelt. Die fehlenden Werte können dann dadurch geschätzt werden, dass man eine Funktion experimentell dem empirischen Variogramm anpasst, die dem Verlauf des Variogramms möglichst gut beschreibt.

Bezüglich der Eignung einer Immobilienmarktbeobachtung besitzt das geostatistische Verfahren das größere Potential, was sich auch mit der hauptsächlich im angelsächsischen Raum publizierten Literatur zur Thematik (vgl. Anselin, Can, Olmo u.a.) deckt. Einerseits werden im Gegensatz zu den deterministischen Interpolationsverfahren, nicht nur die räumlichen Distanzen in die Gewichtung einbezogen, sondern auch die preislichen Unterschiede zwischen den Objekten berücksichtigt. Zweitens kann mit Hilfe der Variogrammfunktion eine lokale Optimierung der Schätzung durchgeführt werden. Ein dritter Vorteil des Kriging-Verfahrens ist die Möglichkeit ein Gütemaß für die Schätzung anzugeben. Die Evaluierung des Interpolationsergebnisses durch Vorortbegehungen, Expertengespräche, sowie über den Vergleich mit anderen Datensätzen (HVB-Expertise GmbH, Kaufkraft u.a.) stützen diese Aussagen.

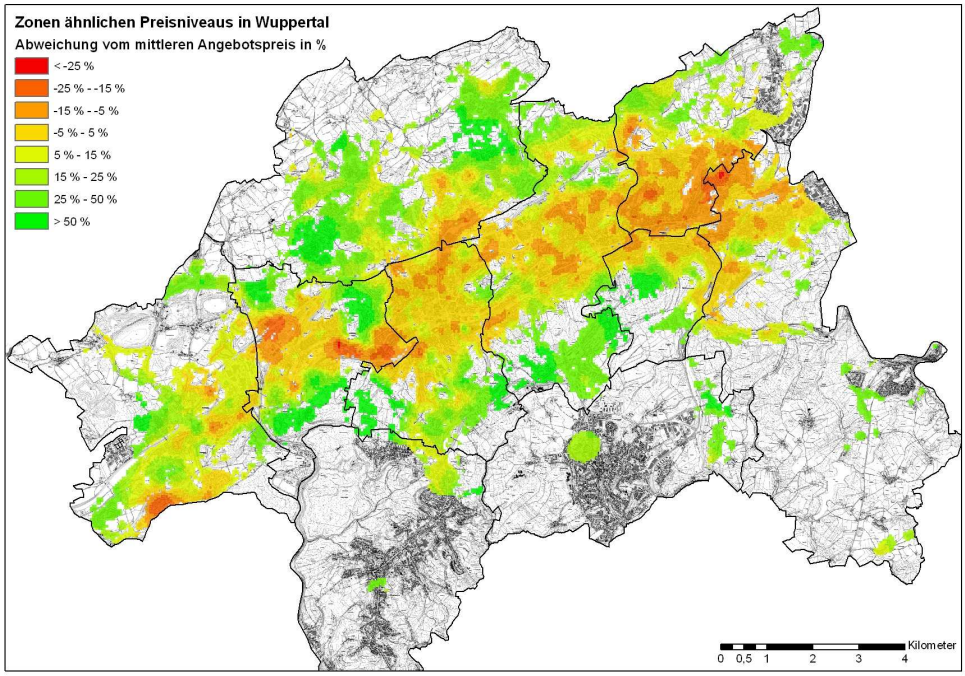


Abb. 3: Ergebnis der Kriging-Interpolation am Fallbeispiel Wuppertal

Die über die Lage definierte und geostatistisch optimierte Bestimmung der fehlenden Preisinformationen hat zur Folge, dass in den Angebotspreisen enthalten gebäudestrukturbedingten Preisunterschiede abgeschwächt werden. Das Ergebnis repräsentiert nicht mehr die Angebotspreise in ihrer ursprünglichen Form, sondern kleinräumige Zonen ähnlichen Preisniveaus, die sich über die Standort- oder Lagequalitäten bedingen. Beim Vergleich wiederholter standardisierter Auswertungen über längere Zeiträume können temporale Veränderungen dieser Zonen beobachtet werden. Starke Schwankungen lassen sich dabei u.a. auf planerische Maßnahmen zurückführen. Im Umkehrschluss kann dieser Ansatz für eine objektivierte Evaluation planerischer Eingriffe genutzt werden.

Mit der Verknüpfung der Angebotspreisinterpolation mit Qualitätsinformationen der einzelnen Objekte, ist eine „Re-Optimierung“ der Aussage auf die Akteurs- bzw. Mikroebene möglich. In einem weiteren Schritt soll dieser Aspekt über die Berechnung eines hedonischen Preisindex realisiert werden.

6 DATENMANAGEMENT (HEDONISCHER ANSATZ)

Die hedonische Hypothese besagt, dass jedes Gut als Bündel seiner Charakteristika dargestellt werden kann. Dazu wird unterstellt, dass die Präferenzen der Konsumenten und Produzenten nur durch diese Charakteristika bestimmt werden und dass ein funktionaler Zusammenhang zwischen dem Preis eines Gutes und dessen Eigenschaften besteht. Außerdem wird angenommen, dass die Gütereigenschaften für alle Konsumenten gleich sind. Somit wird die individuelle Konsumentscheidung nicht durch die Wahl eines Güterbündels sondern durch die Auslese einer Kombination von Gütereigenschaften festgelegt. Die Bedeutung dieses Ansatzes besteht darin, dass nicht mehr das Gut selbst sondern nur seine Charakteristika dem Konsumenten Nutzen stiften.

Der Objektpreis beinhaltet neben dem Bodenpreis, die Zahlungsbereitschaft der Nachfrage (für bestimmte Objekteigenschaften bei bestimmten Lageeigenschaften) und die Baukosten, die ebenfalls räumlich und objektspezifisch variieren. Bodenpreis, Objekt- und Lageeigenschaften, sowie die Baukosten können als Charakteristika der einzelnen Immobilien und somit als Argumente individueller Nutzenfunktionen verstanden werden. Immobilienpreisunterschiede gleichen die Unterschiede dieser Faktoren aus. Wie oben beschrieben, erscheinen sie als kompensierende Differentiale. Der Zusammenhang zwischen Angebotspreis und Eigenschaften der Immobilie kann durch folgende hedonische Gleichung dargestellt werden (verändert nach Salvi und Schellenbauer 2004):

Hauspreis = Preis einer Einheit Grundstückfläche • Größe (Menge)

+ Preis einer Einheit Wohnfläche • Wohnfläche

+ Preis der Alterung • Alter des Gebäudes

+ Preis • Eigenschaft weitere Faktoren

+ (…)

+ zufällige unsystematische Einflussfaktoren

Eine wichtige Frage für viele Akteure des Immobilienmarktes stellt sich in der Gewichtung der verschiedenen Eigenschaften einer Immobilie. Die Auflösung der Gleichung, kann über statistische Regressionsverfahren realisiert werden, vorausgesetzt es liegen die Angebotspreise sowie Daten über Objekteigenschaften vor. Dabei werden die relativen Preise als die zu erklärenden Variablen und subjektiv gewählte Qualitätsmerkmale als Regressoren verwendet. Die im Interpolationsverfahren egalisierten Objekteigenschaften können über die geographische Lage wieder eindeutig den Preisinformationen zugeordnet werden. Über die Methode der multiplen Regression kann der Preis simultan auf mehrere Eigenschaften regressiert werden. Die Gewichtung der einzelnen Eigenschaften ist dabei vom Markt bestimmt und somit weitgehend objektiv.

7 AUSBLICK

Das vorgestellte Konzept ermöglicht die flächendeckende, differenzierte Ausweisung kleinräumiger Zonen ähnlichen Preisniveaus sowie die Beobachtung deren zeitlicher Entwicklung im Raum. Die ermittelten Zonen repräsentieren höherwertige, mittlere und einfache Wohnlagen im Verhältnis zu verschiedenen Bezugsebenen, z.B. einem Stadtteil, der gesamten Stadt oder der Region. Das Informationssystem ermöglicht somit detailliertere und differenziertere Aussagen über Märkte, Stadtstrukturen und Entwicklungen. Investiven und planerischen Entscheidungsprozessen kann so ein Werkzeug an die Hand gegeben werden, welches die Grenzen administrativer Grenzen überschreitet. Des Weiteren soll auf Basis der bisherigen Auswertungen von Angebotspreisen, in Kombination mit Baualtersklassen, Ausstattungsmerkmalen, Grundstücksgrößen und weiteren Faktoren, ein Decision Support System aufgebaut werden. Gleichzeitig kann die Visualisierung räumlicher Strukturen und Prozesse die Kommunikation zwischen den verschiedenen Akteuren des Wohnungsmarktes verbessern.

8 QUELLEN

ANSELIN, Luc (1998): GIS Research Infrastructure for Spatial Analysis of Real Estate Markets. Journal of Housing Research, Vol. 9, No. 1.

BORCHERT, Axel (2006): Geographische Informationssysteme für die Immobilienwirtschaft. Standort – Zeitschrift für Angewandte Geographie. Vol. 3.

CAN, Ayse (1998): GIS and Spatial Analysis of Housing and Mortgage Markets. Journal of Housing Research, Vol. 9, No. 1.

CRESSIE, Noel (1993): Statistics for Spatial Data. Wiley Series in Probability and Mathematical Statistics.

FRIEDRICHS, Jürgen und Jörg BLASIUS (2006): Attitudes of Owners and Renters in a debrived Neighborhood. EAR Conference "Housing in an expanding Europe: Theorie, Policy, Participation and Implementation". Ljubljana, Slovenia.

GALSTER, C. George (2003): Investigating behavioural Impacts of Poor Neighborhoods: Towards New Data and Analytic Strategies. Housing Studies, Vol. 18, No. 6.

OLMO, Jorge Chica (1995): Spatial Estimation of Housing Prices and Locational Rents. Urban Studies, Vol. 32, No. 8.

REY, J. Sergio und Luc ANSELIN (2006): Recent Advances in Software for Spatial Analysis in the Social Sciences. Geographical Analysis, Vol. 36.

SALVI, Marco und Patrik SCHELLENBAUER (2004): Preise, Mieten und Renditen. Der Immobilienmarkt transparent gemacht. Züricher Kantonalbank.

TOBLER, R. Waldo (1970): A Computer Movie Simulating Urban Growth in the Detroit Region. Economic Geography, Vol. 46

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Requirements for Decision Support in Integrated Water Resources Management

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1 INTRODUCTION

Since 1972 at the United Nations Conference on the Human Environment at Stockholm the global implications of water problems is voiced. During the last three decades this issue was raised continuously and discussed on national and international level. For example one of the eight principles and concepts concluded by the Agenda 21 and the Dublin Principles specifically referred to "integrated water re-source management, implying an inter-sectoral approach, representation of all stakeholders, all physi-cal aspects of water resources, and sustainability and environmental considerations" (UNCED 1992).

Despite these conceptual formulations, the term IRBM is more precisely defined by the Global Water Partnership (GWP) as attempted to consolidate the two broad conceptual requirements of "integration" and "sustainability," and provide a comprehensive scope for IRBM, which was summarized as, "a process which promotes the coordinated development and management of water, land and related re-sources, in order to maximize the resultant economic and social welfare in an equitable manner with-out compromising the sustainability of vital ecosystems" (GWP/TAC 2000).

So IRBM can be seen as a complex concept which embodies the integration of natural and human sys-tems or we can say physical and societal world. Within the natural system, integration is sought be-tween "freshwater and coastal zone, land and water, surface water and groundwater, water quantity and quality, and upstream and downstream". Similarly in the human system, integration is required between demand and supply, across various water use sectors, among various stakeholders and in nu-merous socioeconomic considerations (Bandaragoda 2002). Following this broad definition the com-plexity of IRBM becomes more than obvious. So we have to raise the question how an appropriate approach can be realised?

For this issue like IRBM a kind of technologies, which is applied on an interdisciplinary basis, is more than helpful to understand the system's behaviour and develop appropriate strategies and cooperative action programmes in response. Thus kinds of socio-technical instrument as Decision Support Systems (DSS) are required.

This paper will discuss requirements for DSS to support a comprehensive approach in IRBM along following areas as examples of the natural and human system:

1. Fresh water quality and quantity

Fresh water of sufficient quality is becoming a scarce resource in an increasing number of regions throughout the world. Water scarcity, and human interventions to handle it, has become a potential source of conflict, partly caused by competitive water uses between sectors and between geographic regions. The European Union adopted the Water Framework Directive (WFD) to manage this field.

2. Flood risk management

The extreme increase of flood events and flood damages during the last decades makes it obvious that an integrated approach of IRBM has to include flood protection. Many issues such as technical measures, aerial and spatial management, retrofitting, rising risk awareness as well as environmental and land-use management have to be incorporated into the complex field. A crucial point of course is to optimize the retention potential of the river basin.

3. Flood plain management

Flood plains are diverse landscapes where various requirements, which increasingly compete with one another, can be observed. Water related biotopes and especially flood plains are not only extremely important but also rich ecosystems with a huge variety of species and functionalities. "Freshwater ecosystems, when scored on the area they cover and the number of species they harbour, are in fact the most species-diverse habitats on Earth" (IUCN, 2005).

These areas belong to the natural system of IRBM. As part of the human system we can consider e.g.

4. Stakeholder involvement and public Participation

IRBM is a challenge for cooperation, integration and support. As known, water is rapidly emerging as a serious limitation on meeting human needs while protecting the environment. Cooperation between all stakeholders' at all organizational levels is required to reach agreement on integrated management plans, as well as appropriate allocation strategies for available resource. Balancing water resources, including issues such as increasing use compared to the availability or deterioration of water quality is becoming increasingly complex and diverse. Appropriate decision making requires specific knowl-edge from both technical and non-technical perspectives (Abbott 2005).

These complexities create the need to understand and comprehend the more detailed technical compo-nents, as well as broader managerial and societal issues, therefore asking efficient integration of vari-ous disciplines, sectors, countries, and societies (Somlyódy et al. 1995).

Economic issues should be mentioned here as a extra issue in the human system which has to be rec-ognised but which are not further discussed in this context

The framework of management processes of the different elements of IRBM are mainly based on legal regulations (acts, environmental standards, conventions et cetera) or other environmental or other goals (e.g. the concept of sustainable regional development). For IRBM purposes numerous regula-tions emerged during the last years. However, integration remains a difficult issue. A number of gaps and barriers still need to be resolved.

2 MANAGEMENT OBJECTIVES AND LEGAL INSTRUMENTS OF IRBM

2.1 The natural system

As described earlier relevant issues are, amongst others, the quality and quantity of water, the decline of water related ecosystems and flood risk management. One crucial problem in most European coun-tries is, that there are too many actors responsible for and involved in water management. The jurisdic-tion over water is often very fragmented and there is not always a single institution ensuring coordina-tion between the different managing agencies.

Water quality and quantity management is mainly the issue for the water management agencies. The coordination with agriculture and nature conservation actors is quite poor.

Wetlands management is considered as a nature conservation issue. This leads to uncoordinated ac-tions in managing wetlands and missed opportunities for fully exploiting their positive role in water management. National wetland restoration policies are almost non-existent, although the international framework should lead to a national wetland protection policy (WWF 2003).

For flood risk management usually water management agencies are again responsible as for water quality and quantity. Although very often another department is concerned with this issue and coordi-nation and collaboration between them often is not enough institutionalised but depends on personal contacts.

An increasing number of legal frameworks and guidance both on international and nation levels came into force during the last years. Table 1 shows an exemplary overview about legal frameworks and objectives in IRBM concerning water quality and quantity, flood risk management and flood plain management in Europe. All these jurisdictions are not implicit conflictive but the interlinkages can be considered as little. Water quality and wetlands are considered separately. Water quality and flood risk management tends to be coordinated by the new European directive which is planned to be agreed upon in 2007. The designed flood risk management plans which are one basic element in the designed Directive should include not only water management aspects but as well spatial planning, nature con-servation and other spatial and land use relevant issues. But we have to wait for the final wording of the law to critic about is finally.

	legal frameworks	**General target**	**Environmental objective**	**Environmental standards**
Water quality and quantity	EC Water Framework Directive, National standards	Good status of water bodies	Good ecological status of surface waters (includes biological,	e.g. reference status of river type

			hydro-morphological and chemical status) Good status of groundwater (includes quantitative and chemical)	e.g. max 50 ml N/l max
Flood risk management	EC Directive for flood risk management (draft), German Act for mitigation of flood risk Guidelines	Minimising of flood risk	raise retention potential	HQ 100 / 1,0 % HQ 1000 / 0,1 %
Flood Plain Management	RAMSAR Convention, NATURA 2000 Directive, National acts (e.g. Germany: BNatSchG)	Protection and development of wetlands and its biodiversity	Endangered biotopes Endangered species	Protection of FFH Appendix species and biotopes BNatSchG § 20c Red lists

Table 1: Legal frameworks and objectives in IRBM (exemplary)

Flood risk management and floodplain management is handled more or less parallel. A little approach is done with the German Act for preventive flood management. With an instrument the "flood risk plans" it could be possible to include aspects of flood plain restorations and dike shifting. But this is not formulated explicitly thus it realisation will depend on the respective planning authorities.

Rather all biotope types of flood plains are protected by laws like FFH Directive and national nature protection acts. But what is missing is a comprehensive and mid- or long-term strategy for sustainable protection and development. For this paradigm a catchment based approach is crucial. The only catchment based approach is demanded by the WFD concerning water quality and quantity. The draft of the flood directive for flood risk management shall be abutted along this methodology and time structure (EC 2006).

Only rarely we can consider established organisations for IRBM in Europe. In general it is organised along administrative boundaries. With WFD the first catchment based organisation structure has been established. Theoretically these are the right structures to coordinate IRBM. Future will tell whether they have enough competences to achieve a successful collaboration. Despite these structures some transnational River Basin Organisations exist. They try to coordinate actions and measures in the catchment basin but very often they have not enough competences for effective coordinated manage-ment.

Another facet of IRBM is that synergies in data management are poor despite it would be more than useful to match up a common data pool. Since implementation of the WFD and its GIS guidance a big step is done towards common standards and exchange of geographical data. But a lot of other steps can still be done.

2.2 The human system

For integration the societal aspects of IRBM public participation is a crucial element which has to be considered. Public participation in water management is rather poor in Europe, especially in Southern and Eastern Europe. (UNEP 2005). The most critical aspects of public participation are the lack of pro-active information provisions to non-governmental stakeholders and the quality of the means to enable the active involvement of interested parties in decision-making processes. Stakeholders often lack specialist knowledge and human capacity to get involved in decision-making for water manage-ment measures. It is difficult for non-governmental water stakeholders to contribute and influence the decision-making process because the issuing of consultation documents and the participation of inter-ested parties often take place only towards the end of the process. There is often low transparency for specific projects.

Participation is more and more not only demanded by political and societal concepts for sustainable development. Participation aspects are integrated as a central part or declaration of legal frameworks as the Aarhus convention or Water framework Directive of the European Union.

For instance from the perspective of a NGO like the WWF some other aspects are important for an IRBM and its successful implementation (WWF n.d.) as shown in chapter one. The WWF states as additional crucial elements inter alia:

- a long-term vision for the river basin, agreed to by all the major stakeholders,
- strategic decision-making at the river basin scale, which guides actions at sub-basin or local levels,

- Effective timing, taking advantage of opportunities as they arise while working within a stra-tegic framework.
- Adequate investment by governments, the private sector, and civil society- organisations… and
- solid foundation of knowledge of the river basin and the natural and socio economic forces that influence it.

3 THE ROLE OF DECISION SUPPORT SYSTEMS (DSS) IN IRBM

Bringing together the natural and the human system is one crucial aspect of IRBM. However decision making in a river basin context is a complex process due to the many stakeholders involved, each with different interests, objectives, evaluation criteria, information needs and competency. Cooperation and sharing of information and ideas might enhance the harmonisation of water use and allocation. Sharing models and analytical methods, and the mutual exchange of information can be an appropriate basis for co-operation in research and analysis. Computer based systems for decision making processes are specially developed to support this multifaceted approach.

A wide range of possible DSS definitions and core functionalities exist. Hahn & Engelen (2000) dis-tinguish two types of computer-based DSS:

1. Data-oriented DSS are primarily concerned with retrieval, analysis and presentation of data.
2. Model-oriented DSS include activities such as simulation, goal seeking and optimization.

Generally a DSS consist of a data base, GIS and other tools or services and the user interface with all the central functionalities and often models are included. It is a striking fact that many DSS exist but only a few are really taken into use in practise or used as intended. The reasons are very often not be-cause the technical realisation is not good enough but because the needs of (potential) users were not met adequately.

During the last years some studies were undertaken to find out reasons for this phenomenon. In the following the analysis of three different studies and their key results and messages will be revealed and discussed. With a synopsis and analysis of two workshops and one evaluation about factors of success and failure for DSS four main reasons for failed development have been worked out (Hare 2004, FEEM 2005, Uran 2002):

- complexity: the system is either too complex or too simple; user interface is not easy enough to use/not intuitive
- transparency: the documentation of data and models is not adequate and uncertainty of results is not transparent
- appropriate functionalities: the needed requirements like scenario building or evaluation of al-ternatives are not satisfactory realised
- flexibility: the system is to inflexible, models cannot be changed, data base interface is not suitable

The most important problem to overcome is to bridge the gap between the developers and the users. Therefore the phase of requirement elicitation has to be done thoroughly. Different elicitation tech-niques exist like interviews, questionnaires, workshops, prototyping and so forth. Each of them has it pros and cons so some different techniques should be used. An iterative and interdisciplinary devel-opment process together with the future user group (or representatives) for gathering requirements is considered as ideal.

Because the importance of including the future DSS users in the development process has to be emphasised for a successful development and implementation a new structure of DSS is proposed here. The DSS can be seen as a sociotechnical instrument with three main components:

1. the interface which includes the user interface and the user specific information, structure and processing
2. the technical component with database, knowledge base, models, GIS, and other possible tools
3. the social component which consists of the interdisciplinary developer team that works out DSS requirements in a discourse.

The DSS for IRBM can be understood as a sociotechnical instrument for analysing, visualising and collaboration for a better understanding and handling of complex system for a coherent and transparent management process.

4 REQUIREMENTS FOR A DSS

In this paper not all requirements for IRBM DSS which should to be regarded can be revealed. The focus here lays on two issues: the aspect of participation in IRBM and technical support for it and key functionalities for DSS.

4.1 Participation

First of all we have to consider that no blueprint for excellent or appropriate public participation ex-ists. Thinking about a reasonable way of pp covers a variety of tasks: Learning how to participate or to organise participation, developing new management styles and attitudes, learning about the river basin to be managed, building up trust between participants, representing and sharing perspectives, develop-ing new partnerships, social learning.

Using several sources (Abbott 2001), Kleinhückelkotten 2002, Baumann et al. 2005, eParticipation, Kingston, EU Water directors (2003), von Haaren et al. (2005), Selle & Rösener (2003)) and own experiences some general requirement - which are certainly not all-embracing - can be stated:

- First of all a change of paradigm has to be take place: Decision makers have to change their role from decision maker to knowledge provider to act as moderators between experts and general population as the stakeholders. This is the most important and most difficult point.
- The communication structure and strategy is crucial in pp.
  - i. A multi-channel communication should be realised (not only one type of communication but a cascade of approaches to public with a set of types and instruments.
  - ii. A mutuality with and between stakeholders should be possible.
  - iii. Address of different milieus, groups and different communication measures tailored for individual milieus (different milieus oriented along main milieus.
  - iv. Gender sensitive approach
  - v. Participation on a consultation level is the minimum to have be realised. A feedback must be possible.
- It must be clear how participants can influence the planning process.
- Possibility for Citizens to engage themselves is context dependent and preferable informal /anonymous if desired.
- Transparency: information about who is involved, how are the comments are used, how are the decision structures are important.
- Gain new target groups by new media (young people, business people, people living in the countryside).
- Using Internet and e-participation tools because of
  - vi. Permanent accessibility of information
  - vii. Profoundness and clearness/visualisation options
  - viii. Interactivity
  - ix. Easy to keep information actual
  - x. Quick feedback is possible
  - xi. Possibility of Cross-linking

Eventually a tight spot exist in the phenomena that public participation is most asked and reasonable on the local level where discussions are undertaken and measures agreed upon and impacts are per-ceived but

information or model results are often too abstract or imprecise for adapting on the local scale. We ca argue that anyway general information can be interesting and appreciated to regard the whole complex. But when is comes to local decision a high level of information aggregation of infor-mation can produce scepticism on local level. This experience is described by evaluation participatory modelling projects in Sweden (Jonsson & Alkan-Olsson 2005, p. 16).

A DSS for IRBM has to provide at least information and provides possibilities for consultations. An active involvement of stakeholders should be as well possible. It is to advocate if functionalities for shared decision making are implemented. This is especially important for DSS tailored for the local level where concrete measures have to be discussed and traded off. For generic DSS this option seems to be not as important as for the local level.

4.2 System requirement specification

An important step to be undertaken for a thorough DSS development and construction is the formula-tion of system requirement specification (SRS). As an appropriate structure the formulating the guide-lines for DSS development the composition of the Institute of Electrical and Electronics Engineers (IEEE) recommendations practise for software requirements specification (IEEE 1998) seems to be adequate for DSS.

The following issues are proposed as SRS structure:

a) Functionality. What is the software supposed to do?

b) External interfaces. How does the software interact with people, the systems hardware, other hard-ware, and other software?

c) Performance. What is the speed, availability, response time, recovery time of various software func-tions, etc.?

d) Attributes. What is the portability, correctness, maintainability, security, etc. considerations?

e) Design constraints imposed on an implementation. Are there any required standards in effect, im-plementation language, policies for database integrity, resource limits, operating environment(s) etc.

In this paper only one issue shall be described more in detail. Several studies were undertaken by the author with almost 200 peoples from different working fields of IRBM. These people came from five countries in the North Sea region. In the time period from 2004-2006 different workshops with inter-national and interdisciplinary groups, questionnaires, interviews, evaluation of a DSS prototype were conducted for identifying general requirements for DSS in IRBM (Evers i.p.).

Some aspects of the first requirement issue, the functionalities, will be described here.

4.3 Set of general DSS requirements – functionalities

a) Compilation of data, information and knowledge with easy and quick access

This means issues like:

- compilation of data in a central data base which is regularly updated with easy, free and fast access.
- make available all relevant information on various aspects and the best available current knowledge
- data / information for identification of pressures - state – impacts - response
- showing missing information and gaps
- showing information and special analyses with maps with explanations

b) Support of planning/decision-making process

This includes following steps typical for decision making processes:

- Problem definition (problem identification, seeking/defining objectives/goals, identifying knowledge required, Identifying possible bottlenecks, Defining evaluation criteria)
- Developments of what-if scenarios including the ranking of scenarios
- Development of alternatives (search for ready-made alternatives, screen ready-made alterna-tives, Developing individual alternatives, showing ways of how to meet goals)

- Effects (simulating and or estimating effects of remaining alternatives, presentation of effects, interpretation of effects, visualisation results interpretation, showing key issues, risk areas)
- Evaluation (concernment analysis, evaluating alternatives according to set of criteria, visuali-sation results of evaluation, prioritise criteria, identify synergies between different measures, cost-benefit-analysis / enhanced cost-benefit-analysis, multi criteria analysis)
- Operational management (provides guidance through the planning process, provides a logical structural approach which ensures that key stages are not omitted)

c) Handling of complexity/better understanding/future perspectives

- combining information and showing complex mid- and long-term interrelations
- Visualisation of scenarios, measures and alternative options with maps, graphs, tables etc.
- Users can learn from other examples and new information (info boxes, dta base about good practise examples, measure pool)
- make possible a link/exchange between catchment and sub-catchment
- integrate a interactive learning tool
- provide library with information about the system

d) Communication/participation /explanation/justification

- give easy and structured access to all relevant information
- including communication platform (chat rooms, transactional functionalities..)
- storing of local and generated knowledge
- transparency of information and process
- supply of tools for stakeholder involvement
- setup of a platform for support and discussion
- possibility to give feedback (or judge) to stated problems, planned measures etc. (discourse Management) Include negotiation tool
- stakeholder Analysis

5 CONCLUSIONS

IRBM is a broad and complex field which combines not only the elements of natural systems but as well the human system. In general Decision Support Systems can assist the integrated managing ap-proach of IRBM but most of the developed systems are not used in practise or to whom it was de-signed for. Lots of DSS projects deal only with designing the natural world – which is often complex enough – but neglect the real user demands. Until now no standards exist that ensure that DSS have certain qualities and that missing functionalities would belong to the past.

Three aspects shall be stressed to improve this situation: coordination of management objectives, re-garding minimum user requirements for DSS development, and collaborated research and develop-ment work to generate more synergies in DSS development.

Divers legal frameworks have to be considered to meet the objectives of integrated water resources management as described in this article. It would be very helpful to coordinate these management fields on catchment levels. The clearer the management objectives are the easier the implementation in a DSS can be realised.

More emphasis must be given to optimise the user interface and certain users' requirements of DSS. Several evaluations were carried out to find out some key issues which have to be regarded by devel-oping DSS for IRBM. One key issue which is trivial but rarely respected is to bridge the gap between users' purposes and the developers. A close link between the developers and the users and especially an interdisciplinary development and continuous evaluation of the system together with users is stated as extraordinarily important. For emphasising this issue a new DSS structure as a sociotechnical in-strument is proposed.

Two important issues of requirements are presented: facilities for participation and DSS functional-ities. Because of the multi-purpose demands of integrating water, environment and socity, establish-ment of a network centred, modular structured system might be a solution for more cooperation and synergies in developing DSS.

6 REFERENCES

ABBOTT, Michael: The water knowledge initiative. http:\\wiki.waterknowledge.org, 2005

BANDARAGODA, D. J.: “Water-land linkages: A relatively neglected issue in integrated water resources management.” Paper presented at the “SaciWATERs” workshop on “IRBM in South Asia: Global Theory, Emerging Practice and Lo-cal Needs” held in Colombo, Sri Lanka (20-22 December 2002).

EUROPEAN COMMISSION: An EU policy on flood risk management. http://ec.europa.eu/environment/water/ flood_risk/index.htm, 2006

EUROPEAN COMMISSION: "Directive 2000/60/EC of the European Parliament and of the Council establishing a frame-work for the Community action in the field of water policy" - The EU Water Framework Directive - integrated river ba-sin management for Europe, 2000

EVERS, Mariele: Decision Support (Systems) for Integrated River Basin Management. Requirements for appropriate tools and structures for a comprehensive planning approach. i.p.

EVERS, M., Brock, J. Rubach, H. & Urban, B.: Integrated spatial management in floodplain landscapes: development of a DSS to conflate different land use demands in planning processes (iFMH). Integrated Land and Water Resources Management: Towards Sustainable Rural Development (International Commission on Irrigation and Drainage 21st European Regional Conference, Frankfurt/Oder, Germany), 2005

FEEM: Results of the International Workshop on “Success and failure of DSS for integrated water resources management”. Venice, Italy, 6 - 7 October 2005

GEERTMAN, S. & Stillwell, J.: Planning Support in Practise. Springer Verlag, Berlin, Germany, 2003

GWP/TAC (Global Water Partnership, Technical Advisory Committee). Integrated water resources management. TAC Background Paper No. 4. Stockholm: GWP, 2000

HAAREN, von, Christina, Bettina Oppermann, Karl-Ingo Friese, Roland Hachmann, Jutta Meiforth, Arne Neumann, Simone Tiedtke, Bartlett Warren-Kretzschmar, Franz-Erich Wolter: Interaktiver Landschaftsplan Konigslutter am Elm. Ergeb-nisse aus dem E+E-Vorhaben „Interaktiver Landschaftsplan Konigslutter am Elm' des Bundesamtes für Naturschutz. Naturschutz und Biologische VielfaltHeft 24, 2005

HAHN, B. & ENGELEN, G.: Decision Support Systems (DSS) for river basin management. International Workshop 6 April 2000, Koblenz, Bundesanstalt für Gewässerkunde, Koblenz-Berlin, 2000

HARE, Matt: The use of Models to Support the Participatory Elements of the EU Water Framework Directive: Creating a dialogue between Policy Makers and Model Makers”, 2004 …

IUCN (International Union for Conservation of Nature and Natural Recourses): Wetland Problems. www.iucn.org/themes/wetlands/wedlands.html, 2005

ALKAN Olsson J. and ANDERSSON L.,: Possibilities and problems with the use of hydrological models as a communica-tion tool in water management, International Journal of Water Resource Management (special issue /WARM/ Advances in Global Change Research), 2005

IEEE (Institute of Electrical and Electronic Engineers): Recommended practice for software requirements specifications, IEEE Std 830-1998, 1988

LOUCKS, D.P.: Developing and implementing decision support system: A critique and challenge. Water Resources bulletin, 31(4), 571-582., 1995

SAVENIJE, H. G.; and VAN DER ZAAG, P.: The management of shared river basins: focus on Development, Ministry of Foreign Affairs, The Hague Revised and published as “Conceptual framework for the management of shared river ba-sins; with special reference to SADC and EU”, in Water Policy, Vol. 2, Nos. 1-2, The Hague: Elsevier Science Ltd., 1998

SOMLYÓDY L., VARIS O., YATES D. : Freshwater Management: Dilemmas and Challenges, IIASA WP-95-37, Laxen-burg, Austria, 1995

TUMWESIGYE, E., VOJINOVIC, Z., JONOSKI, A. & ABBOTT, M. B.: Towards a new business model in urban drainage modelling and hydroinformatics. 10th International Conference on Urban Drainage, Copenhagen/Denmark, August 2005.

UNITED NATIONS – Economic and Social Council: Sustainable Flood Prevention. http://www.unece.org/env/water/ publications/ documents/guidelinesfloode.pdf, 2000

UNITED NATIONS ENVIRONMENTA PROGRAMME (UNEP) : Global resource information database (UNEP GRID): Europe - participation http://www.grid.unep.ch/product/ publication/freshwater_europe/pol.php, 2005

UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (UNCED): Agenda 21. Rio de Janerio, Brazil, 1992

URAN, Oddrun: Spatial Decision Support Systems for Coastal Zone and Water Management. Dissertation at Vrije Univer-siteit Amsterdam. ISBN: 90-9016270-4, 2002

WORLD WILDLIFE FUND (WWF): WWF`s Water and Wetland Index. Critical issues in water policy across Europe, 2003

WORLD WILDLIFE FUND (WWF): Integrated River Basin Management (IRBM); http://www.panda.org/about_wwf/what_we_do/freshwater/our_solutions/rivers/irbm/index.cfm (n. d.)

🏆 *reviewed paper*

The influence of tourist development in the coastal natural environment of Faliraki on the island of Rhodes

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1 INTRODUCTION

In the present work the repercussions of the phenomenon of tourism in the region of Faliraki of Rhodes are researched. The objective is to investigate the effects in the natural environment and the offered tourist product. The factors which were taken into account are:

- The effect of tourism in the natural resources
- The changes that tourism brought to the economy and to the sectors of production
- The changes in land uses of the region because of tourist development
- The attitude of local authorities and hotel keepers owners regarding environmental problems
- The environmental and tourist policy
- The institutional framework

The research focused on the tourist development of the region from 1970 up to today. The approach of the effect of tourist development in the natural environment of Faliraki was based on interviews in combination with on the spot observations as well as comparative study of maps of the region. The research aimed at determining:

- The environmental problems because the tourist development
- The tendencies of tourist development of region
- The attitude of citizens on issues protection of environment

The interviews took place through the use of a questionnaire and were addressed to the Directors - Owners of the hotels and to the local authorities. There were also interviews of the chairmen of the union of hotel keepers of Rhodes and Greece, the association of beach-umbrella makers, the union of rooms-to-lent owners of Faliraki, as well as of other businessmen. At the same time, field observations were made in order to determine and record the problems and the effects in the area. An effort to estimate the environmental influences of tourist development and the currying capacity and faculty of the region of Faliraki was made, and measures for their confrontation were proposed, aiming at the preservation of the environment and the improvement of the quality of the tourist product. For the study of the development of the region aerial photographs of the years 1960, 1975, and 1990, as well as an orthomap of the year 1999, were used.

2 CHARACTERISTICS OF DEVELOPMENT OF REGION

Concerning the development physiognomy of the region researched, it is stressed that this is characterized by the big tourist development that took place during the period from 1969 until today. Its proximity to the city of Rhodes (15 km.) played an important role in its development.

Based on information from the Municipality of Kallithea and the study of aerial photographs, in the region, before the development of tourism, the area was rural with vegetables being cultivated at a large scale and then sold to the rest of Greece. The beach of Faliraki was entirely natural until the mid 70's. Until then, no infrastructure and seasonal equipment existed. The only visitors of the beach were mainly the residents of the community of Kallithea which cultivated the region of Faliraki. In the early 70's they first hotels units were built, and they first tourists who come from Scandinavian countries began to arrive. In the middle of the same decade the beach was transformed into a typical beach.

During the 80's a large scale tourist development which continues to this day, followed. Agricultural exploitation was progressively limited and the residents were redirected towards enterprises of tourist interest, which today constitute "monoculture of" region of Faliraki.

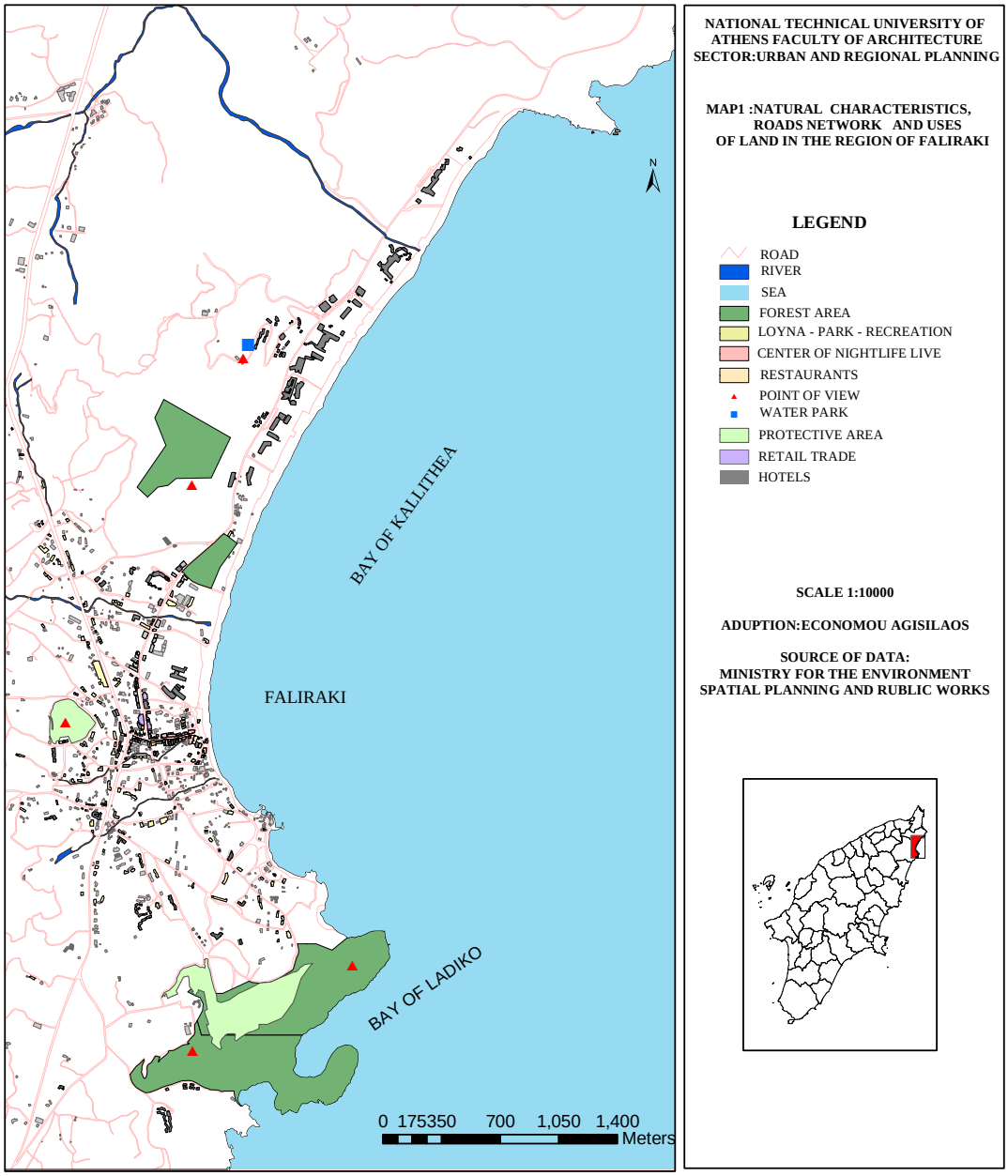
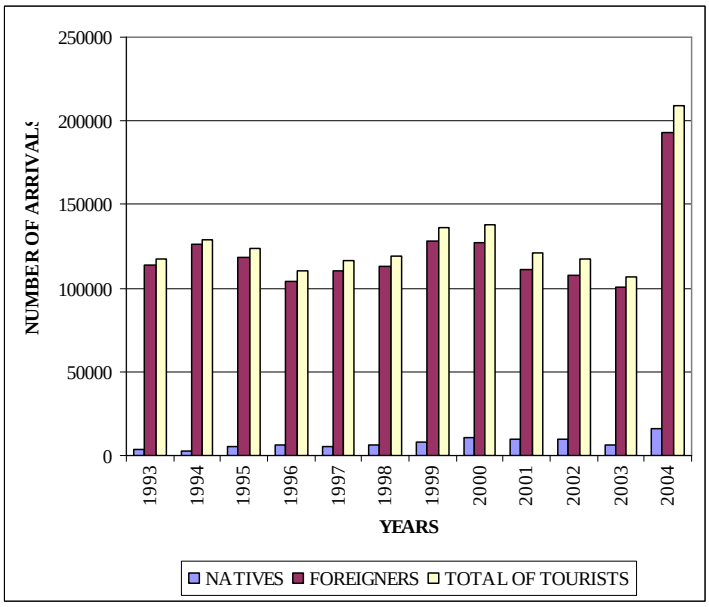


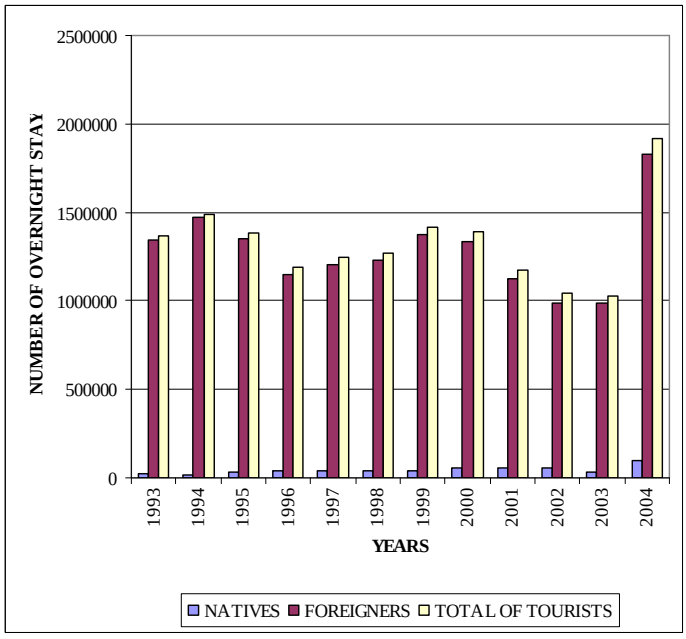
Chart 1: natural characteristics, road network and uses of land in the region of Faliraki

3 EFFECTS OF TOURISM IN THE ENVIRONMENT OF FALIRAKI

The tourist development in the island of Rhodes began during the 60's (Study of Doxiadis "Tourist development of Faliraki of Rhodes, 1969). In the region of Faliraki during this decade, it a small number of hotel beds, restaurants and residences existed. The tourist movement and the overnight stays in the region of Kallithea, where the settlement of Faliraki is found, according to the statistical elements of the Greek tourism organization for the period 1993 - 2004 (for the period 1970 - 1993 separate statistical elements do not exist), are presented in the graphs 1 and 2 respectively:

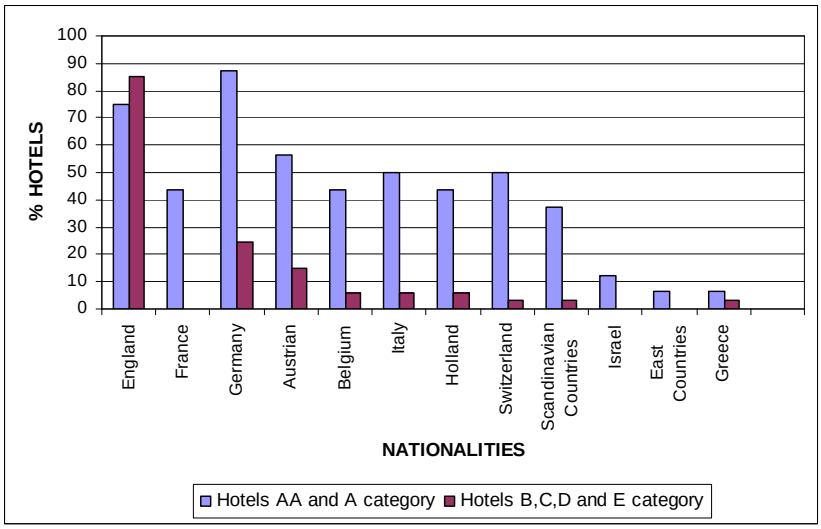


Graphs 1: Tourist movement in the Faliraki at time interval 1993 - 2004 (Source: Greek tourist organization - Address of Tourism Dodecanese, 2004)



Graphs 2: Overnight stays of tourists in the region of Faliraki during the 1993 - 2004 (:EOT Source- Address of tourism Dodecanese, 2004).

From the elements of research, it is shown that the tourist movement and the overnight stays in the region of Faliraki were about constant in period between the years 1990 - 2000. The origin of tourists was mostly from European countries (Graph 3). The greatest percentage of tourists that resided in B, C, D and E category hotels came from England.



Graph 3: Nationalities of tourists in the hotels of Faliraki in year 2001 (Source: Administration of tourism Dodecanese, 2000)

The tourist development in Faliraki, apart from the economic benefits had important effects in the urban - social organization as well as in the natural environment. Based on the aerial photographsof 1960, 1975, 1990 and the orthophotomap of 1999, a progressive transformation of uses of region is observed. The agricultural land, is progressively transformed into a region of tourist interest. This had as result the suppression of some sources of pollution and the appearance of others. The pollution in the region, prior to the tourist development they come mainly from agricultural human activities. The growth of the region meant the progressive appearance of new sources of pollution: hotel groups, rented rooms, settlements, cars, restaurants, refreshment stands, night-clubs, and high speed ships.

Faliraki is a new settlement that was created in a relatively short time in order to cover elementary and current needs of mass tourism. This development caused a series of urban and environmental problems. The large concentration of recreational and other uses in the central settlement of Faliraki or the lack of open communal spaces, open spaces, and parking space are typical of the region. Also typical also it is the insufficiency of road and infrastructure networks (sewage network).

4 THE RESULTS OF RESEARCH ON THE SPOT AND PERSONAL INTERVIEWS

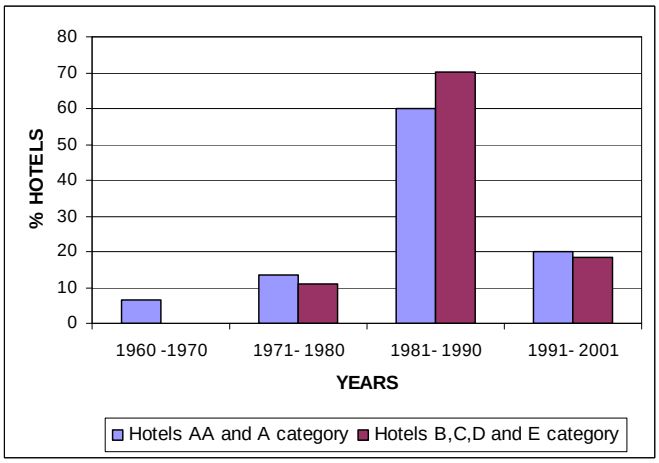
In order to determine the problems, which come from the development of tourism in the region of Faliraki, field research was conducted during August, the tourist season peak period.. As it was also reported in the introduction, personal interviews took place along with field observation.

Before we describe the results, for their better comprehension, the hotel potential of the region of Faliraki is reported the table that follows:

CLASS	HOTELS	ROOMS	BEDS
AA	2	575	1168
A	16	4632	8610
B	11	598	1147
Γ	23	1017	1940
Δ	3	91	178
E	15	245	494
TOTAL	70	7158	13537

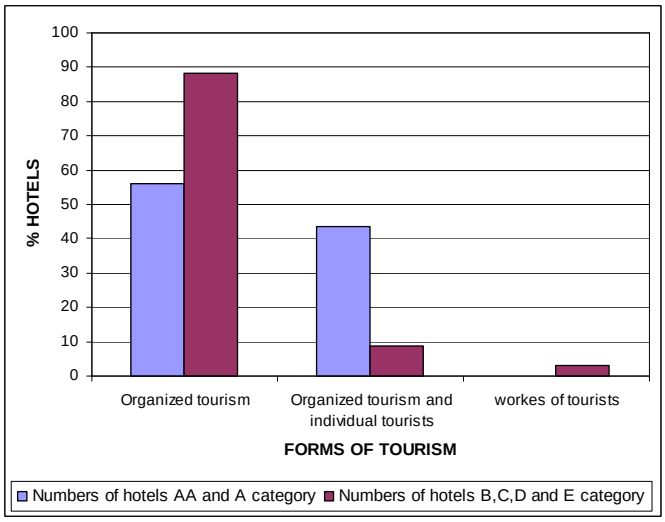
Tables 1: Number of beds and rooms per category of hotels in the region of Faliraki (Source: Greek tourist organization - Address of Tourism Dodecanese, 2000)

By examining the data of the research, it was realized that the foundation of hotel units in the region of Faliraki took place between the years 1970 - 2001. However, most hotels units became operational during the decade between 1981-1990 (Graph 4).



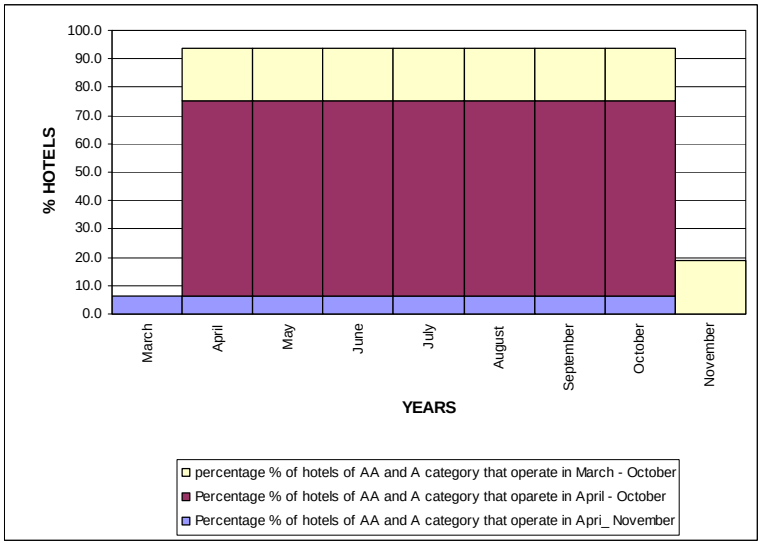
Graph 4: Foundation of new hotel snits in Faliraki at during the years 1960 -2001 (Source: field research, 2001)

The main forms of tourism observed in the region of Faliraki, were organized tourism, individual tourists and the tourists who finance their vacations by working in recreation centers. AA and A category hotels work with both organized tourism and individual tourists, while the rests work mainly with organized tourism.

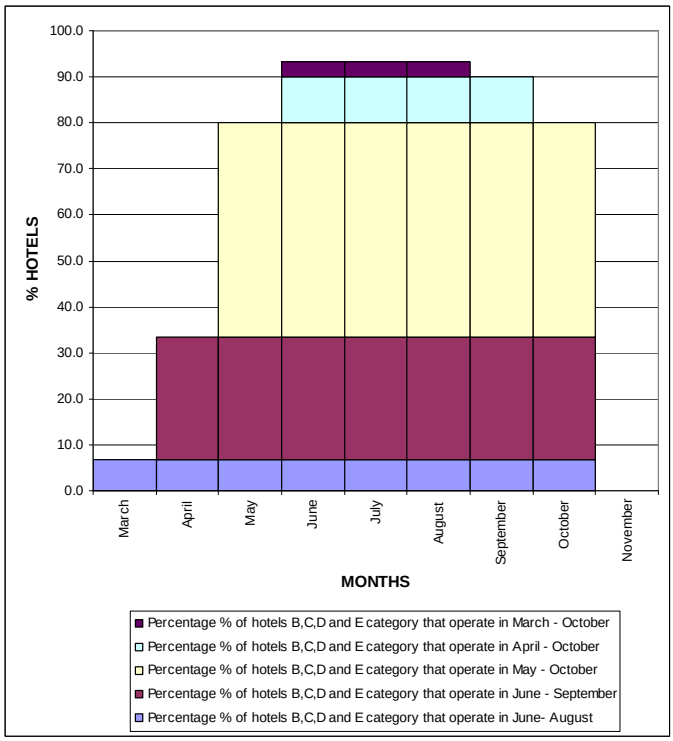


(Graph 5). Graph 5: Forms of tourism in the Hotels of Faliraki in the year 2001 (Source: field research, 2001)

The tourist period according to hotel owners begins from the month of March up to the beginning of November and the duration of tourist stay ranges from 1 to 2 weeks. From the examination of the data, it can be seen that (Graphs 6 and 7) there is a diversification during the tourist period among hotels of B, C, D and E category and hotels of AA and A category.



Graph 6: Percentage % of AA and A category hotel by their months of operation in the year 2001 (Source: field research, 2001)



Graph 7: Percentage % of B, G, D and E category hotels by their months of operation in the year 2001 (Source: field research, 2001)

Regarding at the tourist movement of region, there were different opinions, the largest percentage of hotel owners (35%) claims that there was an increase in tourist movement, 31.1% claims a reduction and 28.8% claims a there has been no change in tourist movement, while a small percentage 2.2% stated that they had no knowledge.

The research of the water supply and sewage networks, revealed that all A category hotels have biological cleaning facilities contrary to the remaining B C, D, and E category hotels, 52% of which have biological cleaning facilities with another 42% using cesspools. At the same time 19% of AA and A category hotels use private water drillings for water supply.

Socio-economic and cultural effects

The tourist development in a region brings about a lot of social changes which depend on the type of tourism (mass tourism creates the biggest social effects), and on the country of origin of tourists. The bigger the difference in the cultural and social - economic level between the countries of reception of tourists and the countries of origin , the bigger the social repercussions. (Tsartas, 1989).

In the region of Faliraki, the tourist growth has brought about a lot of social changes. The growth, mainly, of mass tourism, the countries of its origin (countries with different culture and social - economic level) have affected the social structure of region.

In the region of research an increase in population, due to the increase of employment in tourist businesses, has been observed. The development of tourism in the region of Faliraki caused a concentration of the population of nearby regions in the region of Faliraki, and turn of employment towards tourist professions, at the expense of the primary and tertiary sectors of employment (table 2). The tourist growth in the region of Faliraki brought about important changes in the social stratification of region. New social teams appeared, hotel keepers and businessmen with tourist enterprises, who dominate the region.

From the interviews it resulted that in the region multi-occupation among the remainder residents is observed. That is to say, along with their employment in the rural cultures, construction and in the public sector, the residents are occupied in tourist enterprises as well.

Sector productivities

Area **Kallithea**

Year	1981	(%)	1991	(%)
Primary Sector	100	(9.97)	54	(4.26)
Secondary Sector	260	(25.92)	228	(18.02)
Tertiary Sector	473	(47.15)	885	(69.96)
New	10	(0.99)	23	(1.81)
Not declared	60	(5.98)	75	(5.92)
Total	1003	(100)	1265	(100)

Table 2: Sectors of productivities of Kallithea region (Hellenic Statistics services of Greece, 1981, 1991)

Today, there is big competition, tourist lodgings rival the big hotels and lower the prices and offered services. The dependence on tour – operators is also remarkably. Specifically, in Faliraki they are 5 tour operators. The urban environment of the settlement of Faliraki was shaped in a short time "from the ". The buildings are constructed "randomly" without being included in their surrounding environment. This way of building influences the view of adjacent house-owners and a lot of people fear for new uses that cause noise-pollution.

Generally, in the region of Faliraki the new constructions, the shops with different decoration and their orientation in mass tourism create a picture of opportunism. The local manufactures produce products adapted to the requirements of mass consumption, while in hotels groups traditional dances constitute a spectacle for tourists.

A settlement created over three decades out of nowhere with an intention to serves mass tourism does not create conditions that will develop an environment familiar to the people that live there. It is not accidental that in the region of Faliraki, phenomena of antisocial behavior were presented, mainly from young English tourists of (15-25 years), with intoxication, beatings, robberies and material damage so much against the tourist lodgings where they stayed, as against night-clubs.

4.1 Pointing out of environmental problems concerning water, streams and the infrastructures

As for the pointing out of environmental problems, by the interview with the person in charge of public administration of water of Municipality of Kallithea it was realized that:

- concerning water:

The reserves decrease so that there is a concern for the future. No work has been constructed for the enrichment of the water horizon of the Psinthos region which is supplies Faliraki, no dams for the collection of rain water exist and finally, in some drillings because of over pumping, a surge of sea water has taken place, resulting in the termination of the drilling.

- concerning the streams:

Streams are regarded as spaces for the reception of litter, so that they constitute hearths of pollution. In periods of floods, these function as the main recipients of waters and become dangerous causes of destructions. Also in some parts there is no distance between the stream and urban space, and a part of the stream which goes through the settlement of Faliraki is boxed. The interjection of obstacles in the way of streams (reject of litter) without the suitable regulations for water, a thing that contributes in the destruction of basin of streams, flora and fauna and natural environment around each stream is also an important problem. Finally, in the region of Faliraki technical interventions (flood-preventing work) in the streams, as stabilizations of edging river or artificial dams, do not exist in order to they limit their action in cases of floods mainly at the winter period.

- concerning the wider natural environment

The continuous tourist development led to the deterioration of environmental problems which today is obvious. The most important of these are the exhaustion of natural resources and the unprogrammed building which is accompanied by a great number of urban and circulatory problems. Scattered building make up compact formations and urban surfaces split up cultures and natural area. Also, individual natural units, hills with tree vegetation, streams, coasts, are separated as a result of which the region does not give the picture of functional environmental unit but of a semi natural area.

- concerning the infrastructures

According to the hotel keepers infrastructures are built at a very slow rate (the drainage has not been completed and is 20 years overdue). The sewage systems that is being built will not be connected with all the Faliraki as a result of which the hotels which will not be connected with the sewage system will be overloaded with the transport of mud and sewages from the biological cleanings and cesspools respectively to the Biological Unit of Faliraki. According to the Mayor of Kallithea, the great time necessary for the approval of the works from the administration office in Siro Island contributes to the delay.

The energy system is insufficient. The directors of hotels reported problems of electricity because power failure resulting in problems in the maintenance of foods.

5 QUANTITATIVE ESTIMATE OF CARRYING CAPACITY

The calculation of the capacity and the carrying capacity of a place, constitutes a basic tool for the estimation of tourist development. Attempting to evaluate the carrying capacity of the region that we research, we will have to point out that according to the study of UNEP the tourism generally in the island of Rhodes has been developed to very high degree while the problems of saturation already have been presented in the northern department of island. In the duration of 30 years of development of tourism, the island suffered important changes in the economic and social structure and in the natural environment. The initial area of saturation of tourism is extended round the city of Rhodes and to the west to the settlement of Kremasti as well as to the beach of Faliraki, to the south. The second area of saturation is in the city of Lindo and in its wider region. Specifically for the region of Faliraki it is underlined that:

- It is classified in the tourist saturations regions according to the Study of UNEP.
- The tourist product has a growth of roughly 30 years and is found already in the 3rd stage of tourist growth (Maturation) [87].

According to the General Urban Planning (OFFICIAL JOURNAL OF THE HELLENIC REPUBLIC 721/D/94) and the programmatic size of population for the year 2000, it has been observed that the population in the Municipal apartment of Kallithea is higher than the programmatic size of GUP.

The continuous construction of the region with the creation of new lodgings, contributes in the occupation of cultivable land and in the increase of construction. The carrying capacity of the region is influenced by the duration of the stay of tourists, the duration of use of tourist resources and the territorial distribution of tourist lodgings.

In the present research, the quantitative estimate of capacity and the carrying capacity of region of Faliraki were calculated based on the statistical elements of the population of National Statistical Service and of the tourist movement of Greek tourist organization of Dodecanese. The capacity of the region for the year 2001 was:

X1 = Number of visitors/residents = 1441212 overnight stays visitors / 1.491 residents = 967 overnight stays of visitors/resident/year.

For the completion of the research we accepted as a first admission that the number of tourists for the year 2001 has been constant over the past two years, the time of the tourist period (April. - October) is 210 days and that the number of visitors it counterbalanced by the number of overnight stays of/year (UNEP, ECOMOST, Asimakopoulos, 1997). Simultaneously, the overshooting of limits of the the carrying capacity as for the number of tourists can be certified from ratio F1 = extent of coasts/number of visitors. Consequently, for the region of Faliraki the following are in effect:

F1 = extent of coasts/number of visitors = 261898 m^2/4177 visitors per day = 62.7 m^2 of beach of/visitor of/day.

Next, we accepted as a second admission that the number of visitors = number of overnight stays of/year + local population, and the use of beaches: 50% tourists (UNEP, ECOMOST, Asimakopoulos, 1997). The ratio

87 The tourist product (region, or service) follows a diachronic development of five stages (Kokkosis and Parpairis, 1995): Discovery and take off, Development - enlargement, Maturation - stabilisation, Lassitude - saturation, Decline or renewal

of extent of coasts to the number of visitors of region of Faliraki during in period March - October in 1999 appears in the table that follows:

Months	Area of coast/Number of visitors
March	259.81
April	139.97
May	73.87
June	58.55
July	49.53
August	50.60
September	59.05
October	78.62
November	322.13

Table 3: Rate of extent of coasts/number of visitors in the region of Faliraki during March - October in 1999

Taking into account that the limits for the capacity and the carrying capacity faculty set by the studies of UNEP and ECOMOST aiming at the protection of the environment are 200 overnight stays of visitors/resident/year and 15 m2 of beach of/visitor (Asimakopoulos, 1997), we realise that the capacity in the region of Faliraki exceeds the limits of saturation because of the great number of tourists. Of course, the carrying capacity of the coasts continues to be under the limits of saturation, according always to the data that we have and presents its minimum value on the months of July and August because of the bigger tourist movement.

6 GENERAL CONCLUSIONS

As it was reported in the introduction, the objective of the present work was to locate the effects of tourism development in the natural environment of Faliraki of Rhodes. From the apposition of the above mentioned data and the results of the research we conclude that tourism development led to the degradation of the natural environment of region.

At the same time, we will have to underline that the unplanned mass tourist development in the region of Faliraki, has brought about an important degradation in the offered tourist product. These results from the aesthetic and qualitative degradation of the natural environment because of the irrational management of natural resources. It also results from the degradation of offered services, since there has not been a suitable tourist policy from the local authorities so that the region may be able to satisfy the requirements of a great number of tourists.

Closing, it should be pointed point out that the region of Faliraki is found at a critical stage and the taking of serious measures for its protection is required. It should be made understood that the future course of tourist demand of the place depends decisively on its ability to maintain its natural resources. The suspension of the increase of hotel units is perhaps the most advisable solution, with the simultaneous, of course, objective of qualitative upgrade of the existing potential. The re-establishment and the protection of natural resources, should constitute a direct priority objective for the Faliraki region of Rhodes.

7 BIBLIOGRAPHY

ASIMAKOPOULOS G.(1997), Special Land-planning Study N. Rhodes of Prefecture Dodecanese, Athens
DOXIADIS (1969), ' Study of Tourist development of Faliraki of Rhodes ', Athens
Greek Organism of Tourism, Administration of Tourism of Dodecanese (2000), ' Tourist ' movement of Prefecture of Dodecanese for year 2000 ', Rhodes
KOKKOSIS H. (2000), ' Tourist development and carrying capacity in the islands ' multi-scientific approaches:, Exantas
KOKKOSIS H., A. PARPAIRIS (1995) ' Carrying capacity - Catalyst of configuration of harmonious relations of tourism ' and environment Technical chronicles 5/95 Tourism and Environment: Choices for Sustainable development, Meeting TEE.
KOMILIS P., VAGJONIS Law (1999), Tourist Planning methods and practices of evaluation Publications Propompos
KOSMAKI P, (1999), ' Environmental ' factors and planning of uses of ground and terms of layout Planning, Environmental Repercussions and their Methods of Estimate, Volume A, Greek Open University, Patras,
PANAGIOTATOU E., (Scientific Responsible) (1998) Seasonal residence and built-up growth in Greece, MINISTRY OF ENVIRONMENT PLANNING AND PUBLIC WORKS, inquiring program, G' Fash sector of Urban planning of - Land planning, NTUA, EKKE, Athens

TSAKIRIS G. (1995), ' Frame of Management of Streams of ' Practically ' international conference: Protect and environmental management of streams, MINISTRY OF ENVIRONMENT PLANNING AND PUBLIC WORKS. Athens, Zappeio, 23-24 November

TSARTAS P. (2000), ' Critical ' assessment of parameters of constitution of characteristics of postwar tourist growth Tourist growth, multi-scientific approaches, Sextant,

TSARTAS P. (1989), Social and economic repercussions of tourist growth in the Prefecture Cyclades and particularly in the islands Ios and Serifos at period 1950 - 1980, Athens

🏆 *reviewed paper*

Die Beleuchtung des urbanen Stadtraumes – Verwendung von 3D-Stadtmodellen als Grundlage zu fotorealistischen Simulationsmethoden im städtebaulichen Planungskontext

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1 KURZFASSUNG

Die photorealistische Visualisierung von Beleuchtungsszenarien erlangt unter Zuhilfenahme von virtuellen 3D-Stadtmodellen als unterstützende Entscheidungshilfe im Planungsprozess eine zunehmend größere Bedeutung. Diese Form der Präsentation erschließt sich schnell in eindeutiger Art und Weise jedem Betrachter und vereinfacht so vor allem die Zusammenarbeit in interdisziplinären Planungsteams. Darüber hinaus ist der Lichtplaner in der Lage, sein Konzept in einer virtuellen Umgebung zu prüfen und somit für die erforderlichen Investitionen zusätzliche Planungssicherheit zu erlangen.

Die exemplarisch angewandte Planungsmethodik verbundenen mit den im Vortrag vorgestellten Techniken erlauben es, Situationen im Planungsstadium erlebbarer zu machen und den Planungsstand realitätsnah zu präsentieren. Somit kann die Qualität der Planung durch experimentellen Umgang mit neuen Materialien und Ideen nachhaltig verbessert werden. Darüber hinaus können Planungsalternativen, die nicht das gewünschte Ergebnis erzielen, frühzeitig im Planungsprozess ausgeschlossen werden, ohne dass hierfür besondere Investitionen erforderlich wären.

2 EINSATZ IN DER PLANUNG

Der Einsatz von digitalen Simulationsmethoden in der Planung kann in zeitlich sehr unterschiedlichen Situationen und Stadien des Planungsprozesses geschehen: zum einen in der Entwurfsphase als Diskussionsgrundlage für den Zielfindungsprozess, um das grundsätzliche Erscheinungsbild der Lichtinstallation zu definieren und zum anderen für die Überprüfung der Planungsparameter nach dem Entwurf, um die erwünschten Lichteindrücke virtuell „vor Ort“ zu überprüfen und die vom Lichtplaner vorgeschlagenen Werte in einer der Realität annähernd entsprechenden Umgebung zu testen.

Deshalb ist neben den technischen Komponenten das Modell der bestehenden Situation das zweite wichtige Element für die Entwurfsplanung. Dementsprechend genau müssen schon im Vorfeld der eigentlichen Planung Zielvorstellungen über den Detaillierungsgrad des Modells vorgegeben werden. Anders als in der Objektplanung, die größtenteils schon 3D-geplant ist, gestaltet sich dieser Ansatz auf städtischer Ebene heute noch schwierig: problematisch hierbei sind die momentan fehlenden Standards bezüglich der Datenformate, der Archivierung und des sogenannten Level of Details (LOD), der angibt, in welcher Erfassungsschärfe das städtische Modell zu den Aussagen der Differenzierung der Dachstrukturen und –formen sowie der Lagegenauigkeit der aufzunehmenden Punkte im Modell vorliegt [vgl. hierzu Gröger et al. 2004]. Für Lichtmasterpläne auf gesamtstädtischer Ebene reicht demnach ein eher abstrahiertes Modell mit digitalem Geländemodell und vereinfachten Gebäudekubaturen im LOD 1-Modus.

2.1 Lichtplanung im öffentlichen Raum

2.1.1 Qualitative Lichtplanung

Im Gegensatz zur funktionalen/quantitativen Lichtplanung, die aus dem zwangsläufigen Anforderungsprofil der jeweiligen Projekte einen einzigen, allgemeingültigen Satz von Lichtqualitäten ableiten, der fast automatisch zu einer gleichförmigen und damit auch einheitlichen Gestaltung von Licht und Leuchten führt, gilt es bei der qualitativen Lichtplanung, sich mit komplexen Rastern angestrebter Lichtqualitäten und Gestaltungsmerkmalen auseinanderzusetzen.

Der Ursprung der qualitativen Lichtplanung liegt in der künstlerischen Bühnenbeleuchtung. Anders als bei der physiologischen, lichttechnischen Forschung wird hier nicht nur nach dem Auge, also nach rein quantitativen Grenzwerten für die Wahrnehmung abstrakter visueller Sehaufgaben gefragt. Im Mittelpunkt steht vielmehr der wahrnehmende Mensch, somit die Frage, wie die konkret wahrgenommene Realität im Vorgang des Sehens aufgebaut ist. Denn Wahrnehmung ist kein bloßer Abbildungsprozess, kein Photographieren der Umwelt. Unzählige optische Phänomene zeigen vielmehr, dass bei der Wahrnehmung

eine komplexe Deutung der Umgebungsreize vorgenommen wird, dass Auge und Gehirn unsere empfundene Realität weniger abbilden als vielmehr konstruieren.

Abbildung 1: Atmosphäre und Bühnenlicht: a.) Licht zum Sehen (ambient light), b.) Licht zum Hinsehen (Focal glow) und c.) Licht zum Ansehen (play of brilliance), Tristan und Isolde [Berliner Staatsoper und Bühnenlichtinszenierung Herzog & de Meuron]

Kelly und Lam definieren vor diesem Hintergrund in den 1960er Jahren eine völlig neue Bedeutung der Beleuchtung [nach Ganslandt Hofmann 1992]: „activity needs“ (quantitative Notwendigkeiten), die funktionale Anforderung der Beleuchtung an die visuelle Sehaufgabe sowie die „biological needs“ (qualitative Notwendigkeiten), die psychologische Anforderung an die Beleuchtung im Kontext ihrer räumlichen Umgebung stehen hierbei im Mittelpunkt. Weiterhin wenden sie sich gegen eine durchgängige Beleuchtung mit gleich bleibenden Lichtquantitäten, sondern fordern vielmehr eine differenzierte Analyse aller auftretenden Sehaufgaben nach Ort, Art und Häufigkeit, eine Anpassung des Beleuchtungsniveaus an die jeweiligen Anforderungen und eine Unterscheidung des Lichtes nach dessen Aufgabe.

Denn nach ihrer These kann das Licht drei verschiedene Aufgaben im urbanen Raum erfüllen (vgl. Abbildung 1): a.) Licht zum Sehen (ambient light), b.) Licht zum Hinsehen (focal glow, Anstrahlungen, Betonung mit Licht) und c.) Licht zum Ansehen (play of brillance, z.B. Lichtskulpturen). Dies sind Begrifflichkeiten und Techniken, die in modernen 3D-Renderprogrammen zur Erstellung von qualitativ hochwertigen Beleuchtungsszenarien immer wieder auftauchen. Mit diesen drei Grundkategorien der Beleuchtung ist ein einfaches, aber wirkungsvolles Raster der Lichtgestaltung geschaffen, das sowohl der Beleuchtung eines urbanen Objektes, als auch den Bedürfnissen des wahrnehmenden Menschen gerecht wird. Die eigentliche Herausforderung einer qualitativ orientierten Lichtplanung liegt letztendlich im Entwurf eines Gestaltungskonzepts, das in der Lage ist, differenzierte Anforderungen an die Beleuchtung mit einer technisch und ästhetisch konsistenten Beleuchtungsanlage zu erfüllen.

2.1.2 Lichtmasterplanung

Zwar ist der Allgemeinbevölkerung in Deutschland die quantitative Beleuchtung unserer städtischen Umgebung bei Dunkelheit inzwischen eine Selbstverständlichkeit geworden, aber noch immer ist den meisten Stadtverantwortlichen der Begriff des „Lichtmasterplans“ oder der „Lichtgestaltung“ ein Fremdwort. Dieser planerische Missstand in der Beleuchtung vieler unserer Städte hat zum Glück in den letzten Jahren einen neuen Markt entstehen lassen, der die konzeptionellen Defizite kompensieren kann. Die neue Generation der „Lighting Designer“ vor allem im Sektor des Stadtmarketing haben die positiven Effekte einer qualitativen Lichtplanung auf das Image und die Gestalt einer Stadt erkannt. Wirkungsvolle Projekte in Deutschland, z.B. die Speicherstadt in Hamburg, der Duisburger Innenhafen oder der Zollverein in Essen zeigen, wie mit gutem Lichtdesign Orte, denen ehemals etwas Angsteinflößendes anhaftete, zu neuem Leben erweckt werden können. Lichtdesign sollte immer auf die formalen Rahmenbedingungen seiner Umgebung eingehen. Die Gestaltung mit Licht gleicht hierbei der Arbeit eines bildenden Künstlers, der seine Skulpturen formt [Lange/ SLG 1998]. Ähnlich dem Bildhauer, Maler, Fotografen oder Musiker verfolgt auch der Lichtdesigner eine übergeordnete (Gestaltungs-)Idee. Neben der Berücksichtigung des gesamträumlichen Kontextes der Stadt, ihrer Funktion und Geschichte, stehen für den Planer vor allem das Gesamtkonzept (Masterplan) und die beachtenswerten urbanen Einzelobjekte, die im Detail der umfassenden Planung zu beleuchten sind, im Mittelpunkt seines künstlerischen Denkens. Von besonderer Bedeutung für die Gestaltung mit Licht im urbanen Kontext sind folgende Faktoren [Flagge 1991]:

(1.) Die Stadt und ihre Topographie

Ausbildung und Förderung der prägenden Charakteristika einer Stadt: ihre topographische Lage, ihre Flüsse oder Uferzonen (vgl. Uferpromenade von Nizza, Abbildung 2a.), ihre Hauptverkehrsadern, ihr räumlicher Aufbau („Stadtkrone“) und ihre Baustruktur sowie ihre unverwechselbaren Merkmale wie beispielsweise Denkmäler und Kirchen.

(2.) Orientierung durch Beleuchtungshierarchie

Unter den grundlegenden psychologischen Anforderungen, die an eine visuelle Umgebung gestellt werden, steht an erster Stelle das Bedürfnis nach eindeutiger räumlicher Orientierung. Orientierung kann hierbei sowohl übergeordnet (Infrastruktur, Blickachsen) als auch örtlich (Ablesbarkeit der näheren Umgebung, Maßstäblichkeit des Menschen im urbanen Raum) verstanden werden. Sie bezieht sich auf die Erkennbarkeit von Zielen und der Wege dorthin. Beispielsweise können einige bedeutende Bauten als optische Zielobjekte speziell angestrahlt werden, die für die eigene Orientierung und für die Identität des Ortes wichtig sind. Eine weitere grundlegende Möglichkeit zur Förderung der Orientierung liegt in der Betonung der Wegeführung selbst (z.B. Uferpromenaden, Avenues, vgl. Abbildung 2b., Champs Elyssees). Grundvoraussetzung für eine Betonung mit Licht ist jedoch die gleichzeitige Absenkung des Beleuchtungsniveaus in den angrenzenden, peripheren Bereichen (Beleuchtungshierarchie).

(3.) Räumliche Überschaubarkeit / psychologisches Sicherheitsgefühl

Eine weitere, psychologische Anforderung zielt auf die Überschaubarkeit des Raumes und auf die Ablesbarkeit der umgebenden baulichen Strukturen (Abbildung 2c.). Hierbei ist zunächst die ausreichende Sichtbarkeit aller Raumbereiche von Bedeutung, sie ist entscheidend für das Gefühl der Sicherheit in einer visuellen Umgebung. Besonders in potentiellen Gefahrenbereichen ist die vollständige Überschaubarkeit und strukturelle Verständlichkeit des Raums von entscheidender Bedeutung. Grundsätzlich gilt, dass eine geordnete und eindeutige Raumdarstellung zum Wohlbefinden in einer visuellen Umgebung beiträgt.

Abbildung 2: a.) Die Stadt und ihre topographische Lage: Nizza und seine charakteristische Uferzone [Flagge 1991], b.) Orientierung durch Beleuchtung: Champs Elyssees und c.) Sicherheitsgefühl durch Helligkeit: lichtüberflutete Straßenkreuzung in Lyon [Narboni 1995]

(4.) Licht und Atmosphäre

Besonders im Bereich von Aufenthaltszonen, Plätzen, Parks oder Eventflächen sollten die lichttechnischen Maßnahmen zur Schaffung einer angenehmen Atmosphäre beitragen und unseren Sinnen, mit den heute vorhandenen technischen Möglichkeiten der Lichttechnik etwas Gutes tun. Das visuelle Ambiente und die emotionelle Behaglichkeit sind entscheidend für den Erfolg einer Inszenierung mit Licht. Gestalterische Grundvoraussetzung für eine gelungene Inszenierung bzw. eine qualitativ hochwertige Beleuchtung ist der sorgsame Umgang mit Lichtfarben (Abbildung 3), Leuchtdichten und Lichtpunkthöhen. Die Illumination von Architektur, Parks und Plätzen um ihrer selbst Willen kann zu einem allseits kostspieligen Abenteuer werden.

(5.) Einbeziehung additiver Lichtquellen

Neben einer Straßen- oder Objektbeleuchtung können zum Stadtbild noch weitere Beleuchtungselemente, beispielsweise grelle Schaufenster, Leuchtreklamen (z.B. Abbildung 3c., Times Square), beleuchtete Eingänge und Lichter privater Häuser gehören. Diese Lichtquellen können unter Umständen die erwünschte Wirkung einer Anstrahlung stark beeinflussen und sind aus diesem Grund, soweit möglich, in der Planung zu beachten.

(6.) Leuchten als Straßen- oder Stadtmöbel / Stadtbild

Heute ist die Zahl der unterschiedlichsten Straßenmöbel groß. Dazu gehören Schilder, Masten, Ampeln, Zäune, Bänke, Papierkörbe, Litfasssäulen, Reklametafeln und auch die sichtbaren Beleuchtungselemente im Stadtraum. Die Rolle der Leuchte als Stadtbild-prägendes Merkmal ist nicht zu unterschätzen und stellt besonders in der Gestaltung des Straßenraumes ein grundlegendes Gestaltungsmerkmal in der Stadtplanung dar (z.B. Lichtstelen, Abbildung 3d.). Aus diesem Grund ist auf eine stilistisch passende Auswahl der Leuchten im Bestand zu achten oder, soweit möglich, auf eine sichtbare Montage der Leuchten bei Anstrahlungen zu verzichten.

Abbildung 3: a.) Akzentuierung und Atmosphäre durch Licht, Coloseum in Rom, b.) Detail Farblichtdifferenzierung Coloseum in Rom [www.iguzzini.com], c.) Lichtsmog durch additve Beleuchtung, Times Square New York [www.imagegalery.com] und d.) Leuchten als Elemente des Stadtraumes, Autobahnabfahrt Flughafen Lax[www.aeg.de]

2.1.3 Prozess der Planung

Die Planung von Beleuchtungssystemen stellt einen sehr komplexen, interdisziplinären und kommunikativen Vorgang dar. Die Einflussfaktoren und Anforderungen an alle am Planungsprozess beteilgten Akteure sind vielfältig und bedürfen der kooperativen Planung, Konzeption und Abwägung. Der methodische Ansatz sieht drei Phasen vor (Abb.4):

(1.) Analysephase

Die Analysephase ist unterteilt in Grundlagenermittlung, Analyse aller planungsrelevanten Einflussfaktoren und Ermittlung der funktionalen, lichttechnischen und gestalterischen Anforderungen mit anschließendem Vergleich des Soll-/ Ist-Zustandes.

(2.) Planungsphase

Daran schließt sich die eigentliche Planungsphase an, die inhaltlich durch die Konzeption und Masterplanung aller beleuchtungsrelevanten und nutzungsspezifischen Faktoren inklusive lichttechnischer Berechnung bzw. Überprüfung (Modellsimulation, EDV, CAD) und wirtschaftlicher Kostenschätzung der Planung bestimmt ist.

(3.) Realisierungsphase

Abschließend sollte in der Realisierungsphase die technische Umsetzung, Überwachung und Wartung, sowie die Festschreibung der Lichtplanung im Flächennutzungsplan, Bebauungsplan oder in einer gemeindlichen Gestaltungssatzung zur Gewährleistung einer nachhaltigen Planung durchgeführt werden.

2.1.4 3D-Stadtmodelle als Grundlage für Lichtplanungen

Je nach Größe des Plangebietes benötigt man verschieden detailierte 3D-Stadtmodellgrundlagen. Quartierspläne und Platzgestaltungen erfordern die Ausdifferenzierung zwischen LOD2 und LOD3 mit ausmodellierten Dächern und dazugehörigen Fassadentexturen. In der eigentlichen Objektplanung - LOD4 -, dem „Architekturmodell“, müssen Geometrien demnach die reale Form mit konstruktiven Elementen und Öffnungen abbilden, so dass es möglich ist, einen maximalen Wiedererkennungswert zu erzielen sowie reale Größen und Proportionen ablesen und messen zu können. Der anfänglich groß erscheinende Aufwand für die Erstellung eines 3D-Modells [vgl. hierzu Zeile 2004] rechnet sich allerdings langfristig durch die jederzeitige Verfügbarkeit einer dreidimensionalen Planungsgrundlage, die im städtebaulichen Kontext nicht nur für die Lichtplanung ein wertvolles Instrument zur Kommunikation zwischen den einzelnen am Planungsprozess beteiligten Akteuren darstellt [Zeile et al 2005].

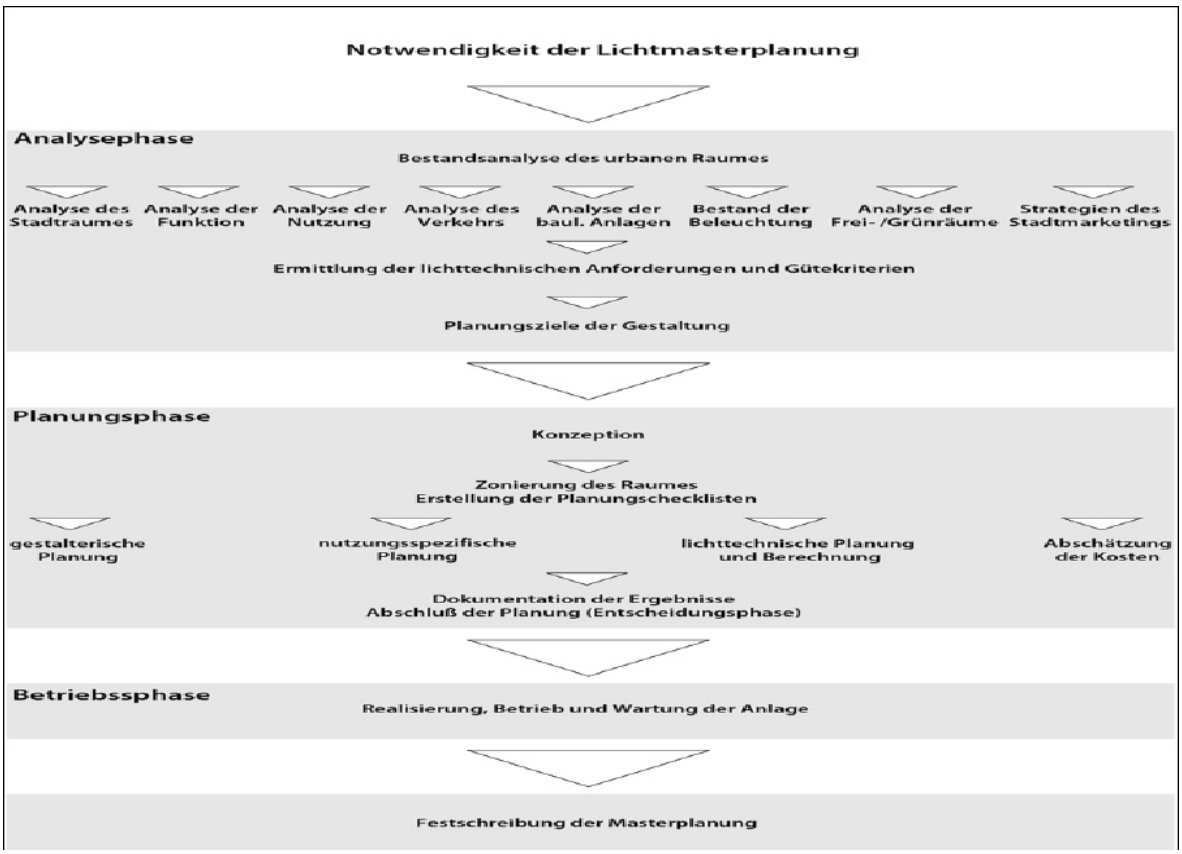

Abbildung 4: Idealer Ablauf einer Lichtplanung [Reichrath 2006]

3 VISUALISIERUNGSTRENDS UND TRANSFORMATION AUF DIE PLANNGSAUFGABE

3.1 HDRI (High Dynamic Range Images)

HDR-Images sind digitale Bilddateien, die einen sehr hohen Dynamikumfang in der Belichtung besitzen. Anders als normale digitale Aufnahmen aus Standarddigitalkameras, die nur einen Teil der real existierenden Belichtungsdynamik abbilden können, wird bei der Erstellung von HDR-Bildern mithilfe von Belichtungsreihen in der digitalen Fotografie oder durch eigens auf HDR-Produktion erstellte Renderalgorhitmen ein in der Belichtungsdynamik nahe an die Realität kommendes Bild erzeugt (Abb.5). In dieser erstellten Datei ist unter anderem auch der reale Kontrastumfang abgespeichert, so dass selbst im Nachhinein noch das Bild in Farb- und Tonwert korrigiert werden kann.

Mithilfe dieser Technik können zwei Lösungsmöglichkeiten zur Visualisierung von Lichtplanungen erreicht werden: Zum einen kann man zur lichttechnischen Überprüfung der Lichtplanung sehr exakte 360°-Panoramabilder in HDRI-Technik aufzunehmen, die nicht nur die Pixelanordnung des Raumes speichern, sondern auch den messtechnisch korrekten Kontrastumfang. Auf Grundlage solcher exakten Bildinformationen lassen sich mittlerweile virtuelle Modelle beleuchten, d.h. die Lichtpunkte in der Fotographie werden als Lichtquellen im Renderprogramm eingesetzt.

Zum anderen kann man selbst in den Renderingprogrammen HDR-Bilder erzeugen, die den geplanten Lichteffekt gerade durch den dynamischen Kontrastumfang besser visualisieren als es bis vor kurzem durch die „klassische“ Bildausgabe möglich war.

Abbildung 5: a.) bis c.) Belichtungsreihe Berlin Alex, HDR-Erstellung, d.) Ergebnis mit komplettem Kontrastumfang [Zeile, Martin; Berlin 2007]

3.2 Verwendung von IES Daten

Die für jede Leuchte vorliegende Lichtverteilungskurve bestimmt die räumliche Lichtstärkenverteilung in Form von sog. Polardiagrammen. Da diese leuchtenspezifischen Diagramme für den Laien oftmals nur sehr schwer verständlich sind, für die Planung aber eine große Bedeutung haben, wurde von der Illuminating Engineering Society of North America [siehe hierzu www.iesna.org] das so genannte IES-Format eingeführt, das die Lichtstärkenverteilung durch das Hinzuladen der IES-Datei im Rendering Programm simuliert, ohne dass eigene, schwierige Berechnungen ausgeführt werden müssen. So kann für jede Leuchte die exakte Lichtstärkenverteilung simuliert werden (Abb.6).

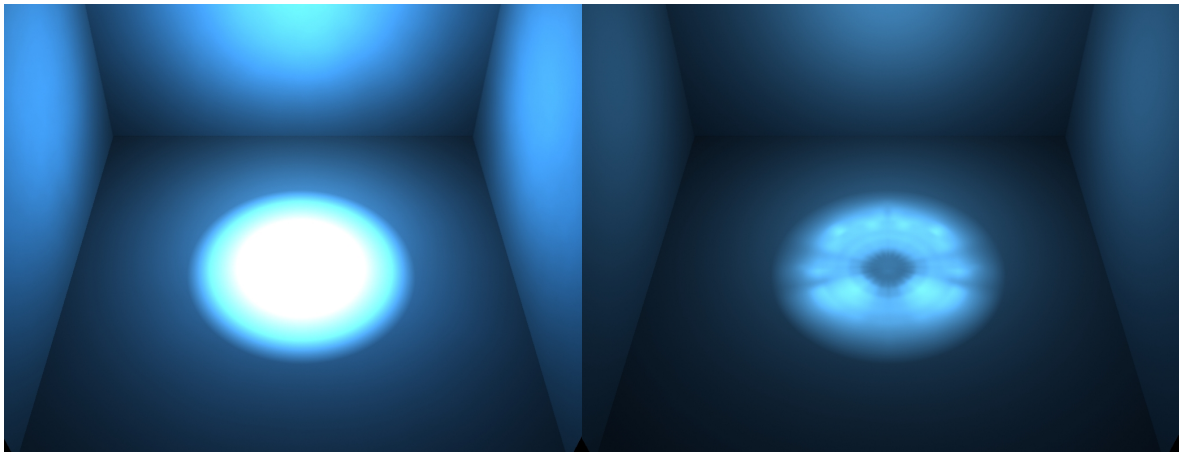

Abbildung 6: a.) Normaler Spot und b.) Spot mit simulierter Lichtverteilungskurve über das IES- Format [LG cpe, Tony Poesch]

3.3 Bump/ Normal Mapping

Mit Hilfe des sog. BumpMapping-Verfahrens werden Oberflächenreliefs aus digitalen Bildern simuliert, ohne die Geometrie zu verändern bzw. zu verfeinern. Hierbei werden über die Texturen weitere Schichten von „Maps“ gelegt, die bestimmen wie hell oder wie dunkel die jeweiligen Texturen an einer bestimmten Stelle sind. Das so entstehende „Hell/Dunkel-Muster“ täuscht somit Höhenunterschiede der Geometrie und die daraus resultierenden Schatten vor, obwohl die Geometrie unangetastet bleibt (Abb.7).

Modernere und technisch weiterentwickelte Verfahren sind das Heighmapping und das Normalmapping, die in den Bereichen der Darstellung von Geländemodellen bzw. für Realtime Virtual Reality Anwendung finden [vgl. hierzu Computerbase 2005]. Gerade für die Beleuchtung von Architekturmodellen ist diese Technik unverzichtbar, da mit Hilfe dieses „Tricks“ Oberflächenstrukturen simuliert werden können, die nicht aufwändig nachmodelliert werden müssen.

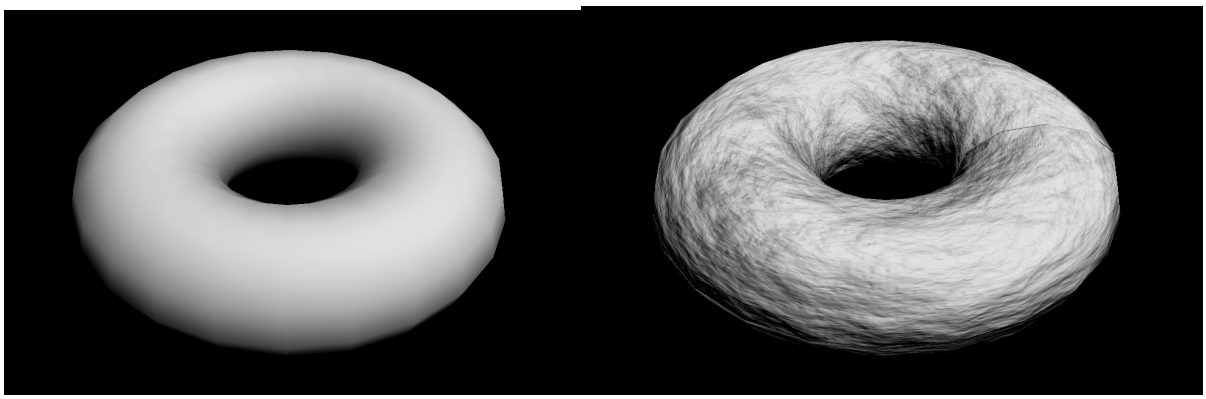

Abbildung 7: a.) Reine Geometrie und b.) mit Bumpmapping simulierte Oberflächenstruktur [LG cpe, Tony Poesch]

3.3.1 Texture Baking

Mithilfe von Texture Baking oder der auch als Abflachungsmapping bekannten Technik können Beleuchtungseinstellungen im Modell auf dessen originäre Textur multipliziert und als eigenes Map auf die Gebäudeoberfläche projiziert werden; es wird in die Textur gerendert. Diese Technik kommt genau wie das Bump-Mapping zum Einsatz, um in Echtzeitumgebungen aufwändige Rechenoperationen für die Berechnung von Licht und Schatten zu vermeiden (Abb.8). Ein weiterer Vorteil liegt darin, dass auch verschiedene Ansichten einer Situation mit einem schnellen und einfachen Renderdurchgang berechnet werden können, ohne dass die gesamte Lichtberechnung, die bei einem hochaufösenden Bild bis zu mehreren Stunden dauern kann, noch nötig ist.

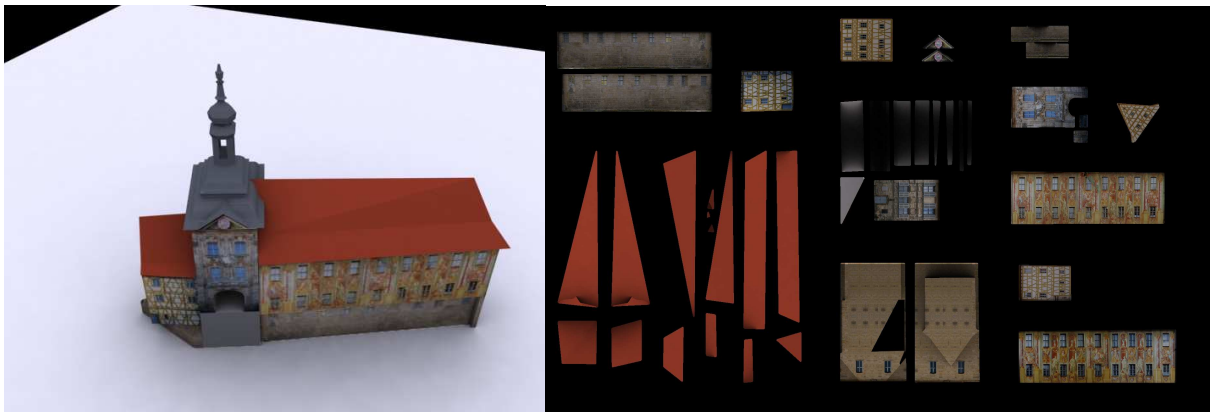

Abbildung 8: a.) Light-Tracing Beleuchtung auf das Brückenrathaus Bamberg und b.) zugehöriges Abflachungsmap. An den Dachflächen ist der Schatteneinfall sehr gut zu erkennen [Eigene Darstellung]

4 (LICHT-)TECHNISCHE ÜBERPRÜFUNG UND SIMULATION

Das kostenfreie, lichttechnische Programm DIALux ist das Ergebnis einer Initiative von mehreren Leuchtenfirmen, die unter dem Dach des Deutschen Institut für Angewandte Lichttechnik (DIAL/Lüdenscheid) ihre Interessen gemeinschaftlich vertreten. Die Leuchtendaten (Eulumdat, IES) müssen separat bei den beteiligten Firmen angefordert werden. Der Planer kann zwischen einem neuen Projekt für die Außen- oder Straßenbeleuchtung wählen. Danach erscheint ein Grundbild beispielsweise einer Standardstraße mit Mittelstreifen oder einer Platzfläche. Weiterhin können auch kleinere DXF-/DWG-Dateien importiert werden und als Plangrundlage dienen [Reichrath 2006].

Demgegenüber steht die Methode der Überprüfung der Planungsabsicht mithilfe von 3D-Modellern wie 3dMax und zusätzlichen Plugins wie VRay, Maxwell, Final Renderer oder Brazil.

4.1 Relux

Die gegebenen dreidimensionalen Daten des virtuellen Stadtmodells lassen sich über die DXF-/ DWG-Schnittstelle in spezielle Computerprogramme für die Lichtberechnung in Relux importieren. Dabei werden jedoch zusätzliche Dateiinformationen, Material- und Oberflächeneigenschaften (z.B. Photomapping, Bump-Maps) nicht mitübertragen. Formate, die solche Features aufweisen, wie beispielsweise 3ds-Dateien, werden

zwar teilweise angeboten, jedoch hat sich im Relux gezeigt, dass bei der Datenkonvertierung Programmfehler auftreten können, vor allem bei komplexen Modellen. Aus diesen Gründen empfiehlt es sich, einfache Beleuchtungszenerien nachzubauen oder die Dateigrösse von Importdateien möglichst gering zu halten, z.B. durch den Verzicht auf Mappings (Abb.9). Die Rechenzeit inklusive Rendering für ein Straßenprojekt mit gleichen Leuchten dauert etwa 5-10 Minuten, bei einer komplexeren Platzsituation mit Materialzuweisung kann jedoch die Berechnung ohne weiteres einige Stunden dauern. Großflächige Planungen mit komplexen Datenbänken kann das relativ kleine Programm jedoch nicht bewältigen [Reichrath 2006].

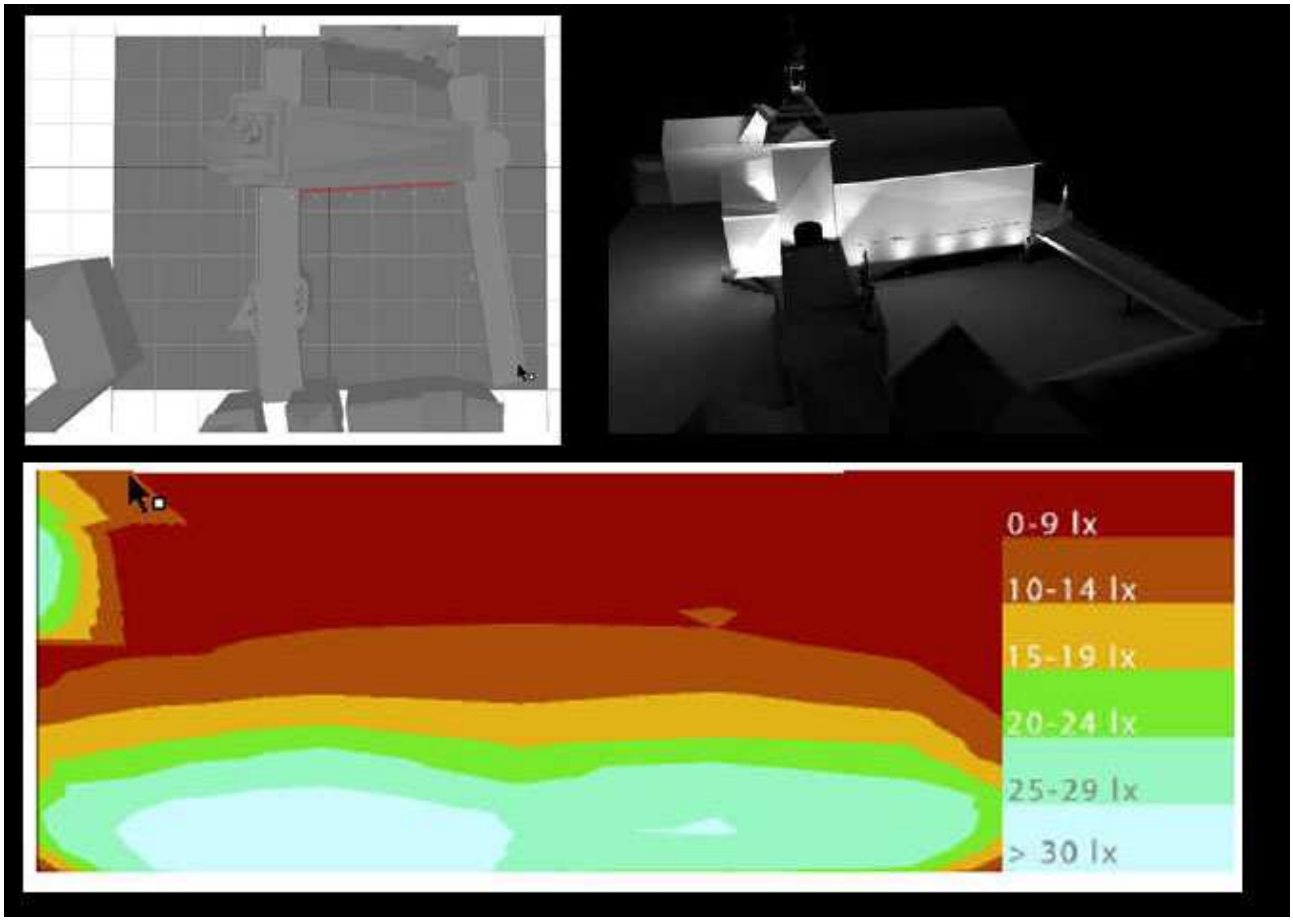

Abbildung 9: Lichttechnische Berechnung in Relux, Brückenrathaus Bamberg [Reichrath 2006]

4.2 3dMax/VRay

Der Einsatz dieser Technik gegenüber Dialux hat zwei entscheidende Vorzüge: die Erhöhung der Zeichengeschwindigkeit und der gestalterischen Möglichkeiten. Gerade das im Vergleich zu technischen Beleuchtungsprogrammen höhere gestalterische Potential der Modellierungs- und Visualisierungssoftwares eröffnet dem Lichtplaner völlig neue Anwendungsmöglichkeiten in der fotorealistischen und lichttechnisch exakten Visualisierung einer Beleuchtungsszene. Die Vorteile der Verwendung eines dreidimensionalen CAD- und/oder Visualisierungsprogramms liegen besonders in folgenden Qualitäten:

(1.) Gegenüber lichttechnischer Berechnungsprogrammen können auch sehr komplexe Dateigrößen und Modelle (Masterplanungen, Stadtmodelle) auf herkömmlichen Computern oder über LAN-Netzwerke von den meisten 3-D-Anwendungsprogrammen bearbeitet und visualisiert werden

(2.) Materialeigenschaften der Objektflächen im virtuellen Raum können wesentlich realistischer dargestellt und berechnet werden, z.B. lassen sich neben dem Einsatz von Bilddaten (Maps), auch Rauhigkeit (Relief), Mattigkeit, Reflexionseigenschaften und vieles mehr in die Lichtberechnung mit einbeziehen. Bei der Ausleuchtung einer Szene werden die Lichtstrahlen nicht nur zur Beleuchtung der Zieloberfläche berechnet, sondern auch hinsichtlich ihrer Reflexion weiterverfolgt (indirekte Beleuchtung, und im Gegensatz zu einem Interflexionsverfahren (vgl. DIALux) mathematisch und physikalisch korrekt visualisiert (Abb.10).

Als Nachteil dieser 3-D-Visualisierungsprogramme sind sicherlich der hohe Anschaffungspreis und der hohe zeitliche Aufwand zur Modellierung und Berechnung der Visualisierungen (Renderings) zu nennen (z.B. komplexe Fassadenoberfläche eines historischen Gebäudes), sofern der zu beplanende Stadtraum nicht als 3d-Modell vorliegt. Außerdem verfügen diese Programme in der Regel nicht über die komfortable lichttechnische Datenverwaltung (Leuchtenliste) und Informationsauswertung (Erläuterungstexte) [Reichrath 2006].

Abbildung 10: Simulation Brückenrathaus Bamberg mit 3dMax/ Vray [Reichrath 2006]

5 SCHLUSSFOLGERUNGEN

Die vorgestellten digitalen Techniken erleichtern in der täglichen Planungspraxis auch dem nicht spezialisierten (Stadt-)planer den Umgang mit der Materie Licht im städtischen Kontext. Gerade weil der Lichtplaner seine Entwürfe auf empirische und für Außenstehende abstrakte physikalische Werte aufbaut, sind diese Konzeptionsvorschläge für den Laien erst dann verständlich, wenn der Entwurf über eine real gebaute Prototypenerstellung dargestellt worden ist. Durch die herkömmliche, abstrakte Form der Lichtkonzeptionserstellung können verschiedene Planungsalternativen nur schwer miteinander verglichen und diskutiert werden.

Mithilfe der vorgestellten Visualisierungsmethoden kann der Kommunikationsprozess zwischen allen an der jeweiligen Planungsphase beteiligten Akteuren erheblich verbessert werden. Der zu Beginn zwar höhere Aufwand für die Erstellung der digitalen Modelle rechnet sich meist im Nachhinein durch eine zügigere und auch sicherere Realisierung des Projekts. Viele kostenintensive Fehler oder Zeitverzögerungen in der Vergangenheit, die vormals durch die schwierige Kommunikation zwischen den verschiedenen Akteuren entstanden waren, können zukünftig somit vermieden werden.

Trotz der oben beschriebenen Möglichkeiten und Vorteile muss immer wieder darauf hingewiesen werden, dass (noch) keine hundertprozentige Abbildung der Realität erzielt werden kann. Der Umgang mit diesen neuen Techniken erfordert neben Kenntnissen über die technischen Aspekte der Lichtplanung vor allem auch eine verantwortungsvolle und respektvolle Auseinandersetzung aller Akteure im Zuge des Zielfindungsprozesses. So kann mittels Einsatz sowohl digital unterstützter als auch analoger Methoden eine qualitativ hochwertige Planung erzielt werden.

Es erscheint uns wichtig darauf hinzuweisen, dass selbst bei günstigen Voraussetzungen das Wirken eines technisch versierten Visualisierungsfachmannes derzeit die Arbeit des Lichtplaners noch nicht vollwertig ersetzen kann. Der Einsatz der vorgestellten Simulationsmethoden begünstigt jedoch den Planungsprozess und soll vorherrschend die Diskussions- und Kommunikationsgrundlage z.B. in der kommunalen Öffentlichkeitsarbeit fördern, ohne jedoch schon den 1:1 Zustand nach Abschluss der Plannung darzustellen [Zeile Farnoudi Streich 2006].

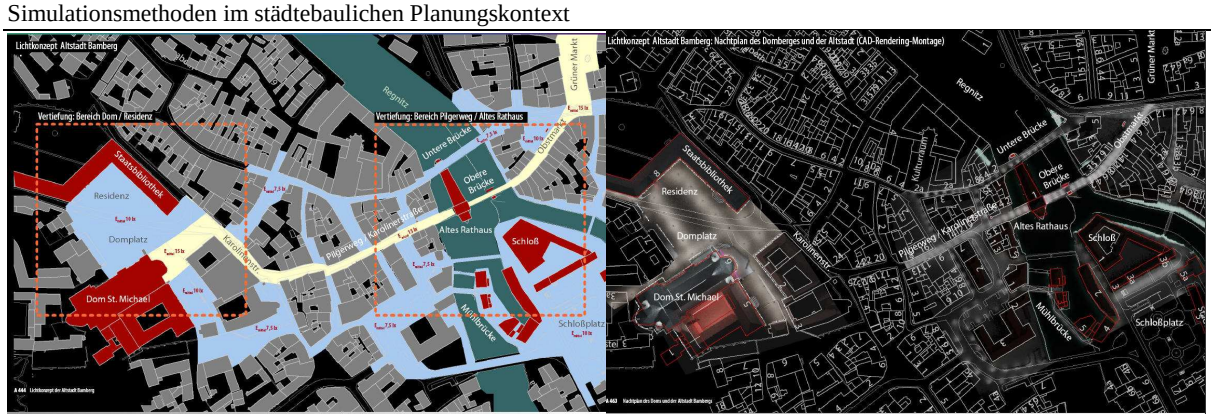

Abbildung 11: a.) Exemplarisches Lichtkonzept Altstadt Bamberg und b.) zugehörige CAD-Renderingmontage [Reichrath 2006]

6 LITERATUR

ComputerBase-Lexikon: Stichwort Bumpmapping, auf http://www.computerbase.de/lexikon/Bumpmapping

Flagge, Ingeborg: Architektur Licht Architektur, Karl Krämer Verlag, Stuttgart 1991

Ganslandt, R. und Hofmann, H.: ERCO Handbuch der Lichtplanung, ERCO Edition, Verlag Vieweg, 1992,

Gröger, G., Kolbe, TH., Drees, R. Kohlhaas, A., Müller, H., Knospe, F., Gruber, U., Krause, U.: Das interoperable 3D-Stadtmodell der SIG 3D der GDI NRW, GDI NRW, Düsseldorf, 2004

Lange, Horst / Schweizer Licht Gesellschaft (SLG): Handbuch der Beleuchtung (Mehrbändig), Verlagsgruppe Hüthig Jehle Rehm GmbH, Landsberg am Lech 1998, 5. Aufl, Stand: 29. Ergänzungslieferung, Dezember 2005

Narboni, R.: La Lumière Urbaine, Le Moniteur, Paris, 1995

Reichrath, Martin: Die Beleuchtung des urbanen Stadtraumes, Diplomarbeit TU Kaiserslautern, LG cpe, 2006

Zeile, P.: Erstellung und Visualisierung von virtuellen 3D-Stadtmodellen aus kommunalen Geodaten am Beispiel des UNESCO Welterbes Bamberg, Diplomarbeit, Prof. Dr. Ing. B. Streich, Lehr- und Forschungsgebiet für computergestützte Planung und Entwurfsmethoden in Raumplanung und Architektur-CPE, TU Kaiserslautern, 2004

Zeile, P., Schildwächter, R. Poesch, T.: 3D-Stadtmodell-Generierung aus kommunalen Geodaten und benutzerspezifische Echtzeitvisualisierung mithilfe von Game-Engine-Techniken, in Schrenk, M.: Beiträge zum 10. CORP. Symposium an der TU Wien, Wien, 2005

Zeile, P., Farnoudi, F. u. Streich, B.: Einsatz von Simulationsmethoden im Rahmen der Planung von Lichtinstallationen, in: Schmidt, J.A.; Töllner, M.: StadtLicht - Lichtkonzepte für die Stadtgestaltung -Grundlagen, Methoden, Instrumente, Beispiele; Fraunhofer IRB Verlag, Stuttgart, 2006

Testplanungen als Instrument zur Aktivierung von Flächenpotenzialen

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1 EINFÜHRUNG

Nicht selten wird der räumlichen Planung von Seiten der Politik vorgeworfen, sie sei nur in geringem Maße politikrelevant und würde von den Bürgern kaum wahrgenommen. Die räumliche Planung muss sich nicht selten dem Vorwurf stellen, dass Inhalte und Vorgehensweisen der räumlichen Planung kaum mehr die Lebensverhältnisse der Bürgerinnen und Bürgern beträfen, daher kaum mehr wahrgenommen und vermittelt werden können; des Weiteren, dass sie nur noch in geringem Maße problemlösungsfähig und daher wenig politikrelevant sei (vgl. Krautzberger 1999,23; Zöbel 1999,51f). In dieses Bild passen die Einschnitte in der räumlichen Planung, die in Bayern [88] und Niedersachsen[89] geplant sind bzw. vorgenommen wurden.

Die scheint keine momentane Zeitgeistströmung zu sein oder von den derzeitigen politischen Verhältnissen abzuhängen; schon 1984 fragte Flückiger (1984,51): „Vielleicht setzen wir auf die falsche Politik – angesichts der Aufgaben und Kompetenzteilung im modernen Staat kein untergeordnetes Problem. Vielleicht formulieren wir Konzepte und Leitbilder für Politiken, die real nicht bestehen und für die sich niemand zuständig fühlt; denn von der Kritik fühlt sich nur betroffen, wer sich verantwortlich fühlt – wo kein Adressat ist, wird es auch keine Resonanz geben."

Daher wurde bei der Bearbeitung des Forschungsprojekts "Flächenmanagement durch innovative Regionalplanung" (FLAIR) im Rahmen des Forschungsprogramms "Reduzierung der Flächeninanspruchnahme und nachhaltiges Flächenmanagement" (REFINA) des BMBF das Prinzip "Probleme-zuerst" zugrunde gelegt, welches unter anderem das Element der so genannten "Testplanungen" enthält. In diesem Aufsatz für den Workshop Flächenmanagement auf der REAL CORP 007 werden die wesentlichen Inhalte und Vorgehensweisen von Testplanungen umrissen.

2 ORGANISATORISCHE RAHMENBEDINGUNGEN

Testplanungen haben einen spezifischen Anwendungsbereich; er liegt besonders in langfristigen, übergeordneten Planungen im Vorfeld formeller Planungen und dient deshalb vor allem der Vorbereitung und Ausrichtung dieser Planungen. Das heißt, Testplanungen sind meist zu aufwändig, wenn es zum Beispiel um Aufgaben geht, für die bereits erprobte Bearbeitungsroutinen existieren. Insofern sind sie eine Ergänzung traditioneller Planungsinstrumente, kein Ersatz.

2.1 Organisatorische Rahmenbedingungen von Testplanungen

Testplanungen erfordern inhaltlich und organisatorisch eine spezifische Art des Vorgehens (vgl. Scholl 2006):

(a) Bei der Durchführung von Testplanungen haben sich temporäre Organisationen ('task forces') bewährt. Dies sind zeitlich begrenzte (wenige Monate bis etwa drei Jahre bestehende) Organisationen, die nur für die Bearbeitung der jeweiligen Planungsaufgabe gebildet werden. Sie werden neben der normalen Verwaltung etabliert, die ihrerseits meist keine ausreichenden Ressourcen für solche Planungsaufgaben hat.

(b) Die Akteure treffen sich regelmäßig (ungestört von Tagesroutinen) zu klausurartigen Sitzungen. Dabei wird die Zahl der vertretenen Hierarchieebenen möglichst reduziert.

88 Auszug aus der Initiative "Verwaltung 21 – Reform für ein modernes Bayern": "Die Landesplanung wird auf das bundesrechtlich notwendige Maß reduziert. Dazu wird das Bayerische Landesplanungsgesetz überarbeitet. Bis Ende 2004 wird ein neues schlankes Landesentwicklungsprogramm aufgestellt. Die Regionalen Planungsverbände werden in ihrer bisherigen Struktur abgeschafft. Ziel ist die radikale Vereinfachung der Regionalplanung." (Bayerische Staatskanzlei 28. Juni 2004) In einem ersten Schritt wurde die Landesplanung aus dem ehemaligen Staatsministerium für Landesentwicklung und Umweltfragen herausgelöst und in das Bayerische Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie eingegliedert. Eine Abschaffung der Regionalen Planungsverbände hat bisher nicht stattgefunden; das Landesentwicklungsprogramm wird derzeit in einem um ca. 40% reduziertem Umfang fortgeschrieben.

89 In Niedersachsen wurden Ende 2004 die Bezirksregierungen abgeschafft. Wie die Koordination innerhalb der in Niedersachsen ohnehin stark kommunalisierte Regionalplanung in Zukunft betrieben werden soll, bleibt dabei vorerst offen.

(c) In dem Leitungsgremium, das mehrheitlich aus unabhängigen Experten besteht, werden die anstehenden Themen in Rede und Gegenrede diskutiert.

(d) Organisatorisch lässt sich das Vorgehen nicht von vornherein in allen Einzelheiten festlegen, sondern muss flexibel gestaltet werden. Es kommt darauf an, Beweglichkeit für die Behandlung überraschend auftauchender Probleme zu behalten, hierzu sind vor allem ausreichende zeitliche Reserven vorzusehen.

(e) Zweckmäßig ist, den kontrollierten Abbruch des Planungsverfahrens (als "Sollbruchstellen") vorzusehen, falls sich die Planungsaufgabe als undurchführbar erweisen sollte.

2.2 Wesentliche Arbeitsschritte bei Testplanungen

Planer sollten eine klare Vorstellungen darüber haben, welche inhaltlichen Aufgabenstellungen im Rahmen des jeweiligen Planungsprozesses abzuarbeiten sind. Damit geht diese Art der Planung über die bloße Moderation eines Planungsprozesses (als Organisation eines Kommunikationsprozesses ohne inhaltliche Vorgaben von Seiten der Planer) hinaus.

Da ein solcher Planungsprozess anfangs nach aller Erfahrung sehr schnell dazu führt, dass man es mit zahllosen sehr unterschiedlichen Problemformulierungen - einem "Problemknäuel" - zu tun hat, haben sich folgende Arbeitsschritte bewährt:

(a) Erkundung raumbedeutsamer Konflikte

Aufgabe dieses Arbeitschrittes ist, die Absichten der Akteure und die daraus resultierenden raumbedeutsamen Probleme beziehungsweise Konflikte herauszuarbeiten. Dabei sind komplexe Probleme meist nicht im ersten Anlauf perfekt dingfest zu machen; es ist vielmehr ein "Herantasten" an die Probleme. Fast immer braucht es dazu mehrere (mitunter bis zu drei) Durchgänge, die Zeit beanspruchen. Dabei ist dafür zu sorgen, dass sich eine gemeinsame Wahrnehmung der jeweils unterschiedlichen Interessen aus den verschiedenen Blickwinkeln herausbildet; beispielsweise denken Planer, Politiker und Betriebswirte fast immer in sehr unterschiedlichen Zeithorizonten. Der Prozess der sozialen Konstruktion (des "Er-diskutierens") der verschiedenen Problemsichten, das heißt, die Klärung beziehungsweise Definition der Probleme - als "schwierige raumbedeutsame Fragen" - aus den unterschiedlichen Perspektiven muss zum Bestandteil der Planung gemacht werden. Komplexe Probleme sollten dabei als solche akzeptiert werden - "so einfach wie möglich, aber nicht einfacher". Komplexität verschwindet nicht durch Ignorieren. Dazu sind die wichtigen Akteure "an einen Tisch zu bringen". In der Folge wird fast immer deutlich, dass es nicht nur "eine richtige" Problemdefinition und damit kein "Wahrheitsmonopol" gibt.

Um einen solchen Prozess kompetent leiten zu können, sollten die Planer mit den wechselseitigen inhaltlich-methodischen Abhängigkeiten beispielsweise von Problemdefinitionen, Problemrückverschiebungen[90], Begriffsdefinitionen, Ursachenzuschreibungen, zugrunde liegenden Planungsansätzen, Einflüssen der aktuellen politischen Agenda etc. vertraut sein (für Details vgl. Grunau und Schönwandt 2002).

Das heißt, neben der Erkundung raumbedeutsamer Konflikte geht es in diesem Arbeitsschritt auch darum, die Absichten, Interessen und Bindungen der Akteure frühzeitig einzubeziehen und den Beteiligten zu vermitteln.

(b) Erarbeitung von Problem-Übersichten

In diesem Arbeitsschritt sind geeignete Übersichten über räumliche Konflikte zu erstellen. Sie lassen sich meist in knapper Form zusammenführen. Dabei ist sowohl auf eine Vollständigkeit (so weit wie möglich) dieser Übersichten, als auch auf zeitliche Verläufe (Chronogramme) unterschiedlicher Problemstellungen zu achten. Raumbezogene Darstellungen in Karten, Plänen und Luftbildern erleichtern die Übersicht und sollten durch quantitative Abschätzungen der Gegebenheiten (Daten zum Status Quo und Prognosen) ergänzt werden.

(c) Periodische Lagebeurteilung

Periodische Lagebeurteilungen dienen dazu, die Arbeitsergebnisse zu überprüfen, die dafür bedeutsamen Informationen zu klären sowie festzulegen, auf welche Schwerpunkte man sich in der nächsten Periode

90 Beispiel einer Problemrückverschiebung: Bis Anfang der 1980er Jahre war eines der Probleme deutscher Kommunen, einen geeigneten Standort für eine Mülldeponie und/oder eine Müllverbrennungsanlage zu finden. Danach wurde das Problem meist dahingehend rückverschoben, dass nicht (primär) ein Standort für eine Mülldeponie und/oder Müllverbrennungsanlage zu finden ist, sondern die Frage "Wie kann das Müllaufkommen insgesamt reduziert werden?" beantwortet werden muss.

beziehungsweise dem nächsten Arbeitsschritt konzentrieren will. Dadurch können die Arbeitsergebnisse frühzeitig überprüft sowie die eigenen Mittel und Möglichkeiten zur Umsetzung der Strategie eingeschätzt werden.

(d) Ausarbeitung von Strategien

In diesem Arbeitsschritt werden gemeinsam mit den Akteuren Strategien erarbeitet. Strategien sind keine "finalen Pläne" sondern "Direktiven". Sie beinhalten eine zweckmäßige Abfolge von Entscheidungen beziehungsweise Handlungen und nicht nur eine Entscheidung. Um mit Überraschungen und Risiken umgehen zu können, erfordern solche Strategien "robuste" Lösungen, die Toleranz für nicht vorhersehbare Inhalte und Entwicklungen aufweisen und schrittweise realisierbar sind. Es geht mehr um das "Lenken in eine gewünschte Richtung", nicht um eine punktgenaue Steuerung und Kontrolle, nicht darum, die "einzig richtige" Lösung zu haben oder gar Probleme abschließend zu lösen ("Kontrollmythos"). Strategien entstehen meist aus mehrmaligen Versuchen, ein Problem zu lösen.

Damit die Strategien auch von möglichst vielen Akteuren akzeptiert und umgesetzt werden, kommt es unter anderem darauf an, dass gemeinsame Interessen verwirklicht werden. Schließlich gibt es fast immer eine Teilmenge gleichgerichteter Interessen, die als Anknüpfungspunkte für abgestimmte Handlungen dienen können.

Es ist zudem darauf zu achten, dass Ideen- und keine Statuswettbewerbe stattfinden (Statuswettbewerb: wer muss sich von wem was sagen lassen?). Außerdem ist fast immer auf aufgabenfremde Motive einzugehen (zum Beispiel Sachziele versus Schutzziele).

(e) Schwerpunktsetzung

Begrenzte Ressourcen erfordern fast immer inhaltliche Schwerpunktsetzungen, auf die sich die Arbeitsgruppe einigen muss. Ansatzpunkte hierfür ergeben sich in der Regel aus den in den vorangegangenen Arbeitsschritten erarbeiteten Planungsinhalten.

(f) Ablauf Testplanungen

Diese Erarbeitung und Tests geeigneter Strategien wird an externe Planungsbüros vergeben. Je drei Teams werden parallel in kreativer "Denk-Konkurrenz" auf die Planungsaufgabe angesetzt und in einem Wettbewerb der Ideen dazu angehalten, unterschiedliche Lösungswege auf ihre Brauchbarkeit hin auszuloten bzw. auszutesten. Der Grund dafür, mehrere Teams einzusetzen, ist, dass innerhalb einer Gruppe unterschiedliche Alternativen fast nie mit gleicher Intensität verfolgt werden. Ein solcher Wettbewerb der Ideen ermöglicht fast immer tragfähigere Lösungen als dies bei den bisher üblichen Verfahren der Fall ist.

Begleitet beziehungsweise beurteilt werden diese Teams durch eine Kontaktgruppe und ein Leitungsgremium. Dem Leitungsgremium obliegt die fachliche Begleitung der Testplanungen sowie die Erarbeitung der Handlungsempfehlungen.

Der Ablauf besteht in der Regel aus insgesamt vier Werkstattgesprächen: einer Eröffnungsveranstaltung, in welcher die Problemübersichten dargestellt werden, sowie zweier Zwischen- und einer Endpräsentation. Die Kontaktgruppe und das Leitungsgremium geben bei diesen Werkstattgesprächen fachliches Feedback und können anhand der Zwischenergebnisse Festlegungen für weitere Überarbeitungen und Vertiefungen treffen.

Die Leitungsgruppe entwickelt in klausurartiger Sitzung die Handlungsempfehlungen auf Basis der Ergebnisse der einzelnen Teams.

(g) Implementationswerkstatt

Die in den Testplanungen erarbeiteten Strategien werden aller Voraussicht nach nicht direkt in Handlung umsetzbar sein, da einige Maßnahmen oder Maßnahmenbündel politisch nicht durchsetzungsfähig sind. Von daher sollten "Implementations-Werkstätten" mit Mandatsträgern des Plangebietes durchgeführt werden. Die Chancen, Möglichkeiten und notwendigen Modifikationen der vorgeschlagenen Maßnahmen sollen hierdurch ausgelotet werden. Dadurch wird ein geeigneter Instrumentenmix erarbeitet.

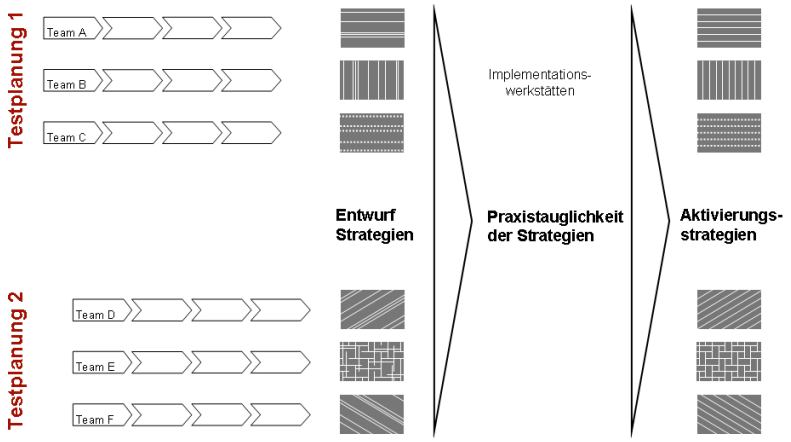

Abbildung 1: Schematischer Ablauf Testplanungen im Forschungsprojekt FLAIR (Quelle: eigene Darstellung)

3 ANWENDUNG VON TESTPLANUNGEN BEIM FLÄCHENMANAGEMENT

Bezüglich des Flächenmanagements gibt es eine Reihe von Herangehensweisen, wie die Siedlungs- und Verkehrsentwicklung und damit die auch die Flächeninanspruchnahme gesteuert werden kann. Planerische Maßnahmen zielen vor allem auf die Mengenreduktion der Flächeninanspruchnahme (Quantitätsziel), Standortsteuerung im Sinne einer dezentralen Konzentration (räumliches Verteilungsziel) und die Reduzierung der Flächeninanspruchnahme durch Innenentwicklung bzw. Lenkung der Bebauung auf Flächen geringerer ökologischer Qualität (Qualitätsziel) (vgl. Müller et al. 2002). Die meisten dieser Herangehensweisen scheinen jedoch nur geringe Erfolge aufweisen zu können.

Daher wird im Forschungsprojekt "Flächenmanagement durch innovative Regionalplanung" (FLAIR) im Rahmen des Forschungsprogramms "Reduzierung der Flächeninanspruchnahme und nachhaltiges Flächenmanagement" (REFINA) des BMBF ein Planungsansatz nach dem "problems first" verfolgt. Zu Beginn werden die Gründe identifiziert, warum bisherige Steuerungsversuche fehlschlugen. Gleichzeitig sollen die raumbedeutsamen Konflikte herausgearbeitet werden, die mitursächlich für ein solches Steuerungsdefizit sind. Dies wird exemplarisch für die Region Südlicher Oberrhein durchgeführt.

Das heißt, in FLAIR wird nicht eine flächenbezogene Herangehensweise verfolgt, sondern Startpunkt ist eine möglichst adäquate Beschreibung der Probleme, bzw. Problemsichten, auf deren Basis keine finalen Pläne, sondern Strategien der Flächensteuerung erarbeitet werden. Die Ausarbeitung dieser Strategien erfolgt über Testplanungen.

Eines der Hemmnisse bzw. Probleme, die identifiziert wurden, ist, dass innerörtliche Potenzialflächen nicht ausreichend aktiviert werden können. "Innenentwicklung vor Außenentwicklung" ist eines der Schlagworte der Raumplanung bezüglich der Flächeninanspruchnahme und so gut wie alle politischen und gesellschaftlichen Kreise können sich hierzu bekennen. Vor die eigene Wahl gestellt, entscheiden sich viele dennoch für den Außenbereich, da dieser attraktiver, leichter zu entwickeln, mit weniger Risiko behaftet usw. scheint. Es bestehen also zahlreiche, oft nicht offenkundige Hemmnisse, die diesem Leitsatz entgegenstehen und damit auch eine Reduzierung der Flächeninanspruchnahme hemmen.

Die Testplanungsteams werden mit der Identifikation von Hemmnissen für Innenentwicklungsvorhaben beauftragt und sollen Vorschläge erarbeiten, mit welchen Impulsen die Innenentwicklung gefördert werden kann. Verschiedene Akteure werden dabei in die Betrachtung einbezogen, um den Suchradius nicht auf wenige –und nicht nur staatliche– Akteure einzuschränken:

(1) die Entscheidungsträger: Gemeinderäte / Bürgermeister vor Ort

(2) Privatpersonen ("der Häuslebauer")

(3) Unternehmen, Banken, Bauunternehmer, Projektträger

Aufgrund des verfolgten Ansatzes "problems first" und den damit verbunden Testplanungen wird erwartet, dass ein flächenbezogener Lösungsansatz nicht ausreichen wird. Vielmehr müssen darüber hinaus weitere Eingriffsweisen betrachtet werden, die der räumlichen Planung zur Verfügung stehen, jedoch zumeist nicht ausreichend beachtet werden. Der räumlichen Planung stehen Eingriffsweisen zur Verfügung, die sich folgendermaßen differenzieren lassen (vgl. Heidemann 2002):

(1) das Ausweisen von Standorten (z.B. Gewerbe- oder Wohngebiete, aber auch Frei- und Grünflächen etc.),

(2) die Errichtung von Anlagen (z. B. Häuser, Parks, Straßen),

(3) die Steuerung der Organisationen, die in diesen Anlagen operieren (z.B. Unternehmen, Verbände, öffentliche Institutionen),

(4) die Beeinflussung der Verhaltensweisen auf diesen Flächen und in diesen Anlagen (z.B. Verkehrsverhalten: Nutzung öffentlicher Verkehrsmittel oder Individualverkehr, Standortentscheidungen, Bevorzugung von Ein- oder Mehrfamilienhäusern usw.).

Raumplaner konzentrieren sich dabei vor allem auf die Eingriffsart (1): sie bedienen sich der Regional-, Flächennutzungs- oder Bebauungspläne, um Flächen auszuweisen, das heißt Flächen eine bestimmte Nutzung zuzuschreiben. Hierzu dienen die "gängigen" Instrumente der räumlichen Planung: Zentrale Orte, Achsen, Vorrang- und Vorbehaltsflächen, Grünzüge, aber auch Bauleitpläne. Die Errichtung von Anlagen, die Eingriffsart (2), ist häufig die klassische Aufgabe von Architekten. Dass bestimmte Berufe für sie typische Aufgaben haben, ist mit ein Grund, warum räumliche Planung zumeist unter den Aspekten der Punkte (1) und (2) behandelt wird: der Ausweisung von Standorten sowie der Errichtung von Gebäuden. Die Steuerung der Organisationen (3) und die Beeinflussung der Verhaltensweisen (4) als Eingriffsarten der räumlichen Planung werden hingegen weitgehend vernachlässigt.

Diese haben jedoch ebenso erheblichen Einfluss auf den Raum: Standortentscheidungen, verkehrliche Entscheidungen, Nutzung der Umwelt etc. basieren auf den Verhaltensweisen dieser Organisationen und Personen. Mit den Eingriffsarten (3) und (4) weitet sich die Arena der Akteure über die klassischen Planadressaten hinaus; es stehen nicht mehr nur öffentliche Adressaten im Blickpunkt, sondern auch öffentliche wie private Nutzer der Flächen oder Anlagen.

Von den Teams, welche mit den beiden Testplanungen beauftragt werden, wird erwartet, dass sie das Spektrum möglicher Lösungen über flächenbezogene Eingriffsweisen hinaus erweitern und auch die Steuerung der Organisationen sowie die Beeinflussung der Verhaltensweisen mit ins Kalkül ziehen, geht es darum, innovative Strategien zur Aktivierung von Flächenpotenzialen zu erarbeiten.

4 FAZIT

Flächenmanagement und die damit verbundene Aktivierung von Potenzialflächen stellen die räumliche Planung vor eine große Herausforderung, die bisher noch nicht ausreichend gelöst werden konnte. Um die damit verbundenen Ziele zu erreichen, müssen innovative Wege beschritten werden und die räumliche Planung strategischer ausgerichtet werden.

"Umsetzbare und konsensfähige Lösungen lassen sich mit Testplanungen in Konkurrenz entwerfen und im Dialog mit geeigneten Organisationsformen – zumeist Ad-hoc-Organisationen – weiter entwickeln und umsetzen. Die vorhandenen Instrumente lassen sich auf dieser Basis problemorientierter und gezielter einsetzen. "Probleme-zuerst" hilft der Raumplanung, ihre Bedeutung wiederzugewinnen und zum Erfolg zu kommen." (Bächtold 2006,55)

Insofern sind Testplanungen eine sinnvolle Ergänzung traditioneller Planungsinstrumente, insbesondere für komplexere Aufgabenstellungen, jedoch kein Ersatz.

5 LITERATUR

BÄCHTOLD, H.G.: Probleme zuerst – Fallbeispiele aus dem Kanton Basel-Landschaft; in: Schönwandt und Jung 2006, 48-55

BAYERISCHE STAATSKANZLEI : Verwaltung 21 – Reform für ein modernes Bayern. Internet: http://www.bayern.de/Politik/Initiativen/ Verwaltung21/Staatsaufgaben/; 10.41, 28.06.2004

FLÜCKIGER, H.: Räumliche Entwicklung und gesamtstaatliche Raumordnung. Ein Vergleich zwischen Nachbarstaaten. Möglichkeiten und Grenzen gesamtstaatlicher Raumordnung in der Schweiz; in: Österreichisches Institut für Raumplanung (Hrsg.): Räumliche Entwicklung und gesamtstaatliche Raumordnung: ein Vergleich zwischen der BRD, Österreich und der Schweiz. - Wien : Österreichisches Institut für Raumplanung (Schriftenreihe des Österreichischen Instituts für Raumplanung), 1984

GRUNAU, J.; SCHÖNWANDT, W.: Die Entwurfsausbildung als Lehre im Problemlösen. In: Schriftenreihe (Internet) des Instituts für Grundlagen der Planung, Universität Stuttgart, 2003

HEIDEMANN, C.: Methodologie der Regionalplanung. Die erste und einzige kommentierte Bilderfibel der Regionalplanung; Karlsruhe: Institut für Regionalwissenschaft, Diskussionspapier Nr. 16, 2002

KRAUTZBERGER, M.: Brauchen wir Raumordnungspolitik?; in: Schmals 1999; 123-130, 1999

MÜLLER, B.; EINIG, K.; SIEDENTOP, S.; REINKE, M.; ZINKE, D.; WEITH, T.; KUJATH, H.-J.; SIENER, M.: Regionales Flächenmanagement: Ansatzpunkte für eine ressourcenschonende Siedlungsentwicklung. Abschlussbericht; Dresden: Erkner, 2002

SCHMALS, K. (Hrsg.): Was ist Raumplanung?; Dortmund: IRPUD (Dortmunder Beiträge zur Raumplanung 89), 1999

SCHOLL, B.: Strategische Planung; In: Akademie für Raumforschung und Landesplanung (ARL) (Hrsg.) 2006: Handwörterbuch der Raumordnung; Hannover: ARL, 1123-1129, 2006

SCHÖNWANDT, W.: Planung in der Krise? Theoretische Orientierungen für Architektur, Stadt- und Raumplanung. Stuttgart: Kohlhammer, 2002

SCHÖNWANDT, W.; JUNG, W.: Ausgewählte Methoden und Instrumente in der räumlichen Planung
Kritische Sondierung als Beitrag zur Diskussion zwischen Planungswissenschaft und -praxis
mit Beiträgen von H.-G. Bächtold, W. Jung, W. Schönwandt, R. Signer, M. van den Berg, R. von der Weth
Arbeitsmaterial der Akademie für Raumforschung und Landesplanung Nr. 326, Hannover: ARL, 2006

SCHÖNWANDT, W.; VOIGT, A.: Planungsansätze; in: Akademie für Raumforschung und Landesplanung (ARL) (Hrsg.): Handwörterbuch der Raumordnung; Hannover: ARL; 769-776, 2005

ZÖBEL, C.: Die politische Relevanz der Raumplanung für unsere Zukunft; in Schmals 1999; 42-57, 1999

Mobile Information System Supporting Decision-Making at Local Government Level

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ABSTRACT

The paper proposes a concept of developing a mobile information system aimed at supporting regional level decision-making by city or region governments.

The above proposed concept's objective is a clarification of approaches to understanding the goals, tasks and principles of developing the mobile information system supporting decision-making by regional leaders.

The major issues considered by the paper are:

- substantiation of the system development urgency;
- discussion of system's development principles;
- determination of information resources and realization of information processing principles: harmonization, integration and fusion;
- determination of system's main functions and structure;
- determination of requirements to the system's information securing;
- forming suggestions for the system's organizational and legal issues;
- identifying stages of the system's development, implementation and exploitation.

As an example the paper considers a version of a mobile information system implementation for a university president. Original GIS technology, standard means of cellular communications and mobile devices were used to realize the above system.

1 INTRODUCTION

One of main tasks of regional governmental organization in modern conditions is providing the urgency of decision-making and approach to information resources.

Quality of management decisions, urgency of decision making depends on urgency, reliability and confidence of information about management and controlled subject.

Most obvious action that would allow to increase efficiency of acting governmental bodies is organizational and technical integration of their resources (technical and information first of all). Resources centralized control will allow optimizing their distribution.

It is required to use modern technologies of the information automated gathering, processing and visualization for decision-making tasks and particularly urgent decision-making. Nowadays it is becoming obvious that for effective management of compound geographically-distributed systems (a city, manufacturing firm or a trading company), increase of their medium-term or long-term stability, it is necessary to use information and automated systems of management, which realize last achievements in science of management.

As a result there appears a real chance to create integrated technical and information resource for general use by state authorities, local government and other systems participating in management of region which will be taken as the ground for automated system supporting decisions-making.

2 MAIN CONCEPTS AND DETERMINATIONS

Modern determinations and supporting systems decision-making (SSDM) originate as the management information and database control systems natural development and course; and represent systems which are adapted to solve management daily tasks. SSDM are tools to assist decisions making persons (DMP). With the help of SSDM they can solve unstructured and semi structured multi-objective tasks.

Under concept of mobile information system support decision-making (MISSDM) we shall consider SSDM of region government authority, that contains mobile component SSDM resource access on the base of communicators, pocket PCs and note-books.

3 SYSTEMS` DEVELOPMENT PRINCIPLES

Main principles for MISSDM development are:

- keeping the existing tools in all organization departments, subdivisions and services
- information and technical subsystems` integration on system and organization-information levels to solve tasks in the interest of region
- the system scalability support – adaptation to different use conditions; functional capabilities upgrade
- providing information security on all system levels in accordance with the information category
- systems` creation and implementation in stages

4 INFORMATION PROCESSING METHODS

By objects of MISSDM management we consider totality of objects controlled, that can be population, the region infrastructure bodies, environmental objects, economical activity objects, including all sources participating in providing security and vital activity.

Essential information needed for taking management decisions are:

- confidence information of the management objects` current state (location)
- critical data, defining the management objects` state
- archive database of the management objects
- forecasting information (got as the result of archival database processing with use of simulators) about tendencies and prospects of the objects` and processes` state changes
- information systems reference data (maps, cadastres, registers etc)
- other information systems` data

There appears a task of possible data source grouping on conceptual level, in conditions of the information resources plurality and variety, used in decision taking process.

In this paper it is offered to emphasize three groups or three types of data: harmonized, integrated and fused. Such grouping is of certain sense to understand the following determinations in the data usage and reforming processes:

- Defining the data type (measured, refined, extrapolated and/or interpolated data and etc.)
- defining the data source, quality and trust level to it
- possibility of data use to solve specific tasks
- possibility of data further conversion (the integrated data isomorphic conversions are, as a rule, impossible)

List above is not irrefragable at all, but allows explaining the idea or aim of the data conceptual decomposition.

The Information harmonization solves tasks below:

- providing access for great quantity of data proto-sources
- possibility to reform information into one comfortable for user (decoding, identification, translation, etc)
- Providing access to existing information resources

As a rule, information integration is determined by necessity of operating huge quantity of data in true (or closed to true) time scale.

- Date access is accomplished with use of different devices and depends on some points:
- required data-rate (true time or might be a certain delay)
- necessity of the data parallel processing and/or visualization

Depending on points listed above, data access is provided in layout which this data is kept in. But, frequently, data temporary conversion is needed, as data integrated in this layout is much more comfortable for further processing than simply harmonized data that is kept in different sources with different speed and access level.

Information fusion – means getting the information new quality (information content decrease).

Serves to achieve aims below:

- information content decrease
- the data reliability and security value increase
- the data stability increase (bug-fix)

The information fusion process distinguishing feature is getting new quality of information and volume decrease.

Thus, information processes` analysis shows that their comprehensive automation is required. Only in this case, a person taking decision will have urgent, reliable and full information and will have possibility of management urgency in time scale corresponding to specific situation.

5 SYSTEMS` FORMATION APPROACH

5.1 MISSDM main functions

For effective support decisions-making MISSDM must provide automation of functions below:

- providing the chiefs with reliable and relevant information, submitted by information resources, technical systems, other data sources
- monitoring in true time of certain objects` state
- data accumulating and storage for further usage
- analysis, forecasting, modeling and other types of the data intellectual processing
- events and reaction positioning with use of geographic information system (GIS)
- providing controlled access to MISSDM information resources for slave structures control
- providing MISSDM-users by information resources management and display common interface
- providing users` common centralized authentication and access hierarchy support with priority system
- reporting about the users` actions and system state in general

System functionality shown above will provide urgency decisions-making support.

As MISSDM combines the resources of manifold geographically-distributed information and technical systems with different departmental and industrial tenancy, functions should also include the following:

- providing the information secure and information resources protection in system
- providing information integrity and consistency in system
- providing user's individual rights mode
- providing system resources centralized access control

5.2 MISSDM generalized structure

MISSDM generalized structure is shown on Fig.1

The main factor defining MISSDM elements` content and their interconnection is the system required functionality. In accordance with list of required functions MISSDM should provide to solve tasks on

information data ware for regional governmental authority governing body system should also include following functional elements.

1. Totality of functional systems that are the MISSDM information proto source (local devices – LD):

- Systems providing objects` and processes monitoring (monitor , remote sensing, video-control systems , etc.)
- systems for getting information from inhabitants
- Information systems including ones containing reference data (cadastre, registers, reference-books, classifiers, etc.)

2. Rated-analytical systems providing information processing using specified algorithm.

3. Access control system providing user rights centralized assignment for system information resources use.

4. Information security providing system that is fulfilling Russian Federation statutory acts and legislation domain of confidential information secure during its automotive processing and transmission on communicative channels.

5. Integrated subsystems:

- integrated net combining MISSDM elements into one information space, and providing users information availability within the authorized rights;
- inter-action modules, that are realizing service oriented technologies of system elements and user united interface
- information sources metadata

6. Mobile terminal equipment providing information receipt, predetermined concept and display.

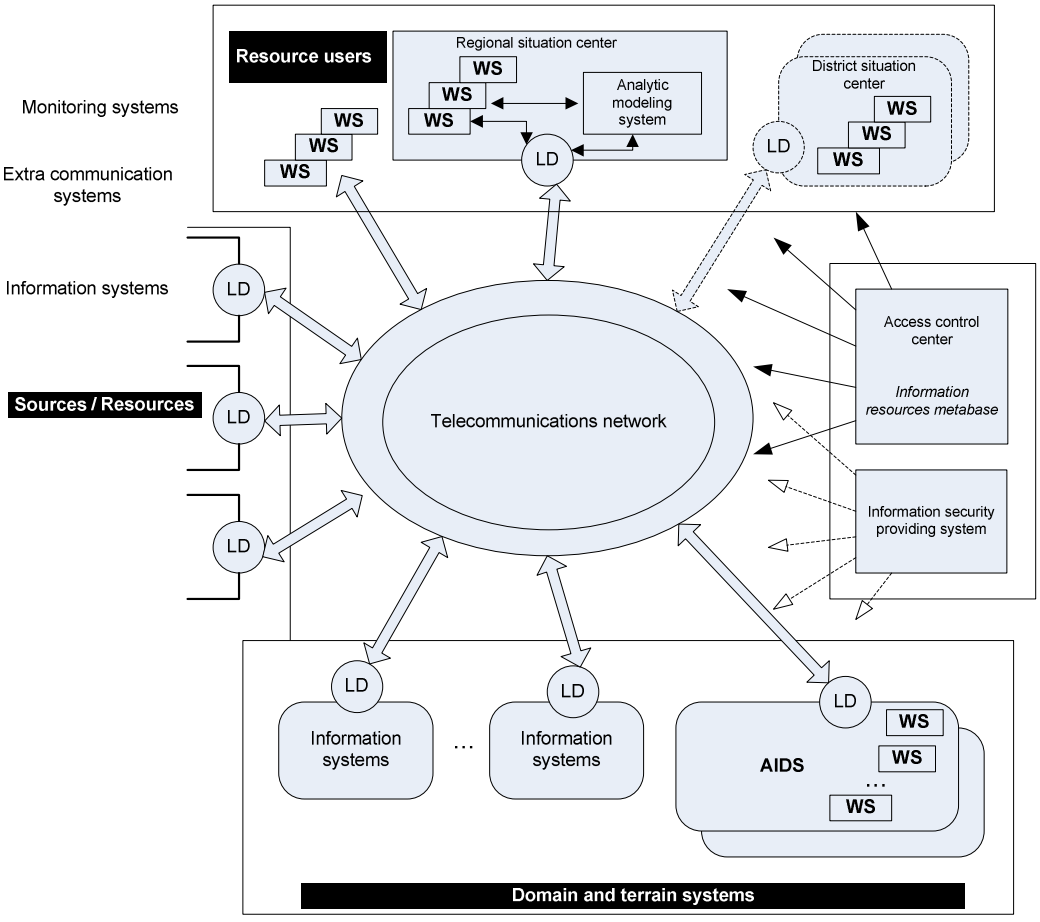

Fig.1. MISSDT generalized structure.

5.3 Providing information security in MISSDM

Main principles of MISSDM unauthorized access protection system formation are:

- consistency and complexity
- implementation simplicity and flexibility
- reasonable sufficiency
- rights minimization
- control availability

5.3.1 Consistency and complexity

Consistency principle implies necessity to record all factors influencing the MISSDTM protect ability during MISSDM designing, planning, implantation and operation.

The system complexity implies combination and coordinated use of organizational measures and engineering-technical tools (including software and hardware) within single protection system limits.

5.3.2 Implementation simplicity and flexibility

Simplicity principle means that used measures and tools must be clear and simple for use. Protection system existence should not, if possible, impede the MISSDM users` work.

Protection system flexibility means preferable use of the protection measures and tools which are providing wide abilities in setting and consistency with used MISSDM software.

On the whole, this principle means that protection system should not significantly worsen the MISSDM functional characteristics (reliability, processing speed, ability of configuration change).

5.3.3 Reasonable sufficiency

Practice of the local and foreign automated systems use shows that it is impossible to generate ideal protection system. Having enough time and tools any protection can be broken. Besides, generation and support of protection system in working condition require human and technical resources (as more as high is provided security).

Thus, you should choose the protection level to optimize correlation of risk, possible losses size and required costs.

5.3.4 Rights minimization

Each employee from MISSDM service and operating staff should have minimal authority for information access and processing. At the same time, this authority should be enough fro the employee to fulfill its official duties.

5.3.5 Control availability

This principle implies the necessity of special ways and tools creation to prevent unauthorized interference attempts into the protection tools operation on one side, and necessity to develop measures for discussed tools operational capability and posedness control on the other side.

To separate access and control rights for system resources use within information space limits, it is generated a system of a user single authentication and authorization, taking into account all hierarchical priorities, and report recording of the MISSDM information resources use.

Single authentication, authorization and report recording system allows to:

- authenticate system users
- authorize users taking into account their hierarchical priorities
- connect new users to system resources according to predetermined regulations and change rights of the existing ones, including formation of groups with similar access rights
- Get report on the MISSDT resources use and users` operation

6 PRACTICAL EXAMPLE OF MISSDM CREATION

We have created MISSDM prototype for Actrakhan State University.

MISSDM prototype solves the following tasks:

- information and analytical support of the university economical activity
- information and analytical support of the staff management activity
- information and analytical support of curriculum process management
- Geographic spatial orientation with connection to global positioning system

The MISSDM software consists of server and clients parts,

Server part includes following software components:

- university staff, students and economical activity database
- management system of the database mentioned above
- Microsoft .Net Framework 2.0 –basic platform to run programs of MISSDM server part.
- Web-service AspuRectorWS, including sampling components and preliminary processing of data from databases above.
- Internet Information Services components, on the base of which Web service AspuRectorWS is being developed;
- AspuDBManager – MISSDM server part setting program
- AspuDS – library for general program elements, being used by Web service and server part setting program
- The MISSDM server part is located at the university Internet-server with published domain-name and IP-address.

The MISSDM clients` part consists of following program components:

- local database of university staff, students and economical activity
- local database description XML schedules
- local database management system Microsoft SQL server Mobile;
- Microsoft .Net Compact Framework 2.0 – basic ground to run programs of the MISSDM clients part
- RectorLib – libraries of MISSDM range;
- RectorCE – Pocket PC of MISSDM version;

The MISSDM clients` part is installed on pocket PC (Fig. 2).

7 CONCLUSION

Nowadays, within the federal program “Electronic Russia” they have foreseen measures to increase the society information, increase of information resources, improvement of their control. For obvious effect there are needed corresponding measures in Russian Federation regions and agents.

SSDM for regional governmental body should solve tasks of grouping different database on conceptual level. In this paper we have observed main methods of the information processing and offered a way to create mobile SSDM.

Prototype of mobile information system support taking-decision was created on the base of the approach offered (for Astrakhan State University)

Fig.2. MISSDM client's part.

8 REFERENCES

1. Popovich V.V. Harmonizing integration and fusion of the data. 2nd International Workshop : IF&GIS-05. SPb, "Anatolya" 2005, 152-158. ISBN 5-7452-0071-5
2. Sorokin R.P., Ivakin Y.A. Use of artificial intelligence methods and tools in geographic information systems. 2nd International Workshop : IF&GIS-05. SPb, "Anatolya" 2005, 152-158. ISBN 5-7452-0071-5
3. Popovich, Korolkov, Rastorguyev Support of the decisions making on the base of GIS Moscow, 2003, cc.46-51
4. Sorokin, R :Intelligent Geoinformation Systems for Modelling and Simulation; The International Workshop on Harbor, Maritime and Multimodal Logistics Modelling & Simulation (HMS-2003) Riga, Latvia, 2003, p.395-398
5. Kristine Asch, Boyan Brodaric, and etc. An International Initiative for Data Harmonization in Geology. //10th EC-GI&GIS Workshop, Abstracts, Warsaw, 23-25 June,2004, p.9.
6. E., Blasch, "Fundamentals of Information Fusion and Applications", Tutorial, TD2, Fusion 2002.
7. Mahler, R.: The Levels 2,3,4 Fusion Challenge: Fundamental Statistics. Fusion 2004, Stockholm, 2004. Proceedings, vol.1, p.p.535-536
8. Vorontsov A.A., Vorontsov A. A., JukovY.N., Fyodorova. Hydrometeorlogic information generalization in GIS. 6th edition, http://www.oceaninfo.ru/news/news6.htm, 2001.
9. Nogenkova L.F. Expert geographic information systems for preventing force-major circumstances. 1999, Part. 4. Special edition. c.111-118.

Social innovation in urban revitalization – it might be a new experience

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1 THE CHALLENGE

Urban revitalization has been on the planning agenda in Europe for many decades. But what is the state-of-the-art? The URBAN Community Initiatives seem to be fairly representative. Between 1994 and 2006:

- 190 programs (urban areas) have been selected in the 15 EU member states
- targeting 5.2 million inhabitants
- with € 1.6 billion of funding allocated
- and a total investment of € 3.38 billion.

Starting from the diagnosis of multiple deprivation, the EU has advocated an integrated area approach with citizen participation. One may question the real impact of URBAN [1], but its rationale or basic philosophy is still convincing. Reading the evaluation report [2], however, one is left with the feeling that the evaluators (maybe 'straitjacketed' by the methodology prescribed by the European Commission) lack the discernment and understanding with which to penetrate the heart and essence of the problem. How can one, for example, explain that the evaluators have not in any way signalized the 'explosive' situation in the French suburbs. After all, the 'riotous' or 'revolting' Clichy-sous-Bois and Aulnay-sous-Bois (among others) have been among the 'troubled' urban areas selected for URBAN [3]. This is not to imply that 'sensitive' areas are exclusively a French phenomenon [4]. Violent outbursts only underline the urgency of the problem. The problem of multiple deprivation or social exclusion also exist without them.

URBAN intended to organize citizen participation in the development and implementation of programs. The individuals affected by severe deprivation were not to be treated as passive objects of intervention. The problem of urban deprivation was supposed to be tackled 'at grass root level'. It is not only the French experience that casts serious doubts on effective citizen participation within URBAN [5].

Urban revitalization or regeneration is not only a matter of land use, built environment or social housing and planning, certainly, is not enough. New ideas are needed.

Social problems such as multiple deprivation ask for social innovations. The latter, unlike technological innovations, are not necessarily commercially successful as they are oriented toward the general interest. Even if cities often view themselves as competing with each other, their 'success' is rather to be measured in terms of social sustainability or social cohesion [6]. 'Success' is not only to be measured in terms of competitive economic and built environment outcomes, but rather to be evaluated in terms of social benefits and costs and their distribution. Social innovations are called for whenever the market fails in achieving distributive justice.

'The solution of social problems lags behind technology because we have not organized the same sharp search for new ideas' [7].

2 A SEARCH FOR NEW IDEAS

Ten cases have been selected for study ranging from Europe to the Americas and the Middle East [8]. They are diverse for a reason: there is hardly a royal road to social innovation in urban revitalization: as a form of territorial social innovation. In fact, all one can hope for is to find good practice. Of course, bad practice can also be informative, enlightening and instructive. Anyway, a framework is needed for analysis and evaluation. Here are the ingredients of such a framework:

- Innovations imply changes. What is the object of change? How tangible is it? Is it procedural, organizational, institutional? Is it a new or improved product or service? Or is it a technology?
- What is the objective to be achieved? One could answer this question by lofty goals such as 'the greatest happiness of the greatest number' or 'to make the worst off as well off as possible'. More down to earth, it needs to be specified what present problem is supposed to be solved; what future

problems are to be prevented; or what aspirations exist for the future. In order to identify whose objectives these are, on must take a closer look at the process.

- Who are the actors or agents of change initiating the search for new ideas? They may belong to the public sector, the private sector or to social movements (the organized civil society). Actors may also represent wider geographical scales beyond the local level. This can affect the mobilization of means, too.
- Successful social innovations by definition are accepted socially. Hence the importance of users and their active participation in the process. At what stage do the users come in: becoming aware of and defining the problem, creation, implementation, evaluation? Participation in the innovation process turns users into actors.
- What means are mobilized by public, private and civil actors to achieve the objectives? The resources deployed can be financial ones, but also resources in kind. Means may also include less tangible elements such as influence or solidarity. The question is how actors, objectives and means are interconnected in some kind of stakeholder analysis.
- The proof of the pudding, that is to say the process is in the results: to be checked against the objectives and expressed in terms of objects.
- If the overall balance of results is positive, the label of good practice can be attributed to
- The case under study. Good practice may be transferable to other places – provided it
- matches or can be adapted to a different context.
- The final key word here is context. The diversity of the cases makes for a diversity of contexts. Trying to identify contextual variables, one can look at factors constraining the innovation process such as complexity, uncertainty, resistance, tensions, compromise or institutional rigidity. Applying, for example a social actor analysis, constraints can result from power, interests and legitimacy.

A full analysis of all cases is beyond the scope of this paper. Only one case will be presented in full. The others will only be highlighted.

Let us start with Montreal, the case that served as a source of inspiration for the entire study [9].

2.1 Local development as social innovation (Montreal)

2.1.1 Object of change

Two marginalized districts of Montreal: Canal Lachine Zone & Angus Technopole

2.1.2 Objective

Socio-economic conversion (to the new knowledge-based economy with special emphasis on employment

2.1.3 Actors or agents (mainly Angus)

• CEDCs (Community Economic Development Corporations) to promote the partnership of actors in the district plus RESO in the case of Lachine and SDA in the case of Angus, an autonomous organization (local representatives & powerful financial partners such as Fondaction, a union retirement fund)

- Trade unions (FTQ, CSN)
- Canadian Pacific Railway (CP) favoring an other development project at the outset: housing versus socio-economic conversion
- City, provincial & federal governments
- Outside organizations (Angus): UQAM (university), SNC-Lavalin, Fondaction, Investissement Québec, Pricewaterhouse Coopers, Ecole Polytechnique etc

2.1.4 Means

- Land ownership SDA (land bought from Canadian Pacific Railway)
- Retirement fund trade unions

- Government financial support e.g. fiscal advantages obtained from the provincial government
- Other support from outside organizations such as universities

2.1.5 Results

- Construction of six buildings (including an industrial mall & a building specialized in social economy businesses): housing 30 companies creating more than 800 jobs
- Creation of two companies to assist in labor market reintegration (integrated environmental training and computer recycling center & wood recycling shop)

2.1.6 Good practice

- Positive results thanks to a successful 'third sector' approach: social enterprises, private
- firms and public sector initiatives – beyond a pure local dimension

2.1.7 Positive context

- Extended local dimension
- Financial commitment of trade unions to urban regeneration

2.2 The Eldonian Village (Liverpool)

The case of Liverpool [10] shares with Montreal the emphasis on employment (eroding in Liverpool and in the Merseyside region) together with strong local partnership. But the circumstances in Liverpool at the outset were certainly less favorable lacking the many supporting actors in the Quebec case. In Montreal, the Angus Technopole project was only contested, at the outset, by Canadian Pacific Railway. The inner city neighborhood in the area of Eldon Street had been scheduled for demolition making way for industrial redevelopment: rehousing the residents individually in peripheral housing estates. This plan however was successfully contested by the residents. Several rounds of conflict were fought with the municipality. Local partnership and leadership got organized under the umbrella of the newly created Urban Development Corporation for Merseyside. An Eldonian housing cooperative acted as prime mover followed by a body with a broader economic and social redevelopment remit. The overarching body, however, is the so-called Eldonian Community Trust, a charity which is fully representative of the local community. The community has created the Eldonian Village. Its portfolio comprises, among others: a residential care home for the elderly; an extra-care facility; a 50-place nursery ; a sports and leisure center; a meeting place, pub and social venue; a neighborhood warden training, employment and safety service. The Eldonians, in total, employ over 90 staff; operate eight community businesses; have provided over 400 affordable homes; have an asset base of over £ 50 million; have stimulated over £ 100 million of private investment; have an annual turnover of over £ 2 million.

The Eldonians have transformed the physical environment of the area and stabilized its social relations. After some twenty years, the project can rightfully claim to be a case of good practice, a view that is even shared today by Liverpool City Council. The Eldonian project has been nominated for the World Habitat Award 2004. The Eldonians have decided to hand on the good practice, launching the so-called Beyond the Boundaries program both within Liverpool and Merseyside and elsewhere. Moreover, they consider their experiment as a going concern.

2.3 'Bottom up' (Gouda)

The case of Gouda [11], a medium-sized town in the Netherlands differs in many ways both from the Montreal and the Liverpool cases. It is a bottom-up approach at improving in a district in what appears as a constant fight with municipality agencies and municipality-related welfare institutions rather used to a top-down approach. The struggle until 2006 is about recognition and financial support or survival in spite of tangible results thanks to volunteering local residents. In the course of 2006, however, part of the initiatives has been included in neighborhood transformation plans.

The initiative is combined Moroccan-Dutch focusing on relations between Moroccans and Dutch (which is a sensitive issue today in many residential areas in the Netherlands).

Local partnership and leadership in the Eastern district of Gouda has never reached the momentum it has in either Montreal or Liverpool (although limited support has not only been received by the municipality, but also from the neighborhood organization, the local police and various private and privatized parties). Nevertheless, basically the volunteers have succeeded in creating the so-called R&M Activity Center. It provides a number of activities – club, support and leisure – in a former school building in the central part of the district. The center offers the residents a place to meet, to socialize, and to try to get a better understanding of education and work in Dutch society in order to improve opportunities. Apart from the daily and weekly activities, occasional conferences are organized about subjects of interest for the neighborhood as well as meetings to inform about work. Furthermore, a debate about the future of the district has been structured as a design studio in 2003 in which the residents have participated. These extra activities are usually supported by local or national institutions.

The first three cases presented are from developed countries, two of them from revitalizing cities with an industrial tradition, in especial Liverpool, the former 'Port of the Empire'. But what about social innovations in developing countries and what about the similarities between the governance of the struggle against poverty in Europe and the developing world, especially Africa [12]? Our first Third World case is León, Nicaragua [13].

2.4 Urban development and self-help (León)

A plots program initiated by the municipality has been the motor of urban development. This land policy is socially oriented focusing on self-help housing including infrastructure and basis urban services such as water and electricity. Participation and knowledge development go hand in hand especially for low-income households without any alternative on the housing market. The actors involved are, apart from the residents, local businesses and associations. The plots program meets with some resistance from local landowners who refuse to sell land to the municipality and from private developers not in favor of self-help. Public financial means are not sufficient, but additional support has been obtained from NGOs and international city links with Hamburg, Zaragoza and Utrecht (after 2000).

Housing, however, is not enough. The key problem of León's future development is employment. The municipality seeks to extend its policy to land development for economic development. In doing so, it faces an uncertain future.

Are there social innovations geared to job creation in poor countries of which there are so many, not only in Latin America (although Nicaragua is one of the poorest countries).

2.5 Battling the digital divide from the bottom up (Lima)

Our second case from a developing country is Lima [14]. Compared to Leon, its focus is sectoral, that is on ICT. A study of ICT-related transformations in Latin American metropolises provides the context for this case. It is the use of ICT in everyday life where Lima stands out. A high proportion of people is connecting from collective facilities and a high proportion of all Internet users are low income. Informal entrepreneurs have established businesses catering for the large demand for ICT services that cannot be met by conventional home connections, computer hardware and software. The so-called cabinas are already consolidated as facilities in most neighborhoods of Lima.

Cabinas are providing online services to sub-standard neighborhoods. The increased online communication with relatives abroad is alleviating poverty. Finally, processes related to Internet use in cabinas help to counterattack social exclusion with regard to different aspects of urban life, e.g. in public education which unlike private education lacks access to ICT.

The social innovation in the Lima case consists of battling the digital divide bottom up. There may be lessons to be learned for other developing countries or maybe even for developed countries.

2.6 The URBAN Initiative (European Union)

What is the role of the State or central institutions in urban social innovation? To answer this question, three cases have been introduced dealing with the role of the EU, of a state-owned financial institution in France and the role of the State in the Netherlands with regard to spatial development policy.

The URBAN Community Initiative has been presented in section 1. Does the EU qualify as a social innovator when it comes to urban regeneration? Concluding, it can be said that the EU as a facilitator of innovations has not scored positively on all aspects, but it seems to have made a difference in member states without an explicit national urban policy (also with additionality and leverage [15]). Partnership was new and consciousness of social inclusion policies (amidst others) seems to have been raised.

2.7 The CD's Urban Renewal Program (France)

The French example is that of the CDC, the Caisse des Dépôts et Consignations (founded in 1816), and more particularly its Urban Renewal Program [16].

A third of its total earnings is invested as part of so-called public-interest missions such as urban renewal or other local development projects [17]. To help local communities to find innovative solutions to their problems of urban revitalization – thereby reinforcing the social usefulness of CDC's actions – has been one of the strategic goals together with e.g. public-private partnership.

To finance some 100 urban renewal projects over five years, the CDC has mobilized more than € 500 million of its own funds plus a total of about € 4 billion worth of loans out of saving funds.

It should be noted that the CDC is present throughout France through its regional departments. These are networks of local establishments in direct contact with regional authorities and local business partners.

An ex-post evaluation has been carried out for 10 urban renewal projects, representative of the entire program [18]. The selected projects were located in neighborhoods defined as a priority in terms of achieving a better urban and social mix: upgrading of services and development of appropriate urban management; redevelopment of run-down or fragile territories; diversification or better distribution of housing supply and economic activities.

The CDC insists on the necessarily comprehensive dimension of urban renewal projects which is, however, primarily process oriented relating to engineering, and partnership-based governance. The challenge of urban renewal is a broad one as local communities must deal with 'problem neighborhoods' which does involve more than social housing.

The evaluation of the French projects within URBAN has shown that they favored physical & environmental regeneration rather than improvement of socio-economic conditions or social capital impact for that matter [19]. Has the CDC action achieved more balanced impacts in line with the nature of problem neighborhoods? Did the residents participate in the process? Projects were supposed to be undertaken 'in partnership and consultation with the various actors involved (including the residents)'.

Finally, there is the question whether the CDC qualifies as a social innovator. It may appear as a pioneer innovator since 1816. As to the Urban Renewal Program, its innovative role has been primarily been that of a pioneer investor: a unique banker stimulating projects that could not be undertaken by the market because of their low profitability in the short and medium term (even though long-term profitability can be obtained). That is to say, projects in the 'public interest'. Therefore it seems altogether justified that the CDC engages in international cooperation, exporting its model to other countries, e.g. Morocco, Tunisia and Poland.

2.8 The 'Agile State' (Netherlands)

The Dutch example is based on case studies at central, regional and local levels [20].

The State today, generally speaking, has to act in an environment marked by increasing complexity, dynamics, even turbulence. Spatial development policy, including urban revitalization, is no exception. Although new plans are launched continuously, their innovativeness does not go beyond tokenism if they are not implemented. A major impediment is that state or government organizations lack the flexibility required to cope with change. How to design an organization that is able to cope? The key lies in what is referred as agility. Agile means 'characterized by quickness or liveliness of mind, resourcefulness, or adaptability in coping with new and varied situations' (Webster's).

Translated into organizational conditions within state or government organizations, agility reads: demand-oriented performance, changeability of the organization, culture, leadership, and application of ICT. Culture stands for four behavioral aspects: responsible entrepreneurship, strong external orientation, high degree of mental flexibility of each staff member, and achievement-oriented behavior.

To create an agile State at different levels, represents a major social innovation.

2.9 A study in complexity (Jerusalem)

The Jerusalem case [21] is about a project that started in 1996 with external support from Swedish, Dutch and German NGOs and universities. The project is marked by a dialogue and cooperation between Israeli and Palestinian NGOs, non-governmental practitioners and academics. At a certain point the discussion centered on an urban development plan for Jerusalem. When urban development without peace proved to be impossible, the Israeli and Palestinian dialogue and cooperation shifted to scenario building.

Four scenarios were developed for the future of Jerusalem:

- 'Besieged City' (status quo)
- 'City of Bridges' (best case)
- 'Fortress City' (intermediate case)
- 'Scorched Earth' (worst case)

The scenarios enabled the Israeli and Palestinian participants in the scenario exercise to reach an agreement on main, positive elements of a vision for the future: rejecting the worst-case scenario and opting, optimistically, for the best case. The scenarios can be used to identify strategic levers of intervention, starting from the status quo and moving stepwise toward the intermediate case. The group experience and the scenario building are social innovations which can provide lessons for 'cross-border cooperation' in other divided cities. During the project reference has been to Belfast, Nicosia, Mostar and Johannesburg [22]. Whether these cases are really comparable remains to be seen. The lessons from Jerusalem are threefold:

- The peace process is not linear, but cyclical (the group was nevertheless able, in discussing the future of the city, to move from a political taboo to a shared vision)
- Talk and negotiation can be an important fact, without them the situation would even be worse
- Scenario building may not solve problems, but it can help to structure a common vision and to pinpoint the consequences of remaining on a destructive path.

2.10 Mondragón Cooperative Corporation (Basque Country)

Starting in 1956, a local productive system has been developed in Mondragón, in the Spanish Basque Country, based on cooperatives which later on have formed a corporation[23]. Also part of the cluster are facilities such as banking, insurance, social welfare, education (high education schools turning into a university) and technological research laboratories.

Mondragón Cooperative Corporation or MCC has made a major contribution to place-based development to more regional than urban revitalization. Unemployment today is as low as 2% to quote only one economic yardstick of success.

MCC has also undergone a process of internationalization to be measured in terms of overseas production and international sales. But the challenge of globalization is not limited to MCC's international economic performance. It, too, involves the issue of transferring the good practice experience of Mondragón to other countries, in especial towards less-developed partners (here the case of León comes to mind). The young university (limited to 5000 students) is supposed to play a pivotal role. Its commitment to applied knowledge or applied sciences might even serve as an example for more developed cities or regions [24].

Potential topics for transfer are cooperative management & governance systems; territorial development & corporate social responsibility; intercooperative collaboration & development of the corporation; trust in collaborators.

Transfer of good practice seems possible even given the idiosyncratic nature of the Mondragón experience, being rooted in the Basque as well as in a social Christian culture. The latter explains the emphasis on defining ethical guidelines for transfer.

Ever since Mondragón, a socially innovative business is no longer an oxymoron.

The ten cases may be compared to SINGOCOM, a major European research program on social innovation in urban revitalization [25]. This project comprises 16 case studies in 10 cities in 6 countries. The cities are:

Newcastle, Milan, Brussels, Vienna, Naples, Lille, Berlin and some initiatives in Wales. They are compared in terms of innovative vision; innovative delivery; innovative institutional organization; innovative process and innovative scalar effect.

3 EVALUATION

Is there a common denominator for territorial social innovations?

It seems to be the creation of an innovative milieu, originally linked to technological innovation [26], but in spite of different aims also relevant to social innovation [27].

An innovative milieu or environment has the following characteristics:

- Group of actors (from business firms, research and educational institutions, public authorities; from the viewpoint of social innovation one has to emphasize citizens or users, that is those for whom the urban regeneration is done)
- Material, immaterial and institutional elements (plants, infrastructure and housing; know-how; public authorities and other organizations including social movements)
- Cooperation (or partnership among actors; networking to make best use of existing resources, thus creating value added or synergy)
- Learning or 'apprenticeship' (enabling actors to modify their behavior in order to develop new solutions, adapting to a changing environment).

Both cooperation and learning involve the external environment of a milieu, beyond the local context. Links to the external environment, which may even be international, are ensured by the formation of transterritorial networks.

Both cooperation and learning relate to:

- The creation of know-how required by urban revitalization
- The development of behavioral norms guiding the cooperation among actors
- The ability to detect specific resources of different actors and the milieu as a whole as opportunities for cooperation. Of particular importance is that those for whom the regeneration is done dispose of resources to achieve their aims which is the essence of real citizen participation and a far cry from tokenism. .

To plan is not enough. Successful urban revitalization requires much more to be sustainable. To quote the British approach [28], a sustainable community should be:

- Active, inclusive and safe
- Well run
- Environmentally sensitive
- Well designed and built
- Well connected
- Thriving
- Well served
- Fair for everyone.

In addition, 'placemaking' is called for, 'a comprehensive package of measures which is implemented through an integrated placemaking vision and strategy'. With placemaking we have come full circle: we are back at the integrated area approach advocated by the URBAN Community Initiative.

4 NOTES

[1] Drewe, P., The URBAN Initiative: the EU as social innovator? in P.Drewe, J.-L. Klein & E. Hulsbergen (eds) The challenge of social innovation in urban revitalization, (in preparation).

[2] See GHK (2003) Ex-post evaluation Urban Community Initiative (1994-1999), Brussels & London. For Urban (2000-2006) see Commission of the European Communities (2002) The programming of the Structural Funds 2000-2006, an initial assessment of the Urban Initiative, Brussels.

[3] See Banlieues, trente ans d'histoire et de révoltes, Manière de voir 89, Le Monde diplomatique, octobre-novembre 2006.
[4] There are more urban areas all over the EU 15 with at least a high potential of violent outbursts. They have similar underlying structural conditions awaiting triggering events which are basically unpredictable. And what about deprived areas in the new EU member states?
[5] According again to the evaluators, the UK programs may have been an exception, adopting a 'broad integrating approach' marked by a focus on local community groups, aiming to integrate community groups, voluntary groups and residents. But then this community-focused approach has not been successful everywhere (for example not in Glasgow North or Hackney Tower).
[6] See Drewe, P. (2006) Thinking cities: what paradigm? Unpublished manuscript, available from: <pauldrewe@wanadoo.nl>
[7] Platt,J.R. (1966) The step to man, John Wiley & Sons, London & Sidney: 132.
[8] Drewe, P., Klein, J.-L. & Hulsbergen, E., The challenge of social innovation in urban revitalization (in preparation).
[9] Klein, J.-L., Local development as social innovation, in Drewe, Klein & Hulsbergen, op. cit.
[10] Roberts, P., Social innovation, spatial transformation and sustainable communities: regenerating Inner Liverpool – the case of the Eldonian Village, in op. cit.
[11] Hulsbergen, E., Bottom-up in Gouda East: design studio, in op. cit.
[12] De Muro,P., Hamdouch, A., Cameron, S. & Moulaert, F. , Combating poverty in Europe and the Third World: the role of networking within and across cities, in op. cit.
[13] Bredenoord, J., Urban development and self-help in León, Nicaragua, in op. cit.
[14] Fernández-Maldonado, A. M., Battling the digital divide from the bottom up in Lima, in op. cit.
[15] Meaning that additional resources have been developed including direct and indirect private-sector leverage.
[16] Blais, A. & Narring, P., The Urban Renewal Program (PRU) of Caisse des Dépôts et Consignation (CDC): innovative action to regenerate French towns and cities, in Drewe, Klein & Hulsbergen, op. cit.
[17] One third is paid to the state as dividend with a payout ratio comparable to that of private companies; another third is retained by CDC as its own saving fund.
[18] The ten projects are located in Arcueil, Bordeaux, Clichy, Creil, Perpignan. Reim, Roubaix, St. Etienne, Toulouse and Vaux-en-Velin.
[19] GHK, op. cit.
[20] Mierop, R., The Agile State, an organizational view on spatial development policy in the Netherlands, in Drewe, Klein & Hulsbergen, op. cit.
[21] Nasrallah, R. & Amin, A., The case of Jersusalem: a study in complexity, in op. cit.
[22] Working with a German NGO included 'learning from Berlin'.
[23] Grellier, H., Larrasquet, J.M., Lopez Perez, S. & Ugarte, L., Thinking about transfer from the Mondragón experience, in Drewe, Klein & Hulsbergen, op. cit.
[24] See Drewe, P. (2006) Innovation – more than just a sound bite? in A. Kuklinski, C. Lusinski & K. Pawlowski (eds) Creative Europe, towards a new creative and innovative Europe, Wyzsza Szkola Biznesu, National-Louis University, Nowy Sacz & Warszawa: 37-51.
[25] De Muro et al, op. cit.
[26] See Camagni, R. & Maillat, D. (2006) Milieux innovateurs, théorie et politiques, Economica Anthropos, Paris.
[27] Matteaccioli, A., Social innovation and urban regeneration from the perspective of an innovative milieu analysis, in Drewe, Klein & Hulsbergen, op. cit.
[28] Roberts, op. cit.

🏆 *reviewed paper*

Planning support systems for the integration of land use and transport; new ways of using existing instruments

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1 INTRODUCTION

This paper will present preliminary results of a participatory Planning Support System development approach. To support the much needed early integration of land use and transport planning on a regional level, a PSS is developed based on an innovative development approach. The reader should not expect brand new technological innovations, because the approach is geared to seek ways in using existing tools and instruments in more useful way. First the backgrounds of this project are discussed. Then the roots of the development approach are discussed, leading to the approach itself. Some early planning products and PSS products are then presented after which the paper closes with a reflection, recommendations and conclusions.

2 INTEGRATING LAND USE AND TRANSPORT PLANNING

In the media and in politics we see a sharp increase in attention for climate change, (un)sustainable developments and suggestions to improve these situations. One of the issues which receives growing concern is the urbanisation which is apparent in the developed world (where a small majority of people live in cities) and which is explosive in the developing countries (i.e. China and India). Urbanisation is not a major problem in itself, but the (unsustainable) way most urban areas are organized is. Pollution (from industry, but increasingly from car transport), traffic jams, inefficient land use (i.e. urban sprawl) and decreasing public transport potentials are problems that are visible problems most cities face these days.

While we see that in most situations the land use (or spatial) planning of cities is separated from transport planning, the integration of these two planning processes is seen as crucial to overcome some, if not most, of the above mentioned unsustainability problems. The importance if this integration is recognized not only in academia (e.g. Banister, 2002; Banister, 2005), but also by important platforms of industry (e.g. WBSCD, 2001), by politicians and decision makers (European Conference of Ministers of Transport, 2002)and in spatial and transport policy documents (in the Netherlands for instance in: Department of V&W, 2005; Department of VROM et al., 2004).

Yet, in planning practice and especially on the regional scale (where, due to scale of modern cities and transition to a network society, urban issues are most evident), not much integrated land use and transport planning can be seen. Both institutional barriers and barriers with respect to the content of both land use and transport planning are underlying this. In this paper we will focus on the barriers related to content and how to overcome them. These barriers appear to be especially challenging in the earlier phases of planning (i.e. visioning and scenario building) (see also te Brömmelstroet et al., 2006). Yet, it is here, where significant changes for integration exist, while the degree of freedom is relatively large and minds are not set yet.

The issue of barriers related to content is related to the differences in the knowledge that is used and generated in the land use planning process on the one hand and transport planning processes on the other, and how and by whom this is done. In the literature there is no clear consensus about what precisely constitutes knowledge. Without taking part in this debate, we will use the distinction made by Nonaka and Takeuchi. They distinguish tacit and explicit aspects of knowledge. The explicit aspects are easily articulated, codified, and stored in certain media, while the tacit aspects consists often of habits and culture which is only known by an individual and that is difficult to communicate to the rest of an organization (Nonaka and Takeuchi, 1995). The interaction between these two aspects creates knowledge (often by planning professionals) that is used in the planning process.

Comparing land use planning with transport planning, we can recognize that both aspects of knowledge have clearly different characteristics in both fields. While transport planners use more quantitative information on flows, land use planners more often prefer to work with more qualitative notions of space (technical). Oversimplifying one can say that transport planners prefer to calculate and analyze while land use planners like to design and synthesize (tacit). It is these differences that form the barrier of content. The challenge is to find a common language that integrates (or forms a bridge between) these aspects.

With this notion, developing indicators and concepts that address both land use and transport issues (e.g. the concept of sustainable accessibility in: Bertolini et al., 2005) seems insufficient, because it only offers a link of the explicit aspects of knowledge. Attempts to bridge the gap by integrating land use and transport processes (e.g. structural meetings to discuss common issues) are on the other hand too much focused on the tacit knowledge aspects. Recent advances in the field of Planning Support Systems (PSS) seem to create opportunities to connect both worlds.

Following Klosterman, "PSS must not be seen as a radically new form of technology…it must take the form of an information framework that integrates the full range of current (and future) information technologies useful for planning" (Klosterman, 1997, p. 51, emphasis in original). It should facilitate interaction among planners, contain structured and accessible information and facilitate social interaction, interpersonal communication and debate that attempts to deal with common concerns (ibid., p. 51). This implies that a PSS should address both explicit and tacit knowledge aspects. The former by dealing with structured information and the latter by facilitating social interaction. Such a PSS offers a chance to deal with the content barrier that blocks the integration of land use and transport planning. However, as we will discuss below, the development of such a PSS is hampered by fundamental issues relating to the development process.

3 LAND USE AND TRANSPORT PSS: CHANCES AND BOTTLENECKS

A first quick scan of recently developed PSS that are aiming to support exactly the above mentioned early integration of land use and transport planning on a regional scale in the Netherlands shows that they many were developed (Al and van Tilburg, 2005), but not many of them were widely adopted in day to day planning practice. More often then not, they were only used in experimental situations or within they organisation that developed the PSS (te Brömmelstroet, 2006) [91].

This corresponds with insights in the wider field of PSS research. While the implementation of technological support tools for planning has been a rough patch for decades already, recent research shows that the situation for the new family of tools (the PSS) shows no deviation from this trend. In fact, developed PSS are often seen by planners as far too generic, complex, inflexible, incompatible with the 'wicked' nature of most planning tasks, oriented towards technology rather than problems, incompatible with the less formal and unstructured information needs, and too focused on strict rationality (see e.g. Batty, 2003; Bishop, 1998; Couclelis, 1989; Geertman and Stillwell, 2003; Harris and Batty, 1993; Innes and Simpson, 1993; Klosterman and Landis, 1988; Sheppard et al., 1999; Sieber, 2000; Uran and Janssen, 2003; Vonk, 2006). That is why the attitude of planners towards such PSS is characterized as 'downright antagonistic' by Harris (1999). It seems that it is not that the planners do not see the added value of PSS, but that the developed ones do not fit their specific needs. One of the major causes behind this gap appears to be the distance between the development of the PSS (i.e. by universities, knowledge institutes and consultancy firms) and the actual planning processes. This was already posed by Lee in relation to Large Scale Urban Models in 1973 (Lee, 1973). He suggested that, to improve the efficiency of future modelling efforts:

- Models should be transparent; just as likely to be wrong, but achieving consensus on assumptions can result in opposing parties agreeing on conclusions;
- Modelers should find a balance between theory, objectivity and intuition to keep contact with the policy problem;
- They should start with a particular policy problem that needs solving;
- They should build only very simple models.

In 1994, Lee noted that these guidelines still stood, because the modeling community had not changed its attitude in the meantime (and consequently the implementation gap still existed)(Lee, 1994). Similar notions can be found in a recent publication focussing on particular bottlenecks of PSS (Vonk, 2006). In addition, he suggests that communication of developers with practice should be improved to actively analyse the tasks that may be supported and an interactive learning process among all the relevant actors is recommended (Vonk, 2006, p. 96).

[91] Current research is focusing on a more in-depth analysis of this hypothesis and its underlying reasons. Preliminary results point in the same direction as hypothesised here.

In the case of this paper, the particular policy problem is the integration of land use and transport planning. It seems that here the same bottlenecks resulted in the above mentioned lack of implementation. Atop of general PSS bottlenecks (the lack of fit with user needs) the goal of integrating these two planning domains adds some extra challenges. We argued already that the characteristics of both the tacit and explicit knowledge aspects differ. There is also an increased risk of creating too complex information that is not accessible anymore for all planners. Both the land use and transport system are examples of complex systems. We seem only at the start of understanding some of the key processes in those separate systems, let alone all the possible interrelations and feedbacks between the two. In attempts of producing information that approaches reality, complex opaque 'black boxes' are the result Yet, especially in the early phases of planning (visioning, scenario building, debate and mutual learning), simplicity and transparency is key (te Brömmelstroet et al., 2006). It seems that finding the balance between complexity (that does justice to reality) and simplicity (that makes the information accessible) is the challenge of a PSS to support the integration of land use and transport planning. Adapting the famous saying of Albert Einstein; the PSS should be as simple as possible, but no simpler!

Finding this balancing point is something that should be done in close cooperation with the users of the PSS; the land use and transport planners. As will be discussed in the next section this has multiple advantages. Based on insights and concepts of the field of technological innovation (next section), we will present the development approach for a PSS that supports the integration of land use and transport planning. After this, results from a first case will be put forward.

4 ROOTS FOR A NEW PSS DEVELOPMENT APPROACH

In this section we will introduce the development approach that deals with the issues presented above. This approach is rooted in several concepts and insights from related fields. It goes beyond the scope of this article to address these roots in detail, but for the sake of argument, the most important notions are shortly introduced below. [92]

In the late 1980s-early 1990s insights in the defects of a linear understanding of technological innovation resulted in the research field coined 'the social shaping of technology (SST)' (MacKenzie and Wajcman, 1985). Important notions of this field are that implementation (where user needs and requirements are discovered and incorporated in the course of the struggle to get the technology to work in useful ways) is an important site of innovation (Williams and Edge, 1996, p. 874). It also conceived innovation as a complex social activity. Therefore, "an iterative, or spiral process that takes place through interactions amongst and array of actors and institutions involved and affected" (Ibid, p. 875) is proposed as alternative for the linear mode of innovation.

This new technology innovation paradigm resulted in a variety of technology development methods that replaced the, up to then central, waterfall development method, one of which is the Soft Systems Methodology (SSM) (Checkland and Holwell, 1998; Checkland and Scholes, 1990). This is a method developed to deal with ill-defined problem situations which have a large social and political component; so-called 'soft' problems. It is an iterative process in which developers and users (cooperatively and iteratively) go through seven stages, from defining the problem situation to taking action. SSM is a learning system about a complex problematic situation proceeding via debate (Checkland, 2001, pp. 67-70).

A second method in the light of SST is the Dynamic System Development Method (DSDM), developed by Stapleton and Constable (1997) based on the Rapid Application Development (RAD) concept (Martin, 1991). DSDM is founded on nine key principles underlie this technology development method of which the most important are; user involvement; a frequent delivery of products; delivering a system that addresses the current user needs; development is iterative and incremental and; testing is carried out throughout the project life-cycle (Martin, 1991).

In a recent book, Van den Belt introduces the concept of 'mediated modeling' as a problem solving approach (van den Belt, 2004). This concept is itself inspired by a large number of disciplines. It offers a method to develop a model in close cooperation between the modelers and the users. One of the key principles is that most learning takes place in the process of building the model, rather than after the model is finished (Vennix

[92] For a more elaborate discussion of these methods and their influence on our process approach, the reader is referred to (te Brömmelstroet and Schrijnen, 2007)

et al., 1997). A strong user involvement in the process of conceptualization, specification and synthesis of a model is therefore recommended. The method claims to increase the level of shared understanding, builds consensus about the structure of a complex topic, provides a strategic and systematic foundations for research and serves as a tool to disseminate gained insights.(van den Belt, 2004, p. 17)

All methods are based on the participation of the users throughout the development process. This offers several advantages. It creates an internal learning environment for the users, it generates extra knowledge about the issue at hand which will increase the instrumental quality and it creates extra ground for the resulting tool.

5 AN INNOVATIVE APPROACH FOR PSS DEVELOPMENT

Although there is no analytical research showing if these new technology development processes live up to their promises, it is plausible to assume that they (at least) will bring developed PSS closer to the user needs. Up till now, most PSS developments seem to have taken a technological deterministic approach, focusing on technical possibilities and supply side drivers. With the large number of developed PSS versus the large demand for them in planning practice (and the gap between them), the time has come to the social shaping of existing and future PSS. [93]

As "no two […] modeling process can be exactly the same […] nevertheless, certain elements are common to most mediated modeling projects" (van den Belt, 2004, p. 60), we have attempted to combine the lessons that can be learned from the three methods use in technological innovation and translated it into the particular situation in which we are developing a 'land use and transport PSS'.

This approach is based on the following principles:

- **User involvement**: in the entire process, the model developers work in close cooperation with the land use and transport planners and stakeholders;
- **Iteration:** five stages are recognized (problem assessment, metamodel, functional prototype, final model and an integrated strategy), but iteration through learning effects is possible if not preferable (although there is a dominant direction, pictured as the orange arrows);
- **Frequent delivery of products**: every stage delivers its particular product (e.g. the metamodelstage delivers a process protocol which can be used in other processes);
- **From problem definition to taking action**: developing the model is accompanied by using it to come to an iterative land use and transport strategy. This creates learning effects for the model (i.e. through social shaping), keeps participants involved and provides tests for the model that has been developed so far;
- **Addressing current user needs**: the iteration of developing and testing it, makes user needs explicit and uncovers hidden needs in the process.
- **The process is supported by existing tools:** the method is not used to develop new tools from the scratch (in our opinion there is enough supply), but adapt already existing tools. As we addressed above, a PSS is seen as an information framework, so the development process is about finding new ways of using the existing tools to create useful information. An additional advantage is that this embeds the results in the organization.

The approach is shown in figure 1. This structure is largely based on the DSDM lifecycle, but strongly adapted to the specific needs and characteristics of PSS development.

[93] As argued by em.prof. Ottens in a keynote speech at the International Workshop Modeling and Decision Support for Urban Planning held at the School of Urban Design, Wuhan (China)

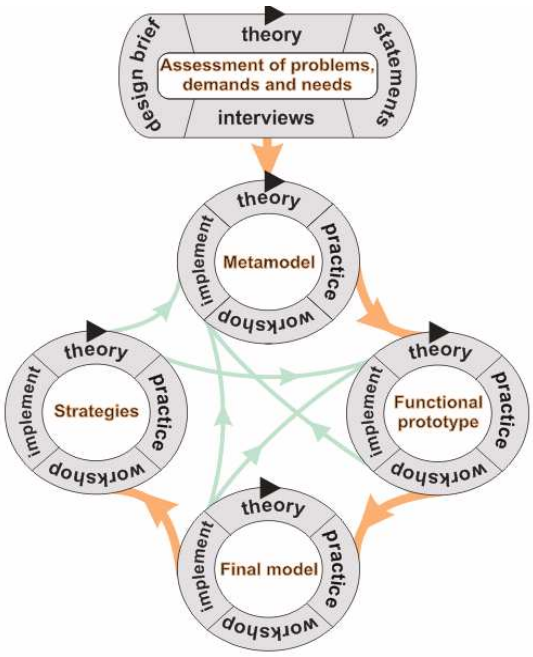

Figure 1 : Project architecture of the Amsterdam case

The PSS development approach is started with a focus on the definition of the specific planning problem at hand (in this case the early integration of land use and transport planning on a regional level). Also the group of participants has to be identified (here, the group has to comprise land use as well as transport planners and preferably also some stakeholders or decision makers) and introductory interviews have to take place, to gain insights in the view points of the problem and expectations of the PSS development process and the result of this process. This phase usually results in a problem definition and a first design brief for the PSS.

Then, a series of workshops is started in which simultaneously a planning product and a PSS is developed. This combination is important, because it creates a continuously testing ground for the intermediate results and creates mutual learning effects (remember: most learning takes place in the process of PSS-building!). Working with the PSS also generates new insights in the user needs. The first phase focuses on a process protocol (coined a metamodel here); which steps have to be followed in which order to come to an integrative land use and transport planning product and what does that integrated land use and transport planning product look like? In a second phase, the participants have to identify which information is useful and understandable in each step. It is this workshop that creates a first version of the common language. In a discussion, the modelers and users have to find out what kind of information works and what kind does not. Functional prototype is chosen as title of this step, because it results in a first version of a planning framework combined with information (a PSS in Klosterman's definition), that has to reflect a consensus of the group of participants. In the third phase, this prototype is put to the test: the group of participants has to work with the PSS to come to an integrative planning product (defined by themselves in the first phase). Depending on how the group has defined the functional prototype, this phase can exist of multiple workshops. The last phase is improving the PSS and drawing up the planning product.

As the approach shows (figure 1), there is a dominant direction, but there are many feedback loops. One can imagine that during the phase of testing the prototype, new insights in an ideal sequence of planning steps are gained (learning by doing).

6 THE METHODOLOGY APPLIED: THE CASE OF AMSTERDAM

In 2005, the transportation planning department of Amsterdam (dIVV), requested the University of Amsterdam to cooperate in a project to increase the usefulness of their transport model. It is the only Dutch municipality with their own fully functional transportation model; GenMod. Despite this unique situation and despite the fact that recent test results show that the quality of the outcomes of the model is the best available in the Netherland, the model is not used to its full potential (especially in strategic phases of the planning process). Several of the above mentioned issues seem to be at play here. The transport model;

- offers explicit knowledge with characteristics that do not fit the characteristics of tacit knowledge in these strategic phases of planning;
- does not fit the user needs of the strategic planners, but is focussed on a technical and supply oriented rationale;
- is too much focussed on supporting transport planners (so geared to there tacit and explicit aspects), while at the strategic level there is a need for a common land use and transport language;

Improving this situation can be seen as a technical challenge, resulting in a process in which the model developers rebuilt the model to improve the model in such a way that it can face the three above mentioned issues. However, a development approach in which the land use planners and transport planners were closely involved seems to be more efficient in this context. This idea was also supported by the model developers and group of strategic transport planners at dIVV. The land use department of the municipality of Amsterdam (dRO) together with the City Region of Amsterdam (a cooperation of sixteen municipalities including Amsterdam and Almere) also expressed their support for such a PSS development approach. In short: the goal of the approach was to transform the existing transport model (and other existing tools of the planning departments) into a full PSS that supports the early integration of land use and transport planning in the region of Amsterdam.

6.1 The process and progress so far

With a group of approximately ten to fifteen participants we started the PSS development process in April 2006 with a kick off meeting. The group consisted of (depending on the different phases) two to four transport modelers, four to five transport planners, two land use planners from dRO and one from the City Region of Amsterdam and a varying group of stakeholders and scientists (of the University of Amsterdam, the University of Utrecht and the Technical University of Delft). In each workshop, a transport modeler or external expert gave a presentation on certain information and model possibilies (i.e. different kinds of accessibility maps).

At the moment of writing we have been together in five workshops and are working towards the final PSS and integrated planning product(s), which will be the focus of the sixth and final workshop[94].. Below we will present the products as they are developed until now. We will also shortly describe how these products were developed.

6.2 Developed PSS products

The first product that was created was a process protocol for an ideal land use and transport integration process. To come to such a protocol, first the participants described the current process and where they saw threats or opportunities for a better integration (figure 2a). From this exercise it became clear that especially the integration in very early phases was both problematic as well as opportunity rich. Planning is seen as a cyclical process (projects – vision – projects etc.). Especially at the vision level there is no common language, resulting in visions from a land use perspective (often meeting critique later on by the transport planners) and vice versa. It would also increase the creativity if external stakeholders would be included in these early phases.

After this problem orientation, an ideal type process was sketched (in a plenary discussion). The results of this discussion were interpreted by the researchers of the University of Amsterdam, who presented a process protocol in the next workshop. Again, this protocol was discussed, and led eventually to the one depicted in figure 2b. Important notions are that a first planning step should focus on generating urban scenario's based on issues as accessibility and sustainability (and starting from an existing urban program). In this step, existing land use constraints (e.g. ecological protected areas) have to be on the table, to make th design process not too idealistic from a transport – land use perspective.

These scenarios are tested on their network implications in a second planning step. This will lead to an optimizing design exercise in which the scenarios are evaluated and infrastructure measures can be introduced. A last step is looking at the differences and similarities between the developed scenarios, to learn what robust choices are for the future land use and transport systems; which choices work in all scenario's

[94] This workshop is scheduled for the 11th of May, so the results can be included in the CORP presentation

and which ones are really sensitive for small changes. Learning effects can lead to reconsideration of choices that were made earlier in the process.

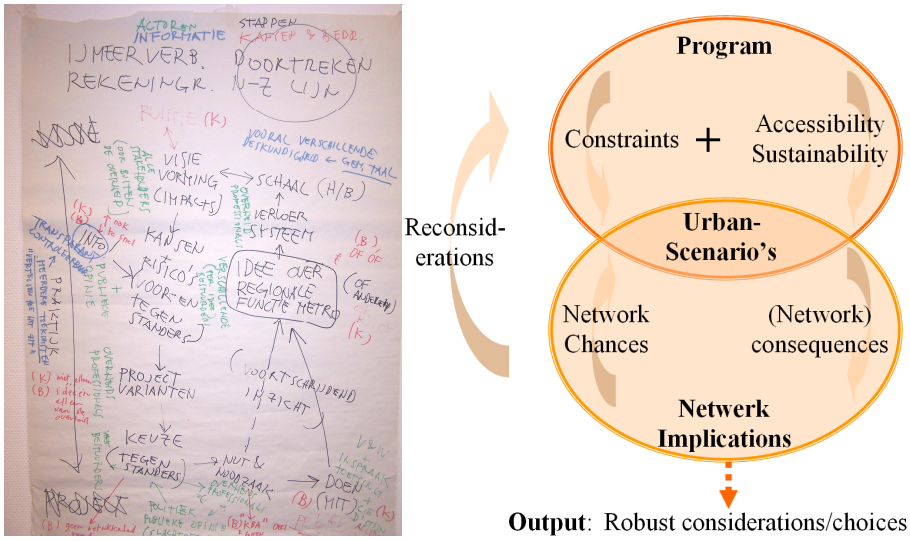

Figure 2: the process protocol (2a= the process problems; 2b= the ideal process protocol)

From the above description of the process protocol, the different kinds of information can already be distinguished. This was the next phase in the PSS development process.

A first step towards the functional prototype was to map the preferred information characteristics of the participants. In an individual exercise they had to rank characteristics on a scale of importance. This revealed that user needs (figure 3) really differed from the current characteristics of GenMod. The planners in the early phases of integrated land use and transport planning need fast knowledge that links to their tacit knowledge. They consider characteristics as "detail" and "precision" to be less relevant. GenMod should be used to "test insights" and "create new ones" instead of delivering "hard facts" and "evaluating" existing plans and projects.

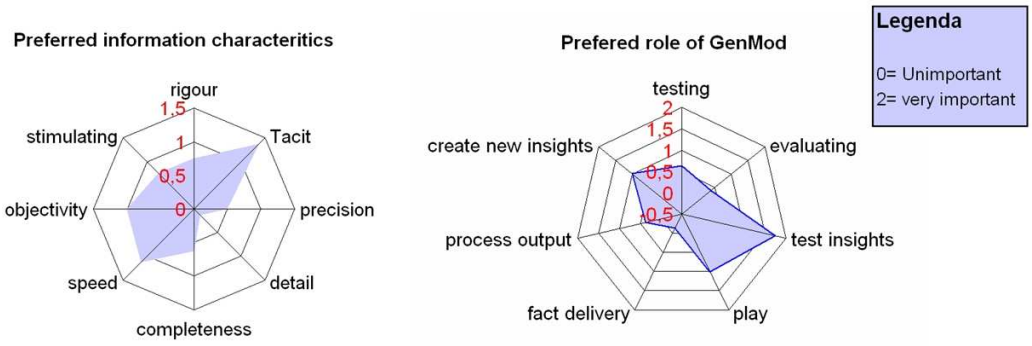

Figure 3: Preferred user characteristics (left = information; right = GenMod)

The second step towards the prototype is judging all kinds of existing information. In a workshop, the participants rated and discussed all kinds of maps and figures that could be useful. A selection of those was made and used in further sessions.

The resulting prototype is shown in figure 4. These are examples of input and output GenMod and other instruments have to work with to support the integrated land use and transport planning process; it is the first version of the PSS. In the first planning step, spatial maps are key. For the design of urban scenarios the participants want to know the spatial situation of indicators as accessibility (the number of people or jobs accessible from each zone within a reasonable travel time) and sustainability (the number of people or jobs reachable within a crow flight distance[95]). Also spatial restriction maps have to be made (by the GIS department) to show design taboos (and question them!?). Then GenMod has to deal with an abstract design based on the program (houses and jobs) located within the Amsterdam Region. With that, the model has to

[95] This indicator is seen as a proxy for sustainability, because it shows the number of activities within reach by slow modes as walking and bycicles (ENG: proximity, NL: Nabijheid).

calculate network consequences, network chances and a number of indicators, which show the change with regards to a basic scenario. This creates an understanding of which choices are good and which are bad (and a sense of robustness).

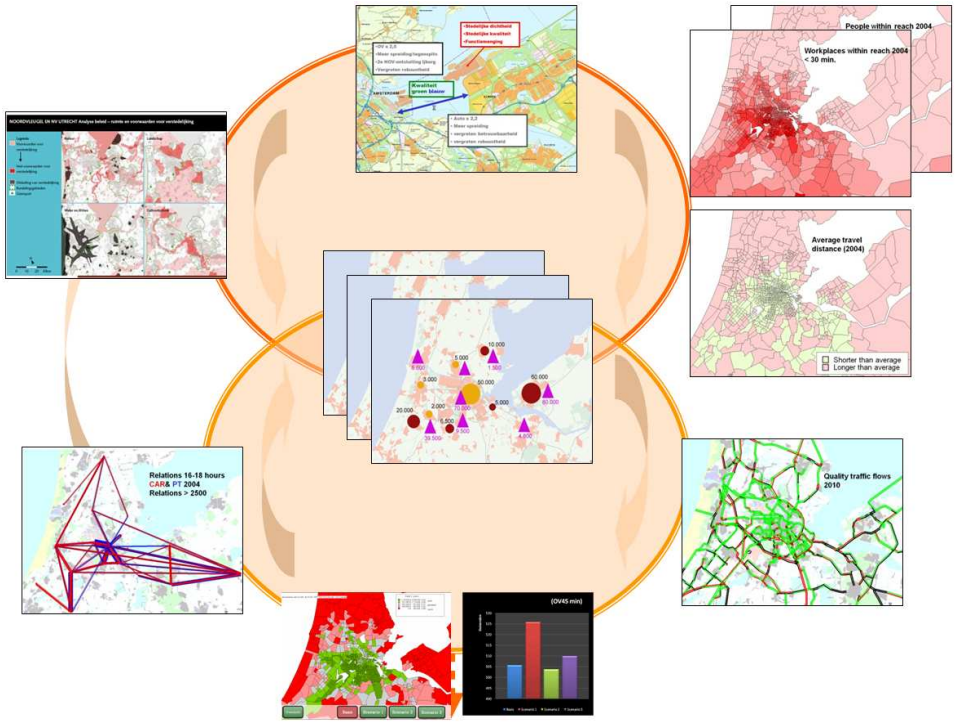

Figure 4 : Functional prototype: the process protocol with types of information support

6.3 Developed land use and transport products

As noticed above, we are in the process of producing integrated land use and transport planning products. At the moment of writing, the planners want to create a shortlist of robust land use and transport projects that have a positive impact on the accessibility of the region and that have this positive impact in different possible futures (robustness). This shortlist should be accompanied by a document containing the discussions, debates and choices that occured during the workshops. It has to present the learning that has taken place in the workshop, especially on interrelations between land use and transport (i.e. if we want to develop workplaces at location A in 2010, public transport project B has to be developed earlier). Working towards such a list, the current intermediate planning products are a range of different (original and optimized) scenarios.

It is important to re-state that the planning product is not a single 'best' scenario, but a set of robust strategic land use and transport choices. Nevertheless, we show one of the scenarios as illustration in figure 5. The red rounds represent 10.000 houses, the yellow ones 10.000 jobs.

Figure 5: One scenario in two steps (left = after first design step; right = after second optimizing design step (including infrastructure projects))

7 REFLECTING ON THE AMSTERDAM CASE

Although the participants are very positive about the learning effects of the workshops and of the new PSS, it is not yet clear if this PSS and the planning products will be more successful that earlier attempts. However, we did monitor the impressions of all participants after each workshop (through a personal survey). Form the results of these surveys we can draw some early reflections.

The transport model developers have learned to present the outcomes of GenMod in different ways. During the development process it became clear that the characteristics of the calculations as well as the output (as explicit knowledge) had to be qualitative rather than quantitative. The developed scenarios were so abstract that interpreting them to fit in the model was highly ambiguous and thus hard numbers could not be cracked. A learning point for the modelers was that this did not hamper the design process, because all participants were fully aware of these facts and even preferred such qualitative information.

The land use and transport planners are also very positive of the process. They see that the information helps them to design integrated visions for the region. There is little discussion about the information itself (something which can be witnessed in many other design efforts). It seems that all participants are very well aware of the assumptions and shortcomings of the used information, so they can focus on using it to discuss planning issues. It has also become clear that for both input and planning output, the planners are more satisfied with relative simple information characteristics than with sofisticated model outcomes. They do not want the PSS to help them to develop THE planning scenario, but to facilitate a discussion in which their own (land use and/or transport) knowledge of the region is challenged and sharpened. The demand for a shortlist of projects and their interrelations proofs this point.

Yet, we also faced some difficulties during the process. One group that designed a scenario was almost entirely absent at the following workshop. This hampered the mutual learning process and eventually resulted in a lower number of scenarios that continued the process. So, it seems crucially important to ensure that all participants have the commitment to come to every workshop.

It also seems to be crucial that the owner/developer of the models are present at the workshops and have a vested interest in its progression. The progress depends on them for calculations and generation of information. It also increases the learning effects, because the modelers can take part in discussions about the information (in the beginning of the process). They can explain certain things, or learn from the fact that some things are not understandable for the planners.

8 CONCLUSION AND RECOMMENDATIONS

Due to its ‘work in progress’ nature, this research does not yet lead to hard conclusions. Yet so far, we can already see that developing PSS in close cooperation with the users (i.e. the land use and transport planners) really creates a lot of learning dynamics. Although naturally, it depends largely on the people that take part in such a process, it would be very interesting to see how this process works in environments based on other planning problems.

It is also necessary to monitor the results of such a process. How do the planning results disseminate into the wider planning community and how are the lessons learned translated in future attempts or in using the software (creating a workbook as a collective memory seems to preferable.

A final recommendation is too extend these PSS development approaches to include other participants besides planners: decision makers, stakeholders and maybe even the general public.

9 REFERENCES

Al, J., and van Tilburg, W. (2005). "Basisboek Instrumenten Regionale Bereikbaarheid." Rijkswaterstaat AVV, Rotterdam.
Banister, D. (2002). Transport Planning, Spon Press, New York.
Banister, D. (2005). Unsustainable Transport: City Transport in the New Century, Routledge, London.
Batty, M. (2003). "Planning Support Systems: Techniques That Are Driving Planning." Planning Support Systems in Practice, S. Geertman and J. Stillwell, eds., Springer, Heidelberg, v-viii.
Bertolini, L., le Clercq, F., and Kapoen, L. (2005). "Sustainable Accessibility: A Conceptual Framework to Integrate Transport and Land Use Plan-Making. Two Test-Applications in the Netherlands and a Reflection on the Way Forward." Transport policy, (12), 207-220.
Bishop, I. D. (1998). "Planning Support: Hardware, Software in Search of a System Computers." Environment and Urban Systems, 22(3), 189-202.

Checkland, P. (2001). "Soft Systems Methodology." Rational Analysis for a Problematic World Revisited: Problem Structuring Methods for Complexity, Uncertainty and Conflict, J. Rosenhead and J. Mingers, eds., John Wiley &Sons, LTD, New York, 61-90.
Checkland, P., and Holwell, S. (1998). Information, Systems and Information Systems: Making Sense of the Field, John Wiley & Sons Ltd., Chicester.
Checkland, P., and Scholes, J. (1990). Soft Systems Methodology in Action, Wiley, Chicester.
Couclelis, H. (1989) "Geographically Informed Planning: Requirements for Planning Relevant Gis." 36th North American Meeting of Regional Science Association, Santa Barbara.
Couclelis, H. (2005) "“Where has the future gone?” Rethinking the role of integrated land-use models in spatial planning" Environment and planning A, (37), 1353-1371
Department of V&W. (2005). "Nota Mobiliteit." Department of V&W, Den Haag.
Department of VROM, Department of LNV, Department of V&W, and Department of EZ. (2004). Nota Ruimte, Department of VROM,, Den Haag.
European Conference of Ministers of Transport. (2002). "Implementing Sustainable Urban Travel Policies. Final Report." Paris.
Geertman, S., and Stillwell, J. (2003). Planning Support Systems in Practice, Springer, Berlin.
Harris, B. (1999). "Computing in Planning: Professional and Institutional Requirements." Environment and planning B : Planning and Design, 26(3), 321-331.
Harris, B., and Batty, M. (1993). "Location Models, Geographical Information and Planning Support Systems." Journal of Planning Education and Research, 12, 84-98.
Innes, J. E., and Simpson, D. M. (1993). "Implementing Gis for Planning - Lessons from the History of Technological Innovation." Journal of the American Planning Association, 59(2), 230-236.
Klosterman, R. E. (1997). "Planning Support Systems: A New Perspective on Computer-Aided Planning." Journal of Planning education and research, 17(1), 45-54.
Klosterman, R. E., and Landis, J. D. (1988). "Microcomputers in United-States Planning - Past, Present, and Future." Environment and Planning B-Planning & Design, 15(3), 355-367.
Lee, D. B. (1973). "Requiem for Large-Scale Models." Journal of the American Planning Association, 39, pp. 163-178.
Lee, D. B. (1994). "Retrospective on Large-Scale Urban Models." Journal of the American Planning Association, 60(1), 35-40.
MacKenzie, D., and Wajcman, J. (1985). "The Social Shaping of Technology : How the Refrigerator Got Its Hum." Open University Press, Milton Keynes.
Martin, J. (1991). Rapid Application Development, MacMillan Publications Corp., New York.
Nonaka, I., and Takeuchi, H. (1995). The Knowledge-Creating Company : How Japanese Companies Create the Dynamics of Innovation, Oxford University Press, New York.
Sheppard, E., Couclelis, H., Graham, S., Harrington, J. W., and Onsrud, H. (1999). "Geographies of the Information Society." International Journal of Geographical Information Science, 13(8), 797-823.
Sieber, R. (2000). "Gis Implementation in the Grassroots." URISA journal, 12, 15-29.
Stapleton, J., and Constable, P. (1997). Dsdm: A Framework for Business Centered Development, Addison-Wesley, Boston.
te Brömmelstroet, M. C. G., Hoetjes, P., and Straatemeier, T. (2006) "Linking Information to Strategic Planning Processes." International Workshop Modeling and Decision Support for Urban Planning held at the School of Urban Design, Wuhan University. China, October 21-23
te Brömmelstroet, M. C. G. (2006). "Properly Equip the Warrior, Instead of Just Manning the Equipment: A First Step in a User-Oriented Pss Development Approach as Support for the Integration of Land Use and Transport Planning." Progress in Design & Decision Support Systems in Architecture and Urban Planning, J. P. van Leeuwen and H. J. P. Timmermans, eds., Eindhoven University of technology, Eindhoven, 35-50.
te Brömmelstroet, M.C.G and P.M. Schrijnen (2007), "Developing a meaningful PSS for land use and transport integration: first experiences from working with a Community of Practice", 10th International conference on Computers in Urban Planning and Urban Management, Brazil, 11-13 July, 2007 .
Uran, O., and Janssen, R. (2003). "Why Are Spatial Decision Support Systems Not Used? Some Experiences from the Netherlands." Computers, Environment and Urban Systems, 27, 511-526.
van den Belt, M. (2004). Mediated Modeling: A System Dynamics Approach to Environmental Consensus Building, Island Press, Washington.
Vennix, J., Andersen, D., and Richardson, G. (1997). "Group Model Building: Adding More Science to the Craft." System Dynamics review, 13(2), 187-201.
Vonk, G. (2006). Improving Planning Support; the Use of Planning Support Systems for Spatial Planning, Nederlandse Geografische Studies, Utrecht.
WBSCD. (2001). "Mobility 2001 - World Mobility at the End of the Twentieth Century and Its Sustainability." World Business Council for Sustainable Development (Prepared by MIT and Charles River Associates), Geneva, Switzerland.
Williams, R., and Edge, D. (1996). "The Social Shaping of Technology." Research policy, 25(1), 865-899.

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Cognitive Cities: interdisciplinary approach reconsidering the process of (re)inventing urban habitat.

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1 INTRODUCTION

Due to a series of economical, ecological and social factors, as well as the change in climatic conditions and the distribution of resources, by which we are all affected, and as a result of ongoing globalization, 75% of the world's population will be living in cities and urban settlements within the next 25 years. New planning tools are needed and this paper will address an interdisciplinary approach reconsidering the process of (re)inventing urban habitat.

In the last twenty years the aim of solving single aspects like infrastructure and/or housing only minimally solved the problems on a one-by-one basis. Lately information & communication technology (ICT) and new financial models have been analysed and developed creating an even more complex vision for problem solving but again not really managing to do so. The introduction of sociological models has added yet another aspect to the discussion.

The focus of this paper is to redefine the idea of 'memoria', our memory and the historical memory of a place in the future knowledge-based society. This major topic must then be considered when analysing the shaping of future urban developments. The goal is to define a different approach capable of reconsidering the process of (re)inventing urban habitat.

When enlarging the spectrum of applicable values and measures that influence urban developments directly or indirectly why not use the concept of 'culture'? The aim is to introduce a new momentum of cultural urban design.

What we are looking at is the introduction and gathering of tangible and/or even measurable qualities that are essential for the 'planning' of coherent and thus successful urban re-development. Enlarging the approach to a wider and more complex view of cultural urban design would mean the introduction of new aspects as parameters for the process.

Two case studies will illustrate the complexity of the process of re-development of urban habitat as valuable elements for the evaluation and introduction of a cultural methodology. This leads towards an interdisciplinary approach, to shape the future of urban habitat. Both case studies are embedded in a clearly defined 'memoria' situation giving a series of indicatorsessential to the process.

The last part deals with the lessons learned from the case studies. The aim is to create a series of cultural tools and measures that need to be envisaged in creating the fertile soil for sustainable urban development, as envisaged in the European Union Territorial Agenda, a real place, leading to what I will call the Cognitive City, a place with also real emotional and human qualities, a place with dignity, integrity, determination and purpose, simply a place we could really be proud of and a place to be simply part of.

1.1 Introducing a new Concept

To redefine the idea of 'memoria', the patterns of human activity, our memory and the historical memory of a place for the future 'knowledge-based society', or the future of 'global cities' as Sassen defines in 'The city in a global digital age'. This topic must be considered when analysing the shaping of future urban developments; to define a different approach capable of reconsidering the process of (re)inventing urban habitat for example in some minor European cities.

It appears necessary to overcome the idea, as Brad Allenby quotes in 'The Autonomic City' referring to William Cronon, that the city is traditionally to be considered an ultimate human environment and therefore needs to be evil: 'The boundary between natural and unnatural shades almost imperceptibly into the boundary between nonhuman and human, with wilderness and the city seeming to lie at opposite poles -- the one pristine and un-fallen, the other corrupt and unredeemed.' (Cronon, 1991) Allenby follows, that 'this perception has transitioned into much of the sustainability literature, leading to a widespread impression that cities are clearly "unsustainable", an interesting conclusion given that cities are perhaps the most sustainable artefact that humans have developed.' (Allenby, 2006)

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This paper is enlarging the spectrum of applicable values, measures and drivers that influence urban developments directly or indirectly: so why not introduce the concept of 'culture'?

This enables to 'understand the nature of cities as evolving "systems of systems"' and 'at least some of the drivers of accelerating change in urban systems can be identified, a necessary step in forming a rational and ethical understanding of the "sustainability" of cities...' (Allenby, 2006) The city becomes more complex not only from the density side of information and networks, but also from the ICT-side which supports this complexity, 'not just an immensely more competent and functional city, but emergent behaviours and characteristics that are both unpredictable and potentially quite powerful and ones that occur without passing through human institutions or filters', generating urban 'culture'.

'Culture (from the Latin cultura stemming from colere, meaning "to cultivate"), generally refers to patterns of human activity and the symbolic structures that give such activity significance.'(from Wikipedia)

What we are looking at is the introduction and gathering of tangible and/or measurable qualities that are essential for the 'planning' of coherent and thus 'sustainable' urban re-developments. Enlarging the approach to a wider and more complex view towards a concept of cultural urban design that introduce aspects like urban diversities, mobility, multiple cultures, innovative cities, migration, urban densities and multiple identities, qualities that will be tried to be identified in the course of the paper.

These new qualities gain more importance 'as we move into the twenty-first century, for cities have re-emerged as strategic places for a wide range of projects and dynamics'. (Sassen, 2006)

1.2 Issues within urban habitat

Economical, ecological and social factors, as well as the change in climatic conditions and the distribution of resources, addressing human rights, justice and dignity questions and as a result of ongoing globalization, by the year 2050 two thirds of the world's population will be living in cities and urban settlements according to the United Nations. 'Understanding the impacts of this growth on people and on the environment has become a necessity, as the links between architecture and society become both more complex and more fragile.' (Burdett, 2006) This massive change in habitat and urban landscape translates into highly varied urban developments and research programs that range from shrinking cities and mega cities on the side, historical cities and new urban designs on the other. The use of some of the ever growing number of word-creations en vogue at the moment highlights the dilemma for conventional planning tools as they are.

But it needs not to be viewed as a dilemma. 'The quintessential urban paradox comprising confrontation and promise, tension and release, social cohesion and exclusion, urban wealth and intense squalor, is a profoundly spatial equation with enormous democratic potential'. (Burdett, Kanai, 2006) Not always does urbanization go parallel with economic growth and infrastructural investments as in Asia, but also the demographic pressure and growth will continue creating an unbalance of social indicators like literacy and income through a concentration of young people as in major African cities.

> 'There is a growing awareness that the urban agenda is a global agenda. The environmental impacts of cities are enormous, due both to their increasing demographic weight and to the amount of natural resources that they consume.'

Richard Burdett with Miguel Kanai; City-building in an age of global urban transformation, Cities, Architecture and Society, 2006

The aspects Burdett introduces are also described through the examples used for the Biennale exhibition, they do not imply at a one-to-one correlation between architecture and social cohesion, 'they do raise awareness of the fragile yet significant link between the design of buildings and their impacts on society' (Burdett, Kanai, 2006) indicating a human dimension that we will take into consideration.

Sassen introduces three important aspects for the formation of inter-city geographies: infrastructure for a new global political economy, new cultural spaces and new types of politics, each a precise indication for a new cultural urban approach. The use of the term 'terrain vagues' by Sassen underlines this approach to define space 'where the practice of people can contribute to the making of public space, beyond the monumentalized public spaces of state and crown', and concludes by saying that 'micro-architectural interventions can build complexity into standardized spaces'(Sassen, 2006) which refers to the concept of 'memoria'. (Collotti, 1997) Collotti points out that 'memoria' filters the original 'form', a metamorphose takes place, the new form is analogue to the original but never identical, it is always part of a creative

process. Collotti refers to Sabini's 'Memoria' when interpreting it as a complex net of associations in the playful handling of signs and meanings typical for a mnemonic process. (Sabini, 1993)

The approach of Sassen leaves a momentum of uncertainty, exactly this uncertainty needs to be envisaged, to really contrast with the technical artefacts of the dense sites of increasing interaction to 'become actors in the networks through which we move. These acute concentrations of embedded software, make the city less penetrable for the ordinary citizen.' (Sassen, 2006) 'The city is also potentially the site where all these systems can become visible, a potential further strengthened by the multiple globalities – from economic to cultural to subjective – that localize in cities.' (Sassen, 2006) In his considerations on various city-models, of cities functioning around the clock, Drewe critically states: 'These city concepts may inspire some designers, but to reassert the grounding powers of urbanism they, too, need to be translated into instruments. Moreover, the assumption of an emerging continuous city needs to be checked against known facts of time use and uncertainties concerning future developments.' (Drewe, 2005) Drewe looks at a paradigma challenge through ICT for spatial planning combined to the idea of introducing time in urban planning and design and thus '… people and their needs as external criteria of the quality of design which is not common practice for example in comtemporary architecture…' (Drewe, 2005) The challenge that ICT which is fundamental for todays global economy (Sassen, 2002) is leading to the question of density and centrality in future urban planning. For the financial centers and main actors in the global economy, centrality has apparently become absolete through ICT, and the cities will be adressing new forms of centrality. (Sassen 1994) Sassen points out four scenarios of this new geography in the global economy: 1) the City centers and/or the central shopping areas as main forms of centrality, 2) Nodes in metropolitan zones of intense economical activities (question: real new organisation of 'centre' or moments of suburban sprawl?), 3) Formation of transterritorial centres, generated by intense economic transactions, 4) New forms of centrality produced within the cyberspace (structures of economical power with complex correlation defining sites of coordination and centrality).

But the financial sector is quite different from the cultural sector, 'both benefit from agglomeration, but the content of these benefits can vary sharply' (Sassen, 2006) as 'the new ICTs should have neutralized the advantages of centrality and density.' And Sassen continues, that 'the more these technologies [ICT] enable global geographic dispersal of corporate activities, the more they produce density and centrality at the other end.'

> 'In fact, the new ICTs have not quite eliminated centrality and density and hence the role of cities as economic and physical entities. Even as much economic activity has dispersed, the centres of a growing number of cities have expanded physically, at times simply spreading and at times in a multi-nodal fashion. The outcome is a new type of space of centrality in these cities: it has physically expanded over the last two decades and it can assume more varied formats, including physical and electronic formats.
> Centrality remains a key feature of today's global economy. But today there is no longer a simple, straightforward relation between centrality and such geographic entities as the downtown, or the central business district.'

Sasskia Sassen, Why cities matter, Cities, Architecture and Society, 2006

How to use these various fields of action, these problem zones, to resolve the open question of cultural urban design? 'In an age where shrinking resources are becoming increasingly evident, one needs to fundamentally reassess economic and cultural principles towards existing structures, spaces and products. How can one work with the pre-existing, and reinstate value in what has been declared obsolete? How can one re-engage with spaces and products that have been marginalised? Where can one discover hidden potential in existing typologies and brands that have long been overlooked?' (Entering the Evacuated Field, www.zollverein-school.de) At the Shrinking Cities Symposium in Germany Hortensia Völckers and Philipp Oswalt address the phenomenon of less chances, minor opportunities, political deficit, multiplicity and paradoxical planning in so called shrinking cities across the world by introducing the idea of 'reinforcing the local' to gap the problems envisaged. 'One essential point of departure for the new models for action that are required is empowerment of the local, a reinforcement of autonomous opportunities for action. For the development of cities, the emancipation of the local means regaining the power to shape a situation that had increasingly evaporated in the face of the dominance of centralized state regulation, the fragmentation of jurisdiction, and the rise in power of external influences.' (Oswalt, 2006)

1.3 Idea for the introduction of a new momentum of cultural urban design – the Cognitive City

To introduce the concept, Allenby's phrase in 'The Autonomic City' perfectly links a series of considerations done up to now. 'As urban systems continue to become increasingly information dense within and among different levels, (see Sassen) it will be impossible to determine what the city "knows" (see Collotti) or how it will choose to react to changing conditions or threat. (see Cronon and Burdett) Understanding the nature of these "cognitive cities" is a profound challenge, (see Oswalt) but one that must be met if the discourse on the sustainability of cities is to have any meaningful content at all.' (Allenby, 2006)

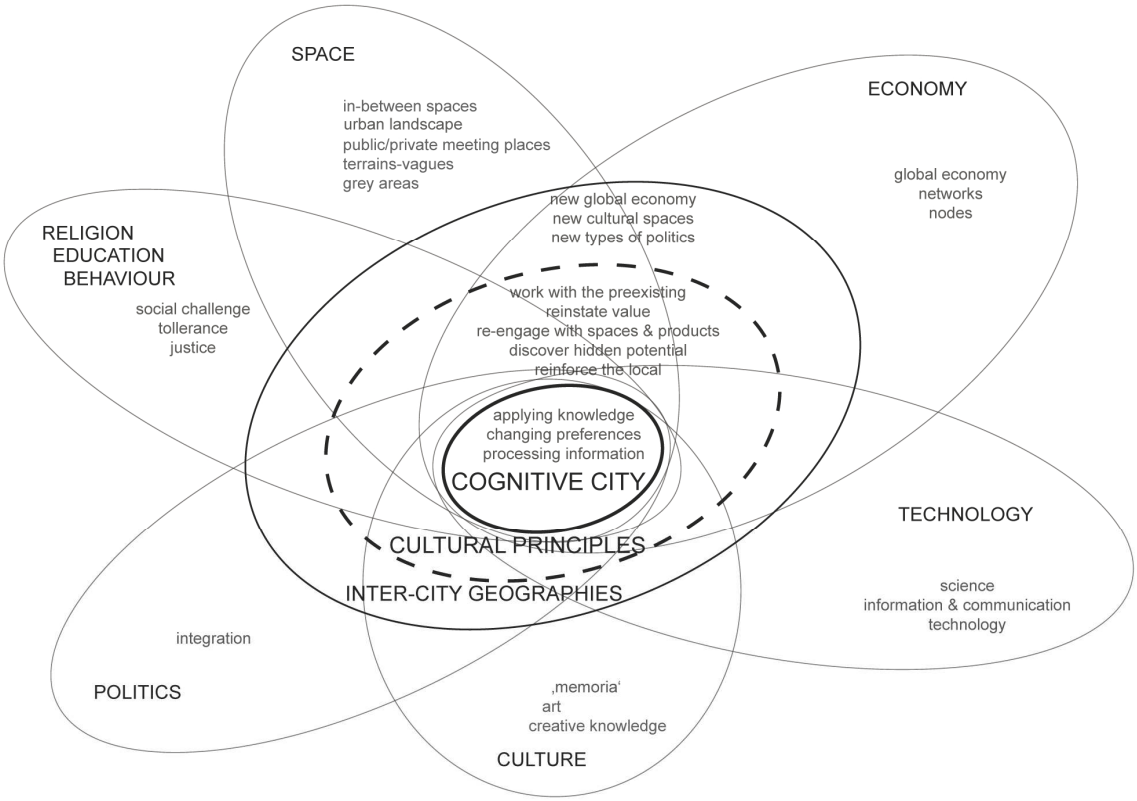
'The term cognition (Latin: cognoscere, "to know") is used in several loosely related ways to refer to a faculty for the human-like processing of information, applying knowledge and changing preferences. The concept of cognition is closely related to such abstract concepts as mind, reasoning, perception, intelligence, learning, and many others that describe numerous capabilities of human mind and expected properties of artificial or synthetic intelligence. Cognition is an abstract property of advanced living organisms; therefore, it is studied as a direct property of a brain or of an abstract mind on sub symbolic and symbolic levels.' Cognition can therefore be interpreted as the principle condition for the knowledge-based society.

As we are talking of architecture, what happens, not to the spatial qualities, but within those spaces? 'Cognitive space uses the analogy of location in two, three or higher dimensional space to describe and categorize the thoughts, memories and ideas. The dimensions of this cognitive space depend on information, training and finally on a person's awareness. All this depends globally from the cultural setting'. So the conclusion is that cognitive space enables cognition, and cognition enables knowledge; knowledge at an individual and collective level. But how can we apply this idea? Let's "borrow" the term cognitive architecture from ICTs, where 'the term 'architecture' implies an approach that attempts to model not only behaviour, but also structural properties of the modelled system.' This enables a profound paradigm change, by enlarging the spectrum of applicable values and measures that influence urban developments directly or indirectly, started by Drewe by introducing 'time' to urban planning. (see Drewe 2005)

Cognitive architecture is used in the two fundamental tools of the ICTs: 'Adaptive Control of Thought--Rational (ACT-R) developed at Carnegie Mellon University under John R. Anderson and symbolic cognitive architecture (SOAR) developed under Allen Newell and John Laird at Carnegie Mellon University and the University of Michigan'. In this paper it will be used as the idea of the "cognitive city" being a planning approach for cultural urban design.

Cultural Setting is the motivation for F. Collotti's and G. Pirazzoli's projects of small interventions on the sites of a series of Trentine Fortresses considering the memory of the place as the trigger for the overall project. A process that Collotti defines as 'fare sistema' (creating a system) based on a cognitive approach to involve all stake holders by processing information, applying knowledge and changing preferences. It is an Italian phenomenon to use 'memoria' to develop new approaches. The concept at the Cittadellarte Fondazione Pistoletto, 'Art as the engine of social change', where 'Art is the most sensitive and complete expression of human thought and consequently the landmark of every cultural, economic and social activity. The responsibility of art is to create the principles of a new classical harmony that through aesthetics and ethics balances all elements of society. Artists should therefore take on the responsibility of establishing ties among all human activities, from economics to politics, science to religion, education to behaviour, and to reconnect all the threads that make up the fabric of society. The idea of creative engagement where we take responsibility not just for ourselves, but for our broader environment and for our planet and its future [and the] University of Ideas, UNIDEE is a workshop where the arts are integrated with humanistic, scientific and social disciplines such as economics, politics, education and religion.' (UNIDEE, http://unidee.cittadellarte.it)

'Art is the most sensitive and comprehensive expression of thought and the time has come for the artist to assume responsibility for establishing communication between every other human activity, from economics to politics, from science to religion, from education to behaviour, in brief all areas of the social fabric.' (Michelangelo Pistoletto, Progetto Arte manifesto, 1994)



Graph 1: Graphical description of the idea – Cognitive City, Tusnovics, 2007

The diagram explains the concept of the cognitive city and shows how, “to plan is not enough!” for or “problem”. We need an approach that re-links to cultural urban design. How can we use these new aspects as a new planning tool?

2 THE CASE STUDIES AS FIELD EXPERIMENT

The two case studies serve to verify the idea of the approach of the envisaged process in planning. The applied methodology follows four steps: 1) individuation of parameters for the analysis, (parameters) 2) the case presentation, 3) data collection and confrontation with the cognitive city idea, 4) evaluation of the case study data (lessons learned).

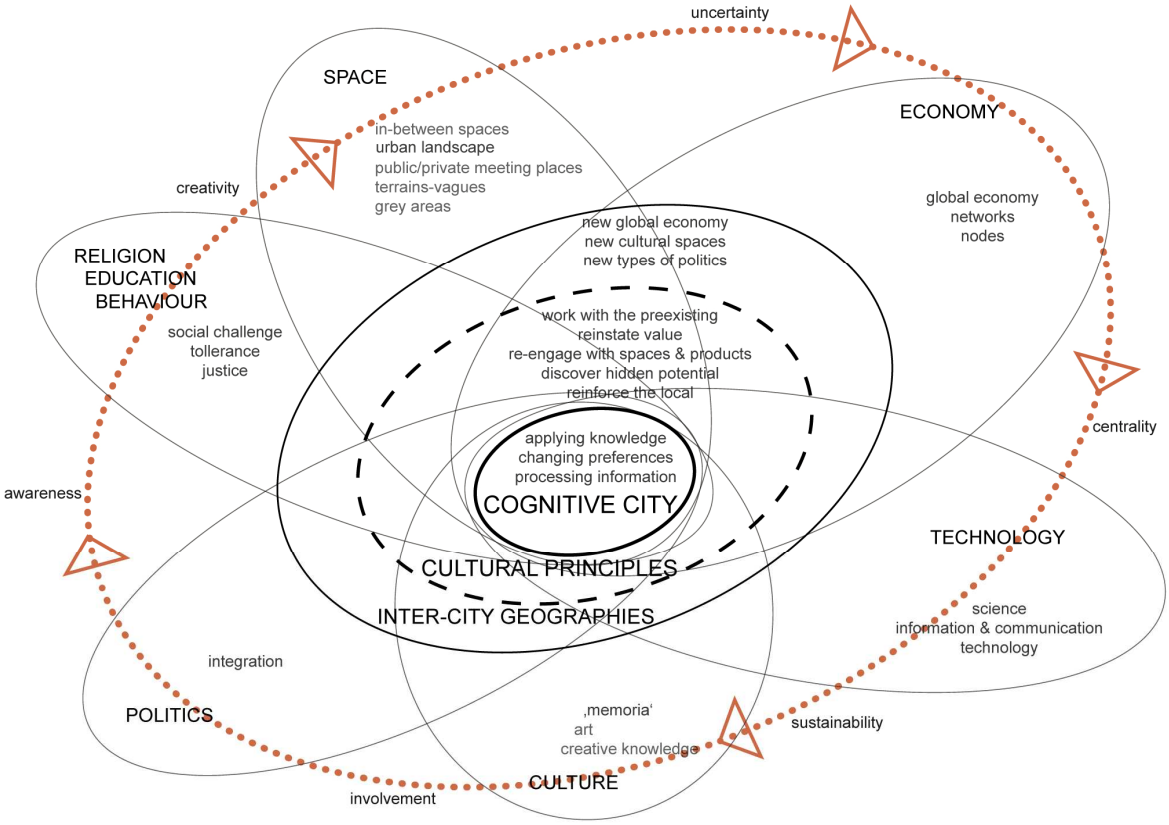
2.1 Parameters for the case study analysis

The chosen parameters are the result of an interdisciplinary analysis of today’s planning approach, the individuation of issues in these processes and the introduction of the cognitive city as the idea for a new momentum of cultural urban design. (see graph 1) The result is a series of parameters to apply to the interdisciplinary considerations on the planning process for urban habitat.

Major social, political and economical challenges are present in cities today, ‘often in both their most acute and their most promising forms: the sharpest juxtapositions, like the rich and the poor, but also struggles for housing; anti-immigrant politics, but also multiple forms of integration and mixing; the most powerful and globalized economics, but also a proliferation of informal economics; the most powerful real estate developers, but also the largest group of builders in the world today: people making shanty dwellings.’ (Sassen, 2006) To respond to these challenges it has become an evident question whether cities could not ‘become platforms for new types of global governance?’ This indicates for the parameters to resolve complex questions that will open to new fields of development of future research questions.

Some of these questions have already been listed by Burdet, by indicating cities as future centres of tolerance and justice for people, they should reduce the impact on the global environment by embracing dense and compact development, their physical form should foster a landscape of greater complexity and integration between people and spaces, they should harness the potential of public transport not only to use energy more efficiently but also to provide access to economic and social progress, they should inspire their citizens with

beautiful and accessible architecture and public spaces and good design and governance of cities should exercise that fundamental right of the polis to create a fair and democratic environment for the over four billion inhabitants who will inhabit the urban landscapes of the 21st century.' (Burdett, 2006)



Graph 2: Parameters and application – Cognitive City, Tusnovics, 2007

For the interdisciplinary approach towards the cognitive city we have used a classification that enables a creative cultural approach to urban design. The cognitive city is a 'place' that:

- enables involvement,
- generates awareness,
- uses creativity,
- deals with uncertainty,
- looks at centrality and
- implies sustainability for future urban habitat questions.

These parameters serve when linking topics like space, economy, technology, culture, politics as well as religion, education and behaviour and considering also the intrinsic 'problems' within and between these topics.

Florida argues that '"place" is the key economic and social organizing unit of our time. Places provide the ecosystems that harness human creativity and turn it into economic value. The task before us is to build new forms of social cohesion appropriate to the new Creative Age and from there, to pursue a collective vision of a better and more prosperous future for all.' (Florida, 2002)

2.1 Case studies and data collection

The two case studies are confronted with the goal of relating to the cognitive city, to analyse the approach as a new system and to determine points of interest. It is not the aim to define a general or universal method but to analyse and confront the complex planning process of re-vitalisation projects with the cognitive city idea. Both case studies are real projects in real urban settings and both have not been realised jet.

It is not the universal rules we are trying to define, but through the collection of data and the analysis within the context of the parameters, allowing for valuable results for the approach of similar projects under similar conditions.

2.1.1 Case 2: Entwicklungsideen Pernerinsel – Hallein

The project 'Entwicklungsideen Pernerinsel – Hallein' developed by H. Pöschl (ICCM, Salzburg, 2006) is a research project situated in the medieval town of Hallein some 20 km south of Salzburg. The project comprises the old city centre on the Salzach River and the Perner Island which hosted the salt works. Hallein spreads over an area of 27 km² with 18.900 inhabitants and is the second largest city of the Salzburg Region. With the 1989 closure of the salt works on the Perner Island, and the consequential economical decline of the city, a series of initiatives to reactivate the city of Hallein have been launched.

The city of Hallein, http://www.hallein.gv.at/de_galerie_hallein-ansichten_2_5.html

This project, elaborated by the ICCM, envisages a 'renaissance' of Hallein by introducing content to the industrial architecture of the salt works and links the island to the city using the notions of creative industries to involve the entire city in this process. The focus is to transform the urban structure of the Perner Island and the historical centre by re-inventing the content and use of the urban landscape.

2.1.2 Hallein data collection and analysis

'Entwicklungsideen Pernerinsel – Hallein' is based on three levels of action and involvement: a) creative city Hallein as frame for motivation and enthusiasm, b) generating of a creative ambience, c) Perner Island as the shaping key-project.

Hallein has great potential as a creative city, therefore the city can be seen as place for entertainment and social components, which requires a new bill of laws to enable the necessary creative ambience. The project addresses a series of informal social relations for local innovation as result of collective learning processes. The 'creative milieu' is based on material components like infrastructure, immaterial components like know-how as well as institutional components which have the decisional powers. The 'creative milieu' is seen as the unification of local milieu with the innovations network. The stakeholders are the city of Hallein, cultural components within the city and the universities. The focus goes towards a creativity terminal on the Perner Island as central focalisation of all existing activities (cultural and social) accompanied with new ideas for a cultural centre on the island within the salt works.

a) The project does not reconsider the inter-city geography, it is based on existing structures and it does not consider all aspects of action. It does involve politics but it does not use technology and economy or space or demographic aspects. b) The project can not be considered part of a global economical system. It seems evident that a strong focus is put on existing and local aspects within the city, but no focus on the other principles. c) The parameters seem not primarily to have guided the process. Most aspects are hardly touched or addressed, like a series of fundamental stakeholders, that appear not involved or considered and other basic aspects for the cognitive city, like the economy and technology seem to be missing.

2.1.3 Case 1: Porto Vecchio di Trieste PO_VE_TS

The PO_VE_TS (Porto Vecchio di Trieste) research project is about the old Austrian harbour of the former empire in the heart of the city of Trieste. The old harbour, in disuse since the 80es, is a coastal strip of land on the Adriatic Sea, covering an area of approximately 700.000 m² and some 1.000.000 m³ of built structures sealed of from the city by the railroad system.

The old harbour of Trieste, http://www.porto.trieste.it/custom/sez_archivio1.php?id=33

The built structure (some 35 warehouses and support structures of high architectonic and historical value) have become apetible to the various players of the harbour authorities but also to the various political powers like the municipality of Trieste, the Province of Trieste and the region Friuli Venezia-Giulia.

The research project, funded by the European Community through the ENAIP of Trieste, elaborated by E. Porro, reflects the necessities of all involved players and confronts the ideas of the various stake holders by confronting the communication within the entire project. The main focus of all projects is the transformation of this urban habitat and the re-invention of the city by integrating this segregated surface into the existing urban fabric.

2.1.4 Porto Vecchio di Trieste POVETS data collection and analysis

PO_VE_TS was set up on five layers of communication: a) Collection of the projects by various possible players, b) analysis of the existing built structure, c) collection of similar interventions in other European cities, d) other interventions and project ideas involving the harbour area promoted in Trieste and e) the MÈTA project reflecting the possible/non possible actions on that surface.

(1) Autorità Portuale di Trieste with Studio Boeri: Based on a concept of open planning for the process and for structural questions. The base-steps are the individuation of activities for the area, then the structural proceeding within existing buildings for re-qualification by restructuring/substitution/subtraction. The project considers the entire area as a homogeneous zone with maritime focus like the ferry-boat harbour for passenger traffic, exhibition space for maritime themes, directional centre and innovation centre for maritime activities and an access and traffic concept with clear diversification for local and through-traffic. A marketing concept combined with political backing and an economic concept for the area was presented. a) What changes have been adopted for the inter-city geography? This project has a positive record for all aspects. The economical dimension is not clear as to what extent it will enable the process of change. The project very much lives of the aspect of inter-city relations and therefore it appears more than necessary to deepen the interrelations of each side. b) How are the cultural principles applied? Reinforcing the local is an aspect that is not evident in the process even though the cultural dimension is present in the entire project. c) Are the 'parameters' visible in the planning process? To a large extent this is more than evident, even though sustainability and awareness are parameters not considered.

(2) Associazione Spedizionieri del Porto di Trieste ASPT – ASTRA: The Project identifies the elements of need, like infill of certain areas, and demolitions and the elements of use like the container surface and the ferryboat area. The project reflects the exact needs of who operates within the harbour, and does not seek to relink the area to the rest of the city. a) The project ignores in great part the rest of the existing city, only

other parts of the harbour-structures are set into relation. b) Aspects of a cultural value are completely ignored, and the relations of the interventions envisaged to one another have no clear focus. c) The idea of creating a cognitive-city is not the aim of this project, that

(3) Trieste Futura with Manuel de Sola e Morales: The three basic ideas are new spaces for harbour use, minor investment that can be self financed and the entire area divided in separated areas according to functions as tourism, exhibition, and cultural, commercial, artisan. Operational aspects are development of new functions for the harbour, new functions for the city and reduction of traffic and parching problems in the centre by shifting into the PO_VE_TS area.. The Morales project had special elements of major importance like the Trade Centre/hotels/ offices/shops. a) The approach of this project is based on changing the inter-city geography by opening the area to new economical and political actors. b) The idea is a soft intervention, which does not define any new or strong parameters. It does not really support change, the parameters are used as hidden continuity. c) At a first glance, certain aspects are covered. Missing parameters are the question of centrality, uncertainty as well as awareness and sustainability.

(4) The communication materials of the existing projects on the old harbour (until the presentation of the PO_VE_TS research, as many more projects have been done since) that was collected is the base for a comparative analysis. This analysis represents clearly projects that belong to urban planning tout-court. Projects that consider only part of the area (besides the Boeri project) that often do not consider the old harbour as a whole and the space-complexity is related to only from its functionality, or to get the feed-back on the political-economical level for investment, as well as the necessity to issue legislative instruments as a master-plan. The graphical transposition of the design process used in the MÈTA-project PO_VE_TS reflects a work in progress approach more than a definitive final urban project: 1) the net/grid necessary as support to the relations of all actors and stake holders involved; 2) the levels/stratifications of various dimensions and heights as communication and interaction platforms wrapping and protecting the existing warehouses; 3) the bridges/axis linking the harbour area with the city in order to mend the communication: 4) the snake/crossing line that unwinds through the entire surface generating movement and dynamics; 5) the dome shaped tenso-structure/structure protecting the area with its precious spaces and for its uniqueness. a) Between simulation and urban project, occupying the voids (drawn levels) the existing warehouses gain a metaphysical dimension of emergence from the past in an upside down scenery, that very well describes the inter-city geographies. b) All applied references and projection topics for the urban transformation at the MÈTA-project level are based on cultural principles. c) This is only a starting point to a cognitive transformation, by applying the possible parameters to the graphical MÈTA-process.

3 LESSONS LEARNED

Interesting enough that neither of the analyzed projects is in the phase of beeing implemented. Only single aspects are beeing adopted, often more for the necessity to have some kind of action than because they are following a real plan.

By adopting the cognitive city, a series of questions will have to be addressed like: What changes have been adopted for the inter-city geography?; How are the cultural principles applied?; Are the ‘parameters’ visible in the planning process?

A space to future research is opened by the cognitive city idea and a first step is done. One of the major aspects is a clear view of the complexity involved. The cognitive city idea enables a broader view, that makes certain absences evident during the process and obviously asks for a more open and cultural approach towards urban habitat questions.

4 CONCLUSIONS FOR THE ‘COGNITIVE CITY’: CHALLENGES AND POTENTIALS

A series of challenges and potentials are found within the interdisciplinary approach reconsidering the process of re-inventing urban habitat to generate a cognitive city. The case studies, the general sources of information and the analysis based on graph 1 leads to a series of conclusions:

The nead for new political systems form new claims by informal political actors that will materialize and assumes concrete forms.’ In order to profoundly change the approach we need to reconsider the relations of these cities to the typical urban topographic representations and measures we are using today. ‘Could it be that precisely what urban topography misses [today] is a new type of inter-city potential? At a time when

growing numbers of people, economic opportunities, social problems and political options concentrate in cities, we need to explore how urban governments can work internationally to further global governance.' (Sassen, 2006) An important task for urban habitat is the need of social structure of creativity, a supportive social milieu, open to creativity – artistic and cultural as well as technological and economic. 'The social and cultural milieu provides a mechanism for attracting new and different kinds of people and facilitating the rapid transmission of knowledge and ideas' (Florida, 2002) on the brink of the knowledge-base society. Urban habitat will have to deal with its empty and unused spaces, often characterized more by memory (see Collotti) than current meaning. These spaces are part of the interiority of a city, even if outside of utility-driven logics and spatial frames. 'These terrains vagues allow many residents to connect to the rapidly-transforming cities in which they live and subjectively to bypass the massive infrastructure dominating more and more spaces in their cities. Keeping some of the openness might make more sense in terms of factoring future options at a time when utility logics change so quickly and often violently, excess of high-rise office buildings being one of the great examples.' (Sassen, 2006)

Lynch's discussion on urban theory for the make of a 'good city' focalizes in the development of a general normative theory by identifying a set of performance dimensions, leaving space for individual priorities. He defines five criteria, plus two "meta-criteria": vitality, sense, fit, access, control, plus efficiency and justice. Lynch defines his general normative theory as a work in progress, (Lynch, 1981) which indicates the complexity for the definition of an overall valied approach for urban planning. The cognitive city is to be considered as work in progress, with a series of options within the process, that will need further research, to enable a new tool for a planning of new and requalified urban habitat.

5 LITERATURE

ALLENBY, B.: The Autonomic City, The Allenby Column, 2006
[online] URL: http://www.greenbiz.com/news/columns_third.cfm?NewsID=29382
BURDETT, R.: Introduction, Cities, Architecture and Society, La Biennale di Venezia, Marsilio, 2006
BURDETT, R., KANAI, M.: City-building in an age of global urban transformation, Cities, Architecture and Society, La Biennale di Venezia, Marsilio, 2006
COLLOTTI, F.: La Memoria della Grande Guerra in Trentino; Provincia Autonoma di Trento, 2005
COLLOTTI, F.: ARCHITEKTUIRTHEORETISCHE NOTIZEN; ETH Zürich, 1997
CRONON, W.: Nature's Metropolis: Chicago and the Great West, W. W. Norton, 1991
DREWE, P.: ICT and Urban Form; Delft University of Technology, Faculty of Architecture, 2001
DREWE, P.: What about time in urban planning & design in the ICT age?; CORP 2005, 2005
FLORIDA, R.: The Rise of the Creative Class; Basic Books, 2002
LYNCH, K.: A Theory of Good City Form. Cambridge, MA., MIT Press, 1981.
PISTOLETTO, M.: The "Progetto Arte" manifesto (1994)
[online] URL: http://www.cittadellarte.it/citta2005/pdf/pub/ProgettoArte_manifesto.pdf
SABINI, M.: Stichwort <Memoria> in: Semerani, Dizionario Critico, CELI, Faenza, 1993
SASSEN, S.: Die neue Zentralität
[online] URL: http://www.heise.de/tp/r4/artikel/6/6028/1.html
SASSEN, S.: Locating Cities on global circuits, Environment & Urbanization, Vol. 14, No. 1, 2002
SASSEN, S.: Why cities matter, Cities, Architecture and Society, La Biennale di Venezia, Marsilio, 2006
SEMERANI, L. (Ed.): Dizionario critico delle voci più utili all'architettura moderna, CELI, Faenza, 1993
TALKING CITIES, Entering the Evacuated Fields, Symposium at the Zollverein, September 2006
[online] URL: http://talkingcities.org/talkingcities/pages/193_en.html

http://en.wikipedia.org/wiki/Culture
http://en.wikipedia.org/wiki/Cognitive
http://en.wikipedia.org/wiki/Cognitive_architecture
http://www.cittadellarte.it/citta2005/eng/home/home.htm
http://unidee.cittadellarte.it/
http://www.porto.trieste.it/custom/sez_archivio1.php?id=33

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Integration of incomplete and scattered information to help urban planning and decision-making – With special reference to Tehran

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1 INTRODUCTION: PROBLEM UNDER STUDY, PURPOSE AND METHOD

Urban planning involves processes of making and implementing spatial decisions and policies on different aspects of urban life such as housing, employment, education, recreation, etc. and it has wide-ranging information requirements which depend upon many sources of production, public and private, formal and informal. The cities of the less developed countries (LDCs) – more than their counterparts in more developed countries (MDCs) of the world, face major problems in managing their structural changes. The experiences of cities in the MDCs have usually proved inappropriate in the LDCs and consequently new and innovative solutions are continually being explored for these cities.

This paper is concerned with the integration and sharing of spatial information which from one side can be classified into different functional categories (such as natural and environmental resources; physical spaces and space uses; socio-economic, political, etc. dimensions and organisational structures of urban life) and from the other side can be categorised according to different geographical levels. This information that may be termed urban planning information (UPI) is important in any urban planning activity – correctly or incorrectly - done under the title of urban planning. Considering their use in a cycle of planning, they may be identified "as related to different stages of policy making, implementation of the plans and urban management (refer to Nghi and Kammeier, 2001, p. 62). The study of UPI is done with the intention to devise an effective way to integrate various sources of information for the requirements of decision making in different stages of any urban planning cycle, as well as setting up relations and interactions between various spatial data users and producers within any information system or urban planning context.

In this paper, the existing approach to urban planning in a case example, i.e., the city of Tehran (the capital of Iran) will be reviewed in order to be able to follow briefly its UPI requirements, the problems and shortcomings that exist in relation to the collection; accessibility; accumulation and integration of not only the plans but also the UPI. Then a simple urban strategic planning approach that can be used first as an improvement of the existing planning approach and second as a basis and guide for integrating both plans and UPI, (with special reference to Tehran, but with an tacit potential to be applied in similar contexts) will be presented. This can ultimately (i.e., outside the agenda of this paper) lead to the introduction of a more refined multi-criteria urban information and planning model matching the simple urban strategic planning approach. Also, the multiplicity of this city's information sources will be reviewed briefly in order to find the ways of integrating these varying sources and proposing a framework, including the participation of all stakeholders. The paper concludes by suggesting that simple, low cost, easily maintained and user-friendly spatial UPI systems have the best chance of success in the cases such as Tehran that the integration of both plans and UPI seems to be a very difficult task under the present decision-making and organisational environment.

2 PLANNING CONCEPTS AND INFORMATION REQUIREMENTS 1

Information plays a central role in planning (refer to Rubenstein-Montano, 2000, p.156), whether in the MDCs or the LDCs.

During the post Second World War period, in many European countries, urban planning was essentially an exercise dealing with "the physical planning and design of land-use and built form" (Taylor, 2005, p.34-5 and 46). The "general and fundamental criticisms" of the prevailed approach to urban planning, was mainly towards the lack of an adequate understanding of the phenomena" and" how they are actually functioning and being based on "very little empirical analysis" and "an inadequate comprehension of the complex relationships between physical environments and social life", as well as "failing to grasp" the "problems of human social life and its manifestation in cities" (Taylor, 2005, p.46, 54). This ultimately led to radical changes and the introduction of adapted concepts of planning. Primarily it was the rational process view of planning (refer to Mc Loughlin, 1971, and Chadwick, 1971 and Faludi, 1973 in Taylor, 2005). This concept of planning was reflected in the strategic plans which had due consideration to the social and economic as

well as physical aspects (also refer to Taylor, 2005, p.63). Considering the debate about the necessity and implication of this view of planning about the adoption of a comprehensive approach to planning and the difficulty of gaining a comprehensive knowledge and access to the relevant information about the environment to be planned, an alternative approach " which claimed to be "more relevant to the real world of planning and policy-making", i.e. the incremental or piecemeal approach, was later introduced (refer to Lindblom, 1959 and Pettit and Pullar, 1999, pp.340-41). The Mixed scanning approach as was also introduced, "distinguishes more fundamental or strategic decisions from more detailed decisions" (Taylor, 2005, p.73). In fact the mixed scanning approach as "a hybrid model of both the rationalist and incrementalist approaches", "involves imposing patterns on information received, formulating a program within this framework and going back to changing that framework when- ever one gets stuck on the more detailed level (refer to Faludi, 1973).

"it is now generally accepted that one can not investigate the effects of the planning system independent of its political economic context, and that the market system of land development in particular plays a crucial role in determining the outcomes of planning practice" (refer to Taylor, 2005, p.107). Broadly speaking, it can be said that in many countries of the world – more or less developed - either the traditional (i.e. master planning), the rational comprehensive or some form of mixed-scanning approach are or has been practiced. The major point about the adoption of any of these approaches, in any country or city, is that of their process, the different stages of the adopted process, the adaptation of the process to the local conditions and the UPI requirements of each of the stages. Almost all these stages not only require spatial information but also considerable information processing and analysis. Part of the information requirements of the planning process, especially problem formulation and evaluation of the existing conditions, require the collection, manipulation and analysis of spatial features in order to be able in the following stages of the planning process to generate plans, strategic and operational. Problem formulation and the evaluation of conditions require the collection; manipulation and analysis of spatial features in order to generate plans (refer to Pettit and Pullar, 1999, P.342). Adoption of planning approaches developed in the MDCs, in the LDCs has always posed problems that can be stated as (a) "the inherent differences between planning problems" in the two groups of countries, and (b) "the large dichotomies between indigenous legal or customary traditions and the foreign legal system from which the model for planning provision was derived" (McCoubrey, 1988, p. 371), and (c) the differing degrees of adherence to and acceptance of the idea and practice of planning.

Different planning concepts have varying information requirements: Master or strategic planning, incremental or mixed scanning approaches versus each other and also versus urban management procedures have varying information requirements. Management practices require agencies to use more detailed information for routine operations. These different requirements can "explain the existence of various specialised ad hoc systems in urban planning, such as management information system (MIS), land information system (LIS), and urban GIS" (refer to Nghi and Kammeier, 2001, p. 63). One important point about using the methods devised in MDCs is that general principles and analytical tools that have been developed there cannot be used in LDCs without considerable modifications and adaptations and there is a need for the development of new approaches appropriate to the varying conditions (also refer to Masser, 1974, p. 157)

3 DISINTEGRATED SOURCES OF UPI

While there are many data sources in any city –formal and informal, organised and unorganised - the official procedures are not usually capable of sharing and integrating necessary information to support decisions when planning and managing an urban environment. Also in any city – apart from information shortages – there are many hidden data potentialities that are not used and are not included in or part of an established and effective UPI system. In addition, any decision-making activity involves combining various types of information in order to analyse the different elements of a spatial structure and their interaction. Integration of not only disconnected but also incomplete and scattered information with varying information sources can reduce information uncertainties and reinforce the effectiveness of decisions to solve problems in an urban area.

Different stages of a planning process - whether comprehensive or incremental - including problem formulation and evaluation of policies, require the collection, manipulation and analysis of spatial information. Also, integration and sharing of (spatial) information among different urban information users

and producers can be considered as key element of both an urban planning and management system and the relevant decision support system. This is while any city lacking the appropriate information system, or being unable to set up such a system, or unable to coordinate and integrate urban information – especially in a disintegrated planning setting - will enhance the uncertainties and constraints surrounding its decision-making environment.

4 INFORMATION SYSTEMS, BARRIERS AND URBAN PLANNING

Planning has an integral part which is the collection, manipulation, and analysis of spatial data (refer to pettit and Pulman, 1999, P342). Although it is usually presumed that both producers and users of UPI have ample knowledge and access to necessary tools to define and represent their UPI requirements, in many countries, it is not always true. In fact "in the information era, there is still the contradictory situation of information-poor activities and the under-utilisation of advanced information tools (such as GIS) and this is while the "drastically needed data remain unavailable" (refer to Nghi and Kammeier, 2001, p. 62) for urban decision makers and for building an appropriate UPI system.

The advent of sophisticated information systems and advanced computer-based tools has been not only greatly useful for a wide range of urban planning and managing functions, but also has facilitated the storage, updating, retrieval, and display of spatial data. Their use is expected to facilitates the production of more useful information products, increases planners' ability to analyse spatially related phenomena, and help provide the basis for more informed public and private decision making (also refer to Nghi and Kammeier, 2001, p. 62-4)

These systems have been used to an increasing extent in many LDCs (refer to Klosterman, 1995, p 2), and even where the decision-making environment, planning and information systems are incomplete, disintegrated and not prepared (i.e, is not equipped with all the necessary instruments), public resources are limited or resources allocated to public are not sufficient, and experience with advanced information technologies compared to some MDCs has been (at least until recently) almost missing (also refer to Dyckman et.al., 1984). As a result, some LDCs provide both "the greatest opportunities for - and the most significant obstacles to – using advanced information systems along with computer-based tools for planning" (refer to Klosterman, 1995, p. 2).

Recognising the fact that these systems are tools for storing, manipulating, displaying and analysing spatially related data, it becomes clear that the availability, continuity and quality of data are essential components of such systems. If the data are inaccurate, incomplete or discontinued, the use of sophisticated information systems will only be useless and would be nothing more than the waste of much needed resources in many LDCs (also refer to Klosterman, 1995, p. 2).

In many countries, data on many features of an urban system and many areas of human life, are almost readily available or can be obtained from different official records. However, public agencies around the world are discovering that much of these data are outdated, inconsistent, incomplete, designed only for administrative or regulatory purposes, and very difficult to integrate (also refer to Klosterman, 1995, p.4-5). The weaknesses of some of the LDCs in terms of availability, access, processing and integrating information – as referred to in different studies - reveal some facts that can be listed below (refer to Klosterman, 1995; Bishop et al, 2000, Pettit and Pullar, 1999):

- Lack of adequate data, as a considerable amount of social and economic data is usually collected at national levels, but very little on a local level.
- Local authorities often have very limited data-collection capacities.
- The collected data are often not collected with the aim of being part of an information system or to be usable for a much wider range of applications and be used along with computer-based tools for planning.
- The collected data are not consistent with respect to time, geographic coverage, or definition, making data integration extremely difficult.
- Digital representation of spatial data is sometimes rare due to the lack of appropriate equipment and trained staff.

- Information about state owned land or government property is poor and restricted (especially where there are large military land holdings).
- Most information about land ownership and utilities are in the hands of personnel in separate departments and as a result can be easily lost or mishandled.
- Information about the location of underground utilities and facilities is often worse than the maps showing above the ground features.
- Where maps exist they are often out dated or classified as restricted information and access by public or public departments is very difficult.
- Where current and unclassified maps exist, they are usually of different scales aggravating the problem of efficiently sharing information.
- •Large-scale base maps are often unavailable. When available, they are often extremely out of date, making them of limited use especially for monitoring the rapid, unplanned, and unregulated growth of larger cities.
- •The most readily available spatial data are usually collected through remote-sensing techniques that deal primarily with land cover and the physical environment. As a result, socio-economic and land-ownership data that are essential for urban and regional planning are generally lacking; the data which are available are often limited to census data.
- •The difficulty of collecting accurate and current information on current population and land-use patterns is compounded by the existence of a large "informal sector" that resists the collection of more reliable information in the fear that it will be used against them.
- •Data collection efforts are frustrated by outdated, understaffed, and inadequately funded municipal and district data collection and storage systems that cannot keep pace with constant changes and complexity of human and urban systems.
- •Information collected by government can be extremely difficult to obtain. Many countries view "official" information as confidential. Some countries restrict access to information related to financial, commercial, and trade where speculation might take place. Other countries treat data on geological or natural resources obtained by aerial surveys and remote sensing as military secrets. In others, politically sensitive information is used with extreme caution or suppressed entirely.
- •The lack of current data is compounded by issues related to data quality. The data that are available are often out of date, severely limiting the appropriateness for any planning effort.
- •The collected data are often collected by non-planning local and regional agencies without any concern for their appropriateness for planning.
- •A lack of organisational procedures for monitoring and coordinating the frequency of data updating or for verifying the collected data.

The lack of reliability, consistency and coordination of UPI in many LDCs - including the case example of this paper - results from factors such as administrative inefficiencies, resource limitations and the shortage of skilled personnel and technical expertise as well as lack of funding or political will to support the construction of the UPI system. They also reflect a lack of appreciation of the policy makers; urban planners and managers for the different aspects of application and importance of information systems in any urban planning and managing activity especially when continuance and sustainability reveal themselves as important agendas, locally and internationally (also refer to Klosterman, 1995, p.5). According to the experiences in the MDCs, construction of UPI systems are resource consuming. Thus, the huge costs involved in developing and maintaining an integrated UPI system pose a challenge to fund-scarce urban authorities in many LDCs.

5 BARRIERS TO SET UP UPI SYSTEMS IN TEHRAN

Past and present attempts for integrating urban information in Tehran have revealed limited success because they have failed to introduce a continual and an effective model to, (a) coordinate the planning activities; (b) setting up a hierarchical order in plan preparation as well as a horizontal and vertical relationship between

the information, the content of plans and the processes of planning; (c) coordinate the information requirements of various agencies involved in planning and managing different aspects of Tehran (d) balance the varying interests and circumstances of involved stakeholders, and (e) integrate the various attempts by different stakeholders at different periods of time in terms of setting up a UPI system (Figure 1). Another obstacle to adopt an integrated UPI system in Tehran is that the access to the sources of information involves complicated, expensive and lengthy official procedures. The availability of spatial information for Tehran is not as "poor or non existent" as is said to be for some cities in some LDCs (refer to Bishop et al, 2000, p 87). In Iran, during the last decade, GIS has been used vastly for identification of resources and management of urban and environmental projects, though the practice of analysing the development models by using GIS in urban development planning, is a new experience (refer to Gharagozlou, 2003).

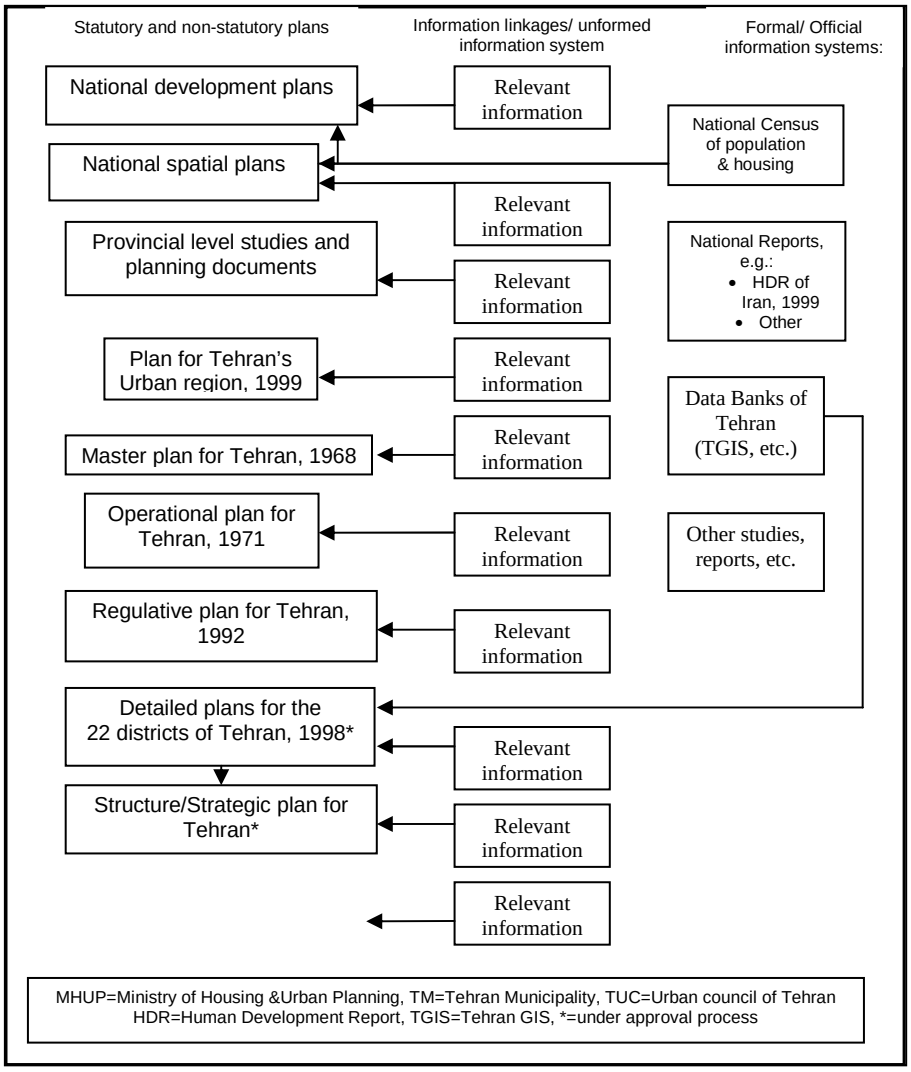

Figure 1: Disintegrated plans, disintegrated information linkages/ unformed information system in Tehran
Source: Writer, 2007

6 PRESENTING A CONCEPT FOR INTEGRATING UPI IN TEHRAN

In order to present an appropriate and effective concept for integration and sharing of UPI in Tehran among all the relevant stakeholders - in a sustainable process, and not in an once and for all time action - a process introducing a planning cycle embracing the urban information system for Tehran, based upon the adaptation of the existing conventional planning method and (step by step) replacing it with an approach more similar to mixed-scanning, is introduced. The improvement of current planning method is suggested in the light of the knowledge gained of the deficiencies in its planning system of Tehran (refer to Daneshpour, 2005) with the intention of emphasising on the key elements and decision areas which are involved in the process of change in this city (Figure 2).

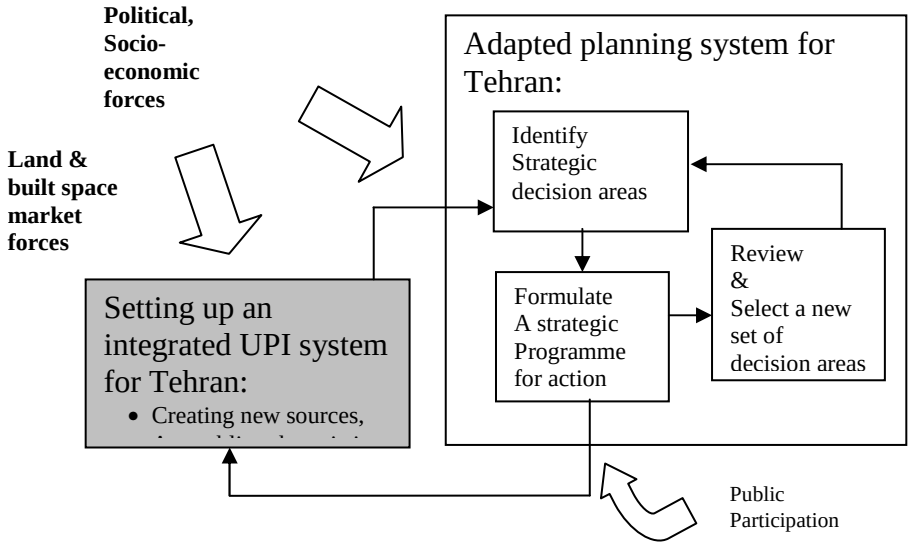

Figure (2): The proposed process of information integration and planning in Tehran
Source: Writer, 2007

7 CONCLUDING REMARKS

This paper tried to make broad suggestions for integrating information from varying sources and for improving the effectiveness of urban information systems in such cities as Tehran. This is accomplished by shifting emphasis from both the primitive methods of data collection, from one side, and from the other side, the more refined tools developed to support decision making, to a more adapted, sustained and user friendly UPI system. Such a framework will show particular promise for improving planning activities because of its potential for a people-oriented focus and establishment of an integrated decision support system. The need for an iterative public participation process, which can enable feedback at all stages within the planning process, is stressed. For these purposes, there is a need to develop a set of planning tools to assist - not replace - planners in the analysis of problems and the generation of plans: tools to help planners and decision makers to make better-informed decisions, be transparent and use integrated and qualitative-based information in the planning process.

To integrate and share the UPI in Tehran - or in any city with similar circumstances - there is a need to improve existing methods and actions and build a one step at a time system that relies deeply on interrelations. The difficulty of developing an up-to-date and reliable UPI system in Iran – as in many other LDCs - makes it essential that these countries adopt a staged and an incremental process of both urban planning and UPI system establishment. This will be based on the idea that it is better to have a modest system in use than an elaborate one that remains ineffectual. An incremental strategy also imposes fewer demands on existing limited resources and is less vulnerable to organisational, political and environmental changes. The most successful systems have often been some of the simplest, which are immediately useful for improving the urban planning and information collection processes.

When there are numerous barriers such as limitation of resource, and different constraints, it is essential for planners to focus their attention on the data infrastructure which supports the system and adopt modest incremental processes. Otherwise the information systems and advanced computer-based tools will only be another expensive and short-lived whim that does little to tackle the problems and respond to the real needs of people (also refer to. Klosterman, 1995, p. 11). Thus is that this paper concludes by suggesting that simple, low cost, easily maintained and user-friendly spatial information technologies have the best chance of success.(also refer to Bishop et.al., 2000, p. 85).

One important lesson that can be learned from the experiences in MDCs is that in order to do a well-organised urban planning, it is necessary to develop a spatial information system as an efficient tool for management of urban resources. The advanced information systems along with computer-based tools for planning are considered an essential requirement for the cities of the LDCs to improve their urban planning management approaches (also refer to Bishop et al, 2000, p. 87) only if these tools are applied appropriately.

8 REFERENCES:

Bishop, I. D., et. al., "Spatial data infrastructures for cities in developing countries: Lessons from the Bangkok experience", Cities, Vol. 17, No.2, pp.85-96, 2000.

Daneshpour, Z. A., "To study and analyse the spatial structure of Tehran" (unpublished research report), Tehran: SBU (Sh. Beheshti University), 1996.

Daneshpour, Z.A., "Improving urban problem-solving approaches, the case of Tehran", Life in the urban landscape- International Conference for Integrating Urban Knowledge & Practice, Gothenburg, Sweden (www.urbanlife2005.com), 2005.

Daneshpour, Z. A., "Spatial inequality and dislocation in Tehran's urban region", First Bi-Annual EURA Conference: Cities in City Regions, Warsaw: Poland, 2006.

Dyckman, J., Kreditor, A., Banerjee, T., "Planning in an unprepared environment: the example of Bahrain", Town Planning Review, 55, 214-227, 1984.

Gharagozlou, A. , "Presenting Urban Development Model by using Environmental Models & GIS & RS (North-West of Tehran)", Map India Conference 2003, GISdevelopment.net, accessed in 2007/3/25, 2003.

Klosterman, R. E. , "The appropriateness of Geographic Information System for regional planning in the developing world", Computer, Environment and Urban Systems, Vol. 19, No. 1, PP. 1013, 1995.

Lindblom, C. E. , "The Science of Muddling Through" in Campbell, S. & Fainstein, S.S. , "Readings in Planning Theory", Blackwell: Oxford, 1996.

Masser, I. , "planning with incomplete data", Town Planning Review, Vol. 45, No. 2, pp.157-169, 1974.

Mc McCoubrey, H., " The English model of Planning Legislation in Developing Countries", Third World Planning Review (TWPR), Vol. 10, No. 4, 1998.

Nghi, D Q and Kammeier H D , " Balancing data integration needs in urban planning: A Model for Ha Noi City, Viet Nam", Cities, Vol. 18, No. 2, pp. 61–75, 2001.

Pettit, C. and Pullar, D. , "An integrated planning tool based upon multiple criteria evaluation of spatial information", Computers, Environment and Urban Systems Vol. 23, pp. 339-357, 1999.

Rubenstein-Montano, B. , "A survey of knowledge-based information systems for urban planning: moving towards knowledge management", Computers, Environment and Urban Systems, Vol. 24, pp.155-172, 2000.

Taylor, N. , "Urban Planning Theory- Since 1945", Sage: London, 2005.

"problems first" – eine Sichtweise von Planung auf Flächenmanagement

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1 EINFÜHRUNG

Bei der Bearbeitung des Forschungsprojekts "Flächenmanagement durch innovative Regionalplanung" (FLAIR) im Rahmen des Forschungsprogramms "Reduzierung der Flächeninanspruchnahme und nachhaltiges Flächenmanagement" (REFINA) des BMBF wurde das Prinzip "Probleme-zuerst" zugrunde gelegt. In diesem Aufsatz für den Workshop Flächenmanagement auf der REAL CORP 007 werden die wesentlichen Inhalte dieses Prinzips beschrieben, ebenso welchen Stellenwert es beim Flächenmanagement einnimmt.

2 PROBLEMDEFINITION ALS AUSGANGSPUNKT

Flächenmanagement zählt zu den Kernaufgaben der Raumplanung und ist zugleich eine komplexe Planungsaufgabe, welche viele unterschiedliche Fachdisziplinen, Interessen, Akteure, Standpunkte etc. umfasst.

Die Frage ist, ob die Raumplanung eine solche komplexe Aufgabenstellung effizient lösen kann – und manche bezweifeln dies. Das heißt, der Raumplanung wird mitunter die Fähigkeit abgesprochen, nachhaltiges Flächenmanagement umzusetzen. Die Kritik an der traditionellen räumlichen Planung, vor allem von außen, lautet dabei häufig:

- Sie befasst sich nicht mit dem, was die Bürgerinnen und Bürger bewegt und interessiert.
- Sie ist nicht politikrelevant.
- Ihr Wirkungsgrad ist oft gering.
- Sie stellt sich nicht der Komplexität von Planungsproblemen.
- Sie ist eine bürokratische Routine, die vor allem mit dem Procedere und weniger mit inhaltlichen Problemen befasst ist.
- Die wissenschaftlichen Diskussionen über Raum- und Stadtentwicklung finden oft auf zu hohem Abstraktionsniveaustatt, es fehlt der Brückenschlag zwischen Theorie und Praxis.

Speziell die ersten beiden Kritikpunkte, dass die Raumplanung sich nicht mit dem befasst, was die Bürgerinnen und Bürger interessiert sowie die mangelnde Politikrelevanz, kann unter anderem damit zu tun haben, dass der Phase der Problemdefinition nicht genug Aufmerksamkeit geschenkt wird. Denn wenn diese (wieder) stärker in den Vordergrund gerückt wird, wird die Raumplanung beinahe zwangsläufig (wieder) relevant sowohl für die Bürger als auch die Politiker.

Eine solche Betonung der Problemformulierung mag Manchen irritieren und die Frage stellen, was hierbei anders oder neuartig sei, schließlich nimmt jeder Planer für sich in Anspruch, problembezogen vorzugehen. Die Erfahrungen des Verfassers sind jedoch andere: bei dem nicht-problemorientierten Vorgehen in der Planung handelt es sich keineswegs um Einzelfälle (vgl. Schönwandt und Jung 2006). Anstatt nämlich zuerst zu bestimmen, was der Missstand (das Problem) ist, werden oft unmittelbar

- Maßnahmen/Lösungen vorgeschlagen ("Lösungsreflex"),
- Methoden zum Ausgangspunkt der Planung gemacht,
- Ziele anvisiert,
- Theorien herangezogen und/oder
- Verfahrensweisen in den Vordergrund gestellt.

Entsprechend ist ein typisches Merkmal vieler traditioneller Planungsprozesse, sich in der Diskussion darauf zu konzentrieren, welche Lösungen realisiert werden sollen, und zwar bei einer "irgendwie" gegebenen Problemdefinition, die "selbstevident" oder gar "völlig klar" scheint.

Die Bedeutung der Problemdefinition als Ausgangspunkt für Planungen wird besonders deutlich, wenn man sich Folgendes vor Augen führt (vgl. Koppenjan und Klijn 2004,116ff):

- Probleme sind nicht "selbstevident" und erst recht keine "objektiv" identifizierbaren Situationen, sondern hängen von den Wahrnehmungen der Akteure ab: sie sind daher immer "sozial konstruiert".
- In einer Problemsituation kann die Problemwahrnehmung der Akteure erheblich divergieren.
- Unsicherheiten in Bezug auf die Inhalte sind nicht nur verursacht durch die Komplexität des Problems, sondern auch durch die divergierende Problemwahrnehmung der beteiligten Akteure.
- Wenn Akteure Schlüsse ziehen und dabei von sehr unterschiedlichen Problemwahrnehmungen ausgehen, sowie zugleich nicht willens oder in der Lage sind, diese Unterschiede in der Problemwahrnehmung zu reflektieren, dann nimmt die Wahrscheinlichkeit zu, dass ihre Kommunikation und Interaktionen zu einem "Dialog der Gehörlosen" - "dialogue of the deaf" (vgl. DeLeon 1988, van Eeten 1999) wird.
- Problemlösungen verlangen deshalb - in der Erwartung der Pluralität von Wahrnehmungen und Präferenzen - eine Vermeidung früher kognitiver Fixierungen, um zu einer gemeinsamen Erarbeitung des Problemverständnisses, das heißt einer gemeinsamen "Repräsentation" des Problems zu kommen.
- Für diese gemeinsame Erarbeitung des Problemverständnisses, ist die Kenntnis und Reflexion der "Planungsansätze", welche die einzelnen Akteure zugrunde legen und verwenden, besonders hilfreich.

Zu den typischen Reaktionen bei traditionellen Planungsprozessen gehört jedoch nicht nur die Neigung, die Phase der Problemdefinition zu übergehen oder zu schnell zu verlassen. Bei der Konzentration auf die Lösungen werden häufig Vorgehensweisen vorgeschlagen, die im Bereich der Denkmuster der eigenen Profession liegen, das heißt der eigenen "professionellen Brille" entsprechen. Diese professionellen Denkmuster werden als "Planungsansätze" bezeichnet. Jede Planung ist– und das ist unvermeidlich – mit der Verwendung von Planungsansätzen verbunden. Inhaltlich wirken sich diese professionellen Denkmuster meist folgendermaßen aus: bei Planungslösungen kommen vor allem disziplinspezifische Ziele, disziplinspezifische Methoden und disziplinspezifische Theorien zur Anwendung. Die inhärente Schwierigkeit liegt auf der Hand: sollten diese professionellen Ziele, Methoden und Theorien nicht geeignet sein, das Problem zu lösen, also "nicht zum Problem passen", ist das Scheitern der Planung quasi vorprogrammiert. Dieser Fehlertyp wird in der Planungsmethodik als "professional bias" bezeichnet. "Aktionismus" oder "Verschlimmbesserungen" sind nicht selten die Folge. Planungsansätze erzeugen also beiderlei: Verständnis für eine Planungsaufgabe, aber auch partielle Blindheit. Bei unbedachter Anwendung kann es daher vorkommen, dass Teile der Planungsaufgabe übersehen werden, alternative, da nicht disziplinspezifische Aspekte vernachlässigt werden und/oder die zu lösenden raumbedeutsamen Probleme aus dem Blickfeld geraten.

3 PLANUNGSANSÄTZE

Das Prinzip "Problems first" ergibt sich als Konsequenz, wenn man sich mit Planungsansätzen befasst. Von daher wird im Folgenden ausführlicher auf das Thema Planungsansätze eingegangen.

Jeder Planung liegt ein solcher Planungsansatz (oder mehrere Planungsansätze) zu Grunde – ob dies dem Planer bewusst ist oder nicht. Planungsansätze sind paradigmatische Denkmuster, welche das weitere Planungshandeln leiten und wesentlich beeinflussen. Sie erzeugen zweierlei: Verständnis für eine Planungsaufgabe, aber auch partielle Blindheit. Bei unbedachter Anwendung kann es daher vorkommen, dass Teile der Planungsaufgabe übersehen werden und/oder die zu lösenden raumbedeutsamen Probleme aus dem Blickfeld geraten.

3.1 Bestandteile von Planungsansätzen

Planungsansätze bestehen aus jeweils einem ganzen Satz an (a) bestimmten Problemsichten, (b) Zielen und (c) bestimmten Methoden zusammen mit (d) einem bestimmten Hintergrundwissen.

Diese vier Komponenten (Problemsichten, Ziele, Methoden und Hintergrundwissen) eines Ansatzes kommen jeweils im Verbund vor und sind voneinander abhängig (für die wissenschaftstheoretischen Grundlagen dieses Themas vgl. zum Beispiel Bunge 1983; 1996,79ff).

Problemsichten

Räumliche Planung hat die Aufgabe, raumbezogene Probleme zu lösen. Die Ausgangspunkte für eine Planung können sein:

- Ist-Zustände, die negativ bewertet werden und daher verbessert werden sollen, oder
- positiv bewertete Ist-Zustände, bei denen jedoch davon ausgegangen wird, dass etwas unternommen werden muss, um sie zu erhalten.

Problemsichten, Problembeschreibungen und damit Problemlösungen sind jedoch nie "objektiv" sondern "sozial konstruiert" und haben ihren Ursprung in dem zugrunde liegenden Planungsansatz. Was als Problem definiert wird, ist abhängig von den drei anderen Komponenten des jeweiligen Planungsansatzes, also von den Zielen, den Methoden und dem Hintergrundwissen.

3.1.1 Ziele

Ähnlich wie bei den Problemsichten können Ziele angesehen werden als

- positiv bewertete Soll-Zustände (oder auch als "Zwischenzustände"), in welche die als negativ angesehene Ist-Zustände überführt werden sollen, oder
- vorteilhaft empfundenen Ist-Zuständen, die bewahrt werden sollen.

Ziele sind ebenso wie Probleme "sozial konstruiert" und abhängig vom jeweiligen Planungsansatz.

3.1.2 Methoden

Methoden sind Vorgehensweisen oder Techniken in Form geordneter, nicht-zufälliger Sequenzen zielgerichteter Operationen, von denen angenommen wird, dass sie in der Lage sind, die als solche definierten Probleme zu lösen. Die Vielfalt der Planungsansätze ist mit einer Vielfalt an Methoden verbunden, und je nach gewähltem Planungsansatz steht nur ein bestimmtes Methodenrepertoire zur Verfügung.

3.1.3 Hintergrundwissen

Das Hintergrundwissen besteht aus einer Kombination disziplinspezifischen und transdisziplinären Hintergrundwissens.

Das disziplinspezifische Hintergrundwissen bezieht sich auf einzelne Fachdisziplinen, wie Architektur, Bauingenieurwesen, Verkehrswesen, Vermessungswesen, (Landschafts)Ökologie, (Siedlungs)Soziologie, (Umwelt)Psychologie, (Raum)Ökonomie, Rechtswissenschaften und so fort. Beim disziplinspezifischen Hintergrundwissen handelt sich jeweils nur um einen vergleichsweise kleinen Teil des insgesamt verfügbaren Wissens.

Das transdisziplinäre Hintergrundwissen lässt sich unterteilen in Ontologie, also die Frage, was die reale Welt ist, woraus sie besteht bzw. was sie enthält, Epistemologie, das sind Theorien der Kognition und des Wissens, und Ethik, also Wert- und Moralvorstellungen, die einer Planung zugrunde liegen.

Ein Planungsansatz aus der Landschaftsökologie soll die oben theoretisch umrissenen Komponenten eines Planungsansatzes beispielhaft verdeutlichen und ist in Tabelle 1 in verkürzter Form wiedergegeben.

Probleme	Mangelnde Quantität und Qualität natürlicher Ressourcen wie Boden, Wasser, Luft, Fauna; Gefährdung derselben durch Verschmutzung, Verwüstung, Überlastung; Menschen, die unter Immissionen, Umweltkrankheiten leiden, ...
Ziele	Langfristige Sicherung eines leistungsfähigen Natur- und Landschaftshaushaltes; Verbesserung der Umweltbedingungen, der

	Gesundheit der Lebewesen und des menschlichen Wohlbefindens; Erhaltung der Artenvielfalt, ...
Methoden	Erhebung naturräumlicher Systemelemente und Analyse ihrer Systemrelationen; Modellbildung und Simulation von Prozessen (gegebenenfalls mit Hilfe mathematischer Modelle, Flussdiagramme, GIS-gestützter Modellierung); Umweltverträglichkeitsprüfung; Schaffung von Natur- und Landschaftsschutzgebieten, evtl. Veränderung menschlicher Wahrnehmung und menschlichen Verhaltens im Umgang mit Natur durch Bewusstseinsbildung, ...
Hintergrund-wissen	*Disziplinspezifisch*: Kenntnisse in Biologie, Ökologie, Land- und Forstwirtschaft, Umwelttechnik, (z. B. Abwasserklärung, Rohstoffrecycling, Prozesssteuerung), Umweltpsychologie, ... *Philosophisch*: Wertvorstellungen über Rechte von Tieren (animal rights); Umwelt als wertvolles natürliches Habitat (nicht als Ressource auf der Basis einer anthropozentrischen Weltsicht), gegebenenfalls als Erbe früherer Generationen oder als Gabe Gottes, ...

Tab. 1: Planungsansatz Landschaftsökologie

Für den Schutz der natürlichen Umwelt hat dieser Ansatz der Landschaftsökologie zweifellos Entscheidendes bewirkt. Trotzdem käme wohl niemand auf die Idee, damit die künstlerische Gestaltung von Gärten, Parks oder Landschaften zu versuchen, weil dieser Ansatz dafür nicht ausgelegt ist. Hierfür wäre ein alternativer Ansatz der Landschaftsgestaltung (Landschaftsplanung als Gartenkunst) besser geeignet.

Andere Beispiele für sich zum Teil ergänzende oder konkurrierende Planungsansätze sind:

- Stadtplanung als Standortausweisung
- Stadtplanung als Urban Design (Stadtgestaltung)
- Stadtplanung als Sozialplanung
- Verkehrsplanung als Förderung beziehungsweise Ermöglichung von Verkehr
- Verkehrsplanung als Verkehrsreduktion oder –vermeidung

3.2 Gegenseitige Abhängigkeiten der Komponenten eines Planungsansatzes

Jeder dieser Planungsansätze hat jeweils spezifische Inhalte (Probleme, Ziele, Methoden, Hintergrundwissen), die den Rahmen für das Vorgehen beim Planen vorgeben. Damit sind auch zugleich bestimmte Einschränkungen verbunden: eine bestimmte Methode kann nicht für jedes zu lösende Problem eingesetzt werden oder ein bestimmtes disziplinspezifisches und transdisziplinäres Hintergrundwissen ist nicht in der Lage, wirklich alle Facetten einer Problemsituation beziehungsweise Planungsaufgabe umfassend zu beschreiben sowie alle denkbaren Ziele einzuschließen.

Das heißt, jedes Mal wenn wir einen bestimmten Planungsansatz benutzen, erzeugen wir beides, Verständnismöglichkeiten aber auch partielle Blindheit. Unsere Sicht ist eingeschränkt auf das, was dieser Ansatz zu leisten vermag.

Eine sich daraus ergebenden Konsequenz ist, dass die vier Komponenten eines Ansatzes (Probleme, Ziele, Methoden und Hintergrundwissen) immer und zwangsweise miteinander verkoppelt sind; sie sind nicht einzeln, sondern nur als "Viererpack" verfügbar. Mit bestimmten Methoden lassen sich nur ganz bestimmte Ziele verwirklichen, und andere eben nicht. Aufgrund eines bestimmten Hintergrundwissens werden nur ganz bestimmte Probleme ausfindig gemacht, andere werden für unbedeutend gehalten oder gar nicht wahrgenommen und so fort. Die Wahl des Planungsansatzes bestimmt also auch die Problemlösung. Und bei gleicher Ausgangslage (präziser: bei gleichem, einer Problemsicht zugrunde liegendem Ist-Zustand) führen verschiedene Ansätze in aller Regel zu unterschiedlichen Lösungen (vgl. Bunge 1996,80). Verschiedene Planungsansätze sind dabei nicht "richtig" oder "falsch", sie sind nur für die Bearbeitung mancher Probleme geeignet und für andere wiederum nicht.

Diese wechselseitige Abhängigkeit der Komponenten eines Planungsansatzes soll nachfolgend anhand einiger Beispiele illustriert werden. Die Darstellung konzentriert sich dabei im Wesentlichen auf die jeweils die Abhängigkeit auslösende Komponente, die Auswirkungen auf alle anderen Komponenten eines Planungsansatzes werden nicht im Detail beschrieben.

(a) Ethisches Hintergrundwissen beeinflusst Problemdefinition und Ziele: legt man ein bestimmtes ethisches Hintergrundwissen zugrunde, nämlich das des so genannten Wohlfahrtsstaates, so ist hohe Arbeitslosigkeit ein ernstzunehmendes Problem, und es ist naheliegend, dass im Zweifel der Staat etwas unternehmen sollte, um die Arbeitslosigkeit zu senken. In der räumlichen Planung schlägt sich dies beispielsweise im Kontext der Ausweisung von Gewerbe- und Industrieflächen nieder.

Es gibt jedoch auch andere Ansätze, zum Beispiel den der Neoliberalisten, deren Devise ist "Nur so wenig Staat, beziehungsweise staatliche Planung wie unbedingt nötig". Deshalb ist Arbeitslosigkeit für die Verfechter dieses Ansatzes in aller Regel kein "Problem", sondern eine zwar bedauerliche aber unvermeidliche Übergangserscheinungen beim Wirken von Marktkräften. Nach ihrer Auffassung entsteht hohe Arbeitslosigkeit ohnedies häufig dann, wenn der Staat allzu stark in das Marktgeschehen eingreift. Als Konsequenz würde ein Anhänger neoliberalistischen Gedankenguts kaum vorschlagen, der Staat solle Finanzmittel bereitstellen beziehungsweise entsprechende Planungen vornehmen, um das Problem Arbeitslosigkeit zu mildern oder zu beseitigen, weil dieses "Problem" für ihn so nicht existiert, es kommt in dieser Form in seiner Denkwelt nicht vor.

(b) Die Festlegung bestimmter Ziele und Problemdefinitionen, im Verbund mit einem bestimmten Hintergrundwissen, wirkt sich auf die Auswahl der verwendeten Methoden aus: soll zum Beispiel statt einer Planung "von oben herab" den Interessen der Betroffenen mehr Gewicht verliehen werden, kommen quasi automatisch Methoden der Kommunikation und Partizipation ins Spiel, weil sie eine Voraussetzung für die Mitwirkung der Betroffenen sind.

(c) Die Verwendung bestimmter Methoden führt mitunter dazu, dass ein bestimmtes Hintergrundwissen wieder an Bedeutung gewinnt. Aus theoretischer Sicht schien sowohl in der Planung als auch in der Geographie der so genannte spatial approach, bei dem der Raum als primär unabhängige Variable in Erklärungsmodelle eingeht, durch handlungstheoretische Ansätze abgelöst worden zu sein. Vor allem die inzwischen weit verbreiteten Methoden der Geographischen Informationssysteme (GIS) haben jedoch entscheidend zu einer Renaissance dieses spatial approach beigetragen.

(d) Die Entwicklung neuer Methoden führt dazu, dass neue Problemstellungen bearbeitet, aber auch neue Ziele formuliert oder Theorien als neues Hintergrundwissen entwickelt werden. So hat das Vorhandensein des Computers mit den entsprechenden Programmen viele der heute verwendeten Simulationen in der Planung praktisch erst möglich gemacht, zum Beispiel die Simulation von Luftausbreitung, Schadstoffausbreitung im Boden oder von Verkehrsströmen einer Stadt. Im letzteren Fall lassen sich zum Beispiel die folgenden neuen Problemstellungen beziehungsweise Ziele formulieren: welche Parameter müssen in Computermodelle eingegeben werden, damit diese Modelle in der Lage sind, den Beginn eines Verkehrsstaus zu prognostizieren, und gegebenenfalls Autofahrern über umschaltbare Hinweistafeln frühzeitig veränderte Routen zu empfehlen, um so den Stau so kurz wie möglich zu halten?

(e) Fachspezifisches Hintergrundwissen dominiert Problemlösungen: die einzelnen Fachdisziplinen belegen die Realität (besser: Realitätsausschnitte) naturgemäß vorwiegend mit ihren fachspezifischen Begriffen, sie untersuchen fachspezifische Zusammenhangsaussagen und wenden fachspezifische Methoden an. Entsprechend werden vor allem fachspezifische Ziele verfolgt beziehungsweise fachspezifische Probleme gesehen und behandelt sowie entsprechende Problemlösungen angeboten. In der Folge schlagen Architekten zumeist bauliche Lösungen vor, Soziologen gesellschaftliche, Ökonomen volks- oder betriebswirtschaftliche, Ökologen naturräumliche und Juristen rechtliche. Diese Lösungen können für ein bestimmtes Planungsproblem die Geeignetsten sein, sie sind es aber nicht zwangsläufig, weil die dabei angewandten fachspezifischen "Brillen" nur Teile der Realität betrachten und vorgegebene Wertsetzungen darüber einschließen, welche Aspekte als relevant angesehen werden und welche nicht.

3.3 Reihenfolge der Bearbeitung der Komponenten

Die oben geschilderten Abhängigkeiten zwischen den vier Komponenten eines Planungsansatzes machen es erforderlich, sich beim Planen über die Reihenfolge der Bearbeitung dieser Komponenten Gedanken zu machen.

Beginnt man mit den drei Komponenten Ziele, Methoden und Hintergrundwissen, kann es passieren, dass die besonderen Probleme ("sozial konstruierten" Problemsichten) der Bewohner, Politiker etc. nicht erkannt werden. Entscheidend ist, was als Startpunkt der Planungsarbeit gewählt wird: wird mit einer bestimmten Zieldefinition, einer bestimmten Methode oder einem bestimmten Hintergrundwissen begonnen, kann der Bezug zu den zu lösenden Problemen verloren gehen, weil jedes Ziel, jede Methode und jedes Hintergrundwissen sich nur für einen ganz bestimmten, eingegrenzten Ausschnitt aller möglichen Problemsichten eignet, nicht jedoch für das gesamte Spektrum aller Probleme.

(a) Die Planungsarbeit mit einem bestimmten disziplinspezifischen Hintergrundwissen zu beginnen, kann dazu führen, dass bestimmte Planungsprobleme damit nicht (mehr) gelöst werden können. Ein Beispiel ist die Theorie der Zentralen Orte, die - als Hintergrundwissen - herangezogen werden kann, um in Aufbauphasen Infrastruktureinrichtungen in einer Region zu verteilen. Für die Lösung von Planungsproblemen im Zusammenhang mit Schrumpfungsprozessen, wenn also Infrastruktur abgebaut werden soll, ist sie hingegen in der ursprünglichen Form kaum geeignet.

(b) Zu ähnlichen Ergebnissen kann es führen, wenn Planer mit einer bestimmten Methode beginnen, etwa der Methode des Datensammelns "nach Lehrbuch" und beispielsweise die in der Raumplanung "üblichen" Daten zu Bevölkerung, Wirtschaft, Verkehr etc. erheben. Ein solches Vorgehen schränkt die jeweils bearbeitbaren Problemstellungen gravierend ein, weil damit nur jene Teilmenge der Problemstellungen bearbeitet werden kann, die sich aus den erhobenen Daten "herauslesen" lässt - andere jedoch nicht.

(c) Startet man beispielsweise mit der Definition von Zielen, so kann dies ebenso dazu führen, dass nur eine sehr begrenzte und eher zufällige Menge der Probleme ins Blickfeld der Planer gelangt. Denn mit der Formulierung von Zielen werden viele der beim Planen erforderlichen Arbeitsschritte übersprungen, wie etwa das Ausloten des gesamten Spektrums möglicher Problemdefinitionen, aber auch die Erarbeitung von Prognosen zu diesen Problemdefinitionen, die Formulierung von Handlungsalternativen, die Bewertung dieser Alternativen und so fort. Hinzu kommt, dass verschiedene Beteiligte oder Betroffene fast immer unterschiedliche Ziele haben. Konflikte sind deshalb der Normalfall.

Für Planungen heißt das, dass bereits die Bestandserhebung und -analyse von den jeweiligen Vorkenntnissen der Planer geprägt wird. Die von den Planern erkannten Probleme und die zu deren Behebung vorgeschlagenen Lösungen hängen von den Vorkenntnissen der Planer, von ihren Zielen und/oder Methoden, oder einfacher: von ihrem Planungsansatz ab. Daraus ergeben sich zumindest zwei verschiedene Vorgehensweisen: man kann mit der Erkundung und Definition vorliegender Probleme beginnen (und daran anschließend einen dafür geeigneten Ansatz wählen). Oder man kann mit einer der drei anderen Komponenten eines Ansatzes beginnen (Ziele, Methoden, Hintergrundwissen), zum Beispiel mit Zentralen Orten als Hintergrundwissen, und sich damit quasi "automatisch" bestimmte Problemsichten "einhandeln".

Eine angemessenere Vorgehensweise wäre deshalb, sich zunächst auf von allen Beteiligten akzeptierte Problemdefinitionen - als "Kristallisationspunkte" der Planung - zu einigen, um anschließend wünschenswerte Ziele, die geeigneten Methoden und das einschlägige Hintergrundwissen zu suchen beziehungsweise zu präzisieren. Desea vorgehen nennen wir "Probleme zuerst" oder "problems first".

4 ANWENDUNG VON PROBLEMS FIRST BEIM FLÄCHENMANAGEMENT

Auch beim Flächenmanagement ist das Prinzip "problems first" wichtig. Bisherige Ansätze, die Flächeninanspruchnahme zu reduzieren und ein nachhaltiges Flächenmanagement zu etablieren, scheinen nur geringe Erfolge aufweisen zu können. Ein Grund hierfür ist nach Ermessen der FLAIR-Partner, dass der Phase der Problemdefinition nicht ausreichend Beachtung geschenkt wurde.

Vielmehr wird in den meisten Fällen – disziplinspezifisch bedingt – flächenbezogenen Lösungen der Vorzug gegeben:

- Die Standortsteuerung im Sinne der dezentralen Konzentration wird von den Trägern der räumlichen Planung seit längerem verfolgt, oft eine entsprechende Wirkung bezüglich der Reduzierung der Flächeninanspruchnahme erzielt zu haben.
- Ebenso konnten Elemente der Mengenreduktion, sofern eingesetzt, kaum zu einer Reduzierung der Flächeninanspruchnahme beitragen, und sind darüber hinaus aufgrund politischer Widerstände nur schwer zu implementieren.
- Strategien der Innenentwicklung nehmen an Bedeutung in den letzten Jahren zu, können jedoch aufgrund politischer und ökonomischer Hemmnisse nicht gänzlich ausgeschöpft werden.
- Auch Modelle Regionalen Flächenmanagements stellen einen wichtigen Beitrag zur Steuerung der Siedlungsflächen dar, schöpfen aber wegen flächenzentrierter Eingriffsweisen und methodenzentrierter Ansätze nur ein Teil-Spektrum raumplanerischer Eingriffsweisen ab.
- Aus den oben genannten Gründen zusätzliche ökonomische Instrumente zu forcieren, erscheint insofern fraglich, als dass diese zwar eine Ergänzung raumplanersicher Instrumente darstellen können, die Steuerungsdefizite der räumlichen Planung jedoch nicht kompensieren.

Von daher wird im Forschungsvorhaben der Ansatz verfolgt, die "Probleme-zuerst" zu behandeln und die Gründe zu identifizieren, warum bisherige Steuerungsversuche fehlschlugen. Gleichzeitig sollen die raumbedeutsamen Probleme (Probledmsichten) beziehungsweise Konflikte herausgearbeitet werden, die mitursächlich für ein solches Steuerungsdefizit sind. Dies wird exemplarisch für die Region Südlicher Oberrhein durchgeführt.

Das heißt, nicht bestimmte Ziele oder Methoden stellen den Startpunkt dieser Vorgehensweise dar, sondern eine möglichst adäquate Beschreibung der Probleme, bzw. Problemsichten, auf deren Basis keine finalen Pläne, sondern Strategien der Flächensteuerung erarbeitet werden.

Sicher, der - anfängliche - Verzicht auf fachspezifische Lösungen, Methoden, Ziele, Theorien etc. führt mitunter zu einer Verunsicherung des jeweiligen Planers, gepaart mit "Vermeidungsverhalten", das heißt, eine solche Vorgehensweise nach dem Prinzip "problems first" wird mitunter als kaum realisierbar abgetan. Solches Vermeidungsverhalten kann sein:

- fachbezogen: "Das gehört doch gar nicht in unser Fachgebiet."
- auf das Thema bezogen: "Derart komplexe Problemstellungen kann man gar nicht lösen."
- oder auch als Person: "Das will doch jeder von uns.", "Als ob das so einfach wäre."

Daher wird das Prinzip "problems first" zum Aufbau eines Flächenmanagements in unserem Forschungsprojekt angewandt, indem zu Beginn eine Erkundung raumbedeutsamer Konflikte erfolgt.

Das heißt, wir untersuchen fachplanerische Ebenen, zum Beispiel Demographie, Bildung, Verkehr, Gesundheit, Tourismus usw., und suchen hier nach den raumrelevanten Entwicklungen bzw. Veränderungen innerhalb dieser Ebenen, zum Beispiel dass der Rückgang der Kinderzahlen die Infrastrukturversorgung mit Kindergärten und Schulen verändern wird, oder aber dass steigende Energiepreise den Landwirt vielleicht zu einem Energiewirt machen usw.

In einem nächsten Teilschritt wird erhoben, welche raumrelevanten Konflikte zwischen den Ebenen entstehen könnten, beispielsweise dass weniger Schüler und damit weniger Schulen auch den Nahverkehr beeinflussen, stellen doch Schüler die Hauptnutzer des Nahverkehrs im ländlichen Raum dar.

Die Fragen sind hier also: Welche raumrelevanten Probleme einer Ebene wirken sich auf andere Ebenen aus? Werden sie auch dort raumwirksam? Wo ergeben sich daraufhin raumbedeutsame Konflikte?

In einem dritten Teilschritt wird untersucht, welche der sich aus der Erkundung ergebenden Konflikte (und damit Planungsprobleme) gravierend sind und für den Aufbau und Umsetzung eines nachhaltigen Flächenmanagements angegangen werden müssen.

5 FAZIT

Planer benutzen immer - und hier gibt es keine Ausnahme - zumindest einen Planungsansatz, auch wenn sie das bisweilen nicht merken, etwa so, wie der Fisch das Wasser nicht merkt. Je nach gewähltem Ansatz

können sich dabei unterschiedliche Ergebnisse einer Planungsaufgabe ergeben, vor allem da die Probleme (bzw. Problemsichten) bei einem unreflektierten Herangehen oft nur ungenügend geklärt werden.

Das Projekt "Flächenmanagement durch innovative Regionalplanung" (FLAIR) im Rahmen des Forschungsprogramms "Reduzierung der Flächeninanspruchnahme und nachhaltiges Flächenmanagement" (REFINA) wird nach dem Prinzip "Probleme-zuerst" durchgeführt.

Die Projektpartner versprechen sich von dieser Vorgehensweise, dass

- Problemformulierungen präzisiert werden,
- das Spektrum möglicher Lösungen nicht durch Methoden oder Theorien determiniert und dominiert wird,
- der Planungsprozess interdisziplinär angegangen wird,
- die Suche nach Lösungen ergebnisoffener gestaltet wird,
- problemorientierte und politisch relevante Lösungen häufiger gesucht und gefunden werden,
- die Überprüfung der Chancen der Implementierung sorgfältiger durchgeführt wird.

Insofern sind Probleme-zuerst-Planungen eine sinnvolle Ergänzung traditioneller Planungsinstrumente, insbesondere für komplexere Aufgabenstellungen wie es beim Flächenmanagement der Fall ist. Sie stellen jedoch keinen Ersatz traditioneller Planungsinstrumente und –verfahren dar.

6 LITERATUR

BUNGE , M.: Treatise on Basic Philosophy, Volume 5: Epistemology & Methodology I, Exploring the World. Dordrecht: Reidel, 1983

BUNGE, M.: Finding Philosophy in Social Science; New Haven, London: Yale University Press, 1996

DeLEON, P.: Advise and Consent. The Development of the Policy Sciences; New York: Russel Sage Foundation, 1988

EETEN, M. van: Dialogues of the Deaf: Defining New Agendas for Environmental Deadlocks; Delft: Eburon, 1999

KOPPENJAN, J.; KLIJN, E.-H.: Managing Uncertainties in Networks. A network approach to problem solving and decision making; London: Routledge, 2004

SCHÖNWANDT, W.: Planung in der Krise? Theoretische Orientierungen für Architektur, Stadt- und Raumplanung. Stuttgart: Kohlhammer, 2002

SCHÖNWANDT, W.; JUNG, W.: Ausgewählte Methoden und Instrumente in der räumlichen Planung
Kritische Sondierung als Beitrag zur Diskussion zwischen Planungswissenschaft und -praxis
mit Beiträgen von H.-G. Bächtold, W. Jung, W. Schönwandt, R. Signer, M. van den Berg, R. von der Weth
Arbeitsmaterial der Akademie für Raumforschung und Landesplanung Nr. 326, Hannover: ARL, 2006

SCHÖNWANDT, W.; VOIGT, A.: Planungsansätze; in: Akademie für Raumforschung und Landesplanung (ARL) (Hrsg.): Handwörterbuch der Raumordnung; Hannover: ARL; 769-776, 2005

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Vom Konstrukt zur Empirie: Beobachtungen zur „Strukturstärke bzw. Strukturschwäche“ österreichischer Gemeinden

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1 EINLEITUNG:

Im Zuge des aktuellen Diskurses zum Thema „gleichwertige regionale Lebensverhältnisse“ bildet die theoretische sowie praktische planerische Handhabung regionaler Disparitäten einen wichtigen Bestandteil (vgl. z.B. Bundesamt für Bauwesen und Raumordnung, 2006). Oftmals wird hierbei zur Beschreibung von Räumen mit einer über- bzw. unterdurchschnittlichen Ressourcenausstattung, Wirtschaftsleistung und/oder Beschäftigungslage die Begrifflichkeit der „Strukturstärke bzw. -schwäche“ herangezogen (vgl. Akademie für Raumforschung und Landesplanung, 2000). Diese Terminologie fand auch Eingang in den österreichischen Planungsdiskurs, wobei jedoch bislang im Gegensatz zur Bundesrepublik Deutschland (vgl. z.B. Maretzke, 2001) und der Schweiz (vgl. z.B. Kanton Aarau - Departement Bau, 2005) „Strukturstärke bzw. -schwäche“ nicht durch empirische Befunde im Sinne einer Analyse ausgewählter Indikatoren zur Identifikation sozioökonomischer Disparitäten konkretisiert wurde.

Ziel des vorliegenden Beitrages ist es, das wertende Konstrukt „Strukturstärke bzw. –schwäche“ österreichischer Gemeinden anhand statistischer Indikatoren zu konkretisieren und empirisch festzustellen sowie die Gemeinden hinsichtlich ihrer Strukturstärke bzw. –schwäche zu klassifizieren. Darauf aufbauend wird die Veränderung der Strukturstärke bzw. –schwäche auf Gemeindeebene im Zeitablauf dargestellt. In weiterer Folge werden relative Erklärungsunterschiede der verwendeten Indikatoren innerhalb des gewählten Indikatorensets identifiziert und deren Veränderung im Zeitablauf sowie deren Unterschiedlichkeit auf Bundesländerebene anhand von Beispielen aufgezeigt. Hieraus können Aussagen darüber getroffen werden, welcher Indikator in Österreich und in den gewählten Bundesländern zu den untersuchten Zeitpunkten welchen Erklärungsgehalt in Bezug auf das Konstrukt „Strukturstärke bzw. –schwäche“ aufweist.

2 ZUM VERSTÄNDNIS DES KONSTRUKTS “STRUKTURSTÄRKE BZW. –SCHWÄCHE“ IN RAUMORDNUNG UND REGIONALPOLITIK

Die (normative) Begrifflichkeit der „Strukturstärke bzw. –schwäche“ kann als traditioneller Bestandteil des Vokabulars deutschsprachiger Raumordnung und Regionalpolitik bezeichnet werden. Insbesondere im Rahmen der vor allem in Deutschland und der Schweiz aktuellen Diskussion zu den sgn. „gleichwertigen Lebensbedingungen“ gewinnt dieses sich gegenseitig ergänzende und stützende Begriffspaar erneut an (zumindest publizistischer) Prominenz: *„In den strukturschwachen Regionen stehen die Sicherung der Daseinsvorsorge und die wirtschaftliche Stabilisierung im Vordergrund.“* (Akademie für Raumforschung und Landesplanung, 2006, S. 9). Die im Rahmen des Begriffspaares „Strukturstärke bzw. –schwäche“ implizit enthaltenen Disparitäten erwecken gerade im Hinblick auf die planerische Grundaufgabe des *„Hintanhalten[s] vermeidbarer Unterschiede der Lebensbedingungen in den einzelnen Regionen“* (Schindegger, 1999, S. 34) handlungsorientierten Zugzwang in Raumordnung und Regionalpolitik. Selbiges kann auch im Fall der EU-Kohäsionspolitik unterstellt werden.

Hieraus motiviert, fand die Begrifflichkeit der „Strukturstärke bzw. –schwäche“ – zumeist fokussiert auf die normativ negativ besetzte „Strukturschwäche“ – Eingang in diverse zentrale Planungsdokumente. Dabei wird jedoch oftmals von einer genauen Definition von „strukturstarken bzw. –schwachen“ Räumen abgesehen und die Begrifflichkeit als monokausales Argument zur Umsetzung bestimmter Entwicklungsvorstellungen verwendet. Folgende exemplarische Beiträge können zur inhaltlichen Klärung der Begrifflichkeit beitragen:

- Das Europäische Raumentwicklungskonzept: Hierin werden als Gründe für (eine nicht näher erläuterte) „Strukturschwäche“ von Regionen *„eine extrem geringe Bevölkerungsdichte, Unzugänglichkeit, klimatische Nachteile, infrastrukturelle Defizite, strukturelle Entwicklungsbrüche, ungünstige Branchenstrukturen, ungünstige landwirtschaftliche Produktionsbedingungen“* (Europäische Kommission, 1999, S. 25) genannt.

- Das Österreichische Raumentwicklungskonzept 2001: „Strukturschwache Räume“ werden hierin definiert als Räume in denen *„Arbeitsplätze, Wohnungen, kulturelle Einrichtungen oder soziale Infrastrukturen in geringerer Anzahl und Vielfalt vorhanden sind“* (Österreichische Raumordnungskonferenz, 2002, S. 65f.).
- Das Österreichisch-Slowakisch-Tschechische Handbuch der Raumplanungsbegriffe: Hierin werden „strukturschwache Räume“ als *„Gebiete, die hinsichtlich ihrer Ressourcenausstattung, Wirtschaftsleistung, Beschäftigungslage und Anpassungsfähigkeit an den allgemeinen Strukturwandel einen deutlichen Rückstand gegenüber dem durchschnittlichen Entwicklungsniveau des Territoriums, dem sie angehören, aufweisen und somit Teilräume mit einem hohen regionalpolitischen Interventionsbedarf darstellen“* (Akademie für Raumforschung und Landesplanung, 2000, S. 224) definiert.

Auf Basis dieser Befunde wird in weiterer Folge „Strukturstärke bzw. –schwäche“ als normatives Konstrukt verstanden, da es sich hierbei offensichtlich um einen nicht direkt beobachtbaren wertbesetzten Sachverhalt handelt. Die Eigenschaftszuweisung „Konstrukt“ bedingt aber nicht *„[…] dass der betreffende Sachverhalt nicht "existiert", sondern nur, dass er aus anderen, leicht(er) beobachtbaren Sachverhalten (sog. Indikatoren) erschlossen wird“* (Wikipedia, 2007). Dieser Ansatz einer indikatorenbasierten Erschließung des Konstrukts „Strukturstärke bzw. –schwäche“ wurde im deutschsprachigen Raum vor allem in Deutschland und der Schweiz verfolgt. Aus der Vielzahl dieser Arbeiten (z.B. Irmen, 1995; Bätzing, 2000; Bundesamt für Bauwesen und Raumordnung, 2004; Würdemann und Sieber, 2004; Kanton Aarau - Departement Bau, 2005) sei an dieser Stelle kurz der wohl umfassendste Ansatz sgn. „Regionaler Strukturindizes“ (Maretzke, 2001) beschrieben: Im Rahmen dieses Ansatzes wird das Konstrukt „Strukturstärke bzw. –schwäche“ über folgende sieben Teilbereichsindikatoren, welche wiederum aus Einzelindikatoren zusammengesetzt werden, abgebildet:

- Angebot an Arbeitsplätzen und Arbeitskräften
- Humankapital
- Wohlfahrtsniveau
- Einkommen
- Infrastruktur
- Wirtschaftsstruktur
- Siedlungsstruktur

Die Teilbereichsindikatoren werden jeweils auf den Bundesschnitt bezogen und einer Aggregation zugeführt, wodurch sektorale „Strukturindizes“ gebildet werden. Diese werden letztlich mittels Clusteranalyse zu einer Typologie verdichtet.

Ähnlich komplexe Ansätze zur Erschließung von „Strukturstärke bzw. –schwäche“ fanden in Österreich wenig Verbreitung. Einer von mehreren vielfach zitierten Gründen hierfür (vgl. Pohn-Weidinger und Gruber, 2002) liegt wohl in der, vor allem zu Deutschland, vergleichsweise eingeschränkten Datenverfügbarkeit. Hieraus resultierend würde eine reine Übernahme eines der erwähnten Ansätze zur indikatorenbasierten Erschließung des Konstrukts „Strukturstärke bzw. –schwäche“ zu kurz greifen.

3 EIN ANSATZ ZUR INDIKATORENBASIERTEN ERSCHLIESSUNG DES KONSTRUKTS „STRUKTURSTÄRKE BZW. –SCHWÄCHE“ IN ÖSTERREICH

Auf Basis dieser Überlegungen und Vorarbeiten aus dem Forschungsprojekt „MOVE - Mobilitäts- und Versorgungserfordernisse im strukturschwachen ländlichen Raum als Folge des Strukturwandels“ (vgl. Sammer, 2002) wurde der hier vorgestellte indikatorenbasierte Ansatz zur Erschließung des Konstrukts „Strukturstärke bzw. –schwäche“ in Österreich (auf Gemeindeebene) erstellt.

Zur Ermittlung von Strukturstärke bzw. -schwäche werden acht sozioökonomische Indikatoren verwendet. Als Datenquelle wird die ISIS-Datenbank der Statistik Austria herangezogen, wobei sich die einzelnen Indikatoren aus mehreren Teilindikatoren errechnen. Einen Überblick über die gewählten Kennzahlen sowie deren Berechnung gibt Tabelle 1.

Um einen Vergleich der Gemeinden zwischen 2001 und 1991 zu ermöglichen werden für beide Zeitpunkte gleiche Indikatoren gewählt. Die Veränderungen des Gebietsstandes zwischen 1991 und 2001 Gemeindezusammenlegungen oder –trennungen ist bereits in den Ausgangsdaten der Statistik Austria berücksichtigt. Der Gebietsstand der Bearbeitung entspricht letztendlich der Gemeindeeinteilung von 2001.

Indikator	Berechnung
Bevölkerungsentwicklung 1981 bis 1991 bzw. 1991 bis 2001	Bevölkerungsveränderung 1981 bis 1991 bzw. 1991 bis 2001 / Wohnbevölkerung 1991 bzw. 2001
Entwicklung der Beschäftigten am Arbeitsort 1981 bis 1991 bzw. 1991 bis 2001	Veränderung der Beschäftigten am Arbeitsort 1981 bis 1991 bzw. 1991 bis 2001 / Beschäftigte am Arbeitsort 1991 bzw. 2001
Erwerbsquote der Frauen 1991 bzw. 2001	Weibl. Erwerbspersonen 1991 bzw. 2001 / weibl. Wohnbevölkerung 1991 bzw. 2001
Anteil der Beschäftigten in der Land- und Forstwirtschaft 1991 bzw. 2001	Beschäftigte am Wohnort in der Land- und Forstwirtschaft 1991 bzw. 2001 / Beschäftigten am Wohnort gesamt 1991 bzw. 2001
Anteil der Tagesauspendler mit Wegzeiten > 45 Minuten pro Strecke 1991 bzw. 2001	Tagesauspendler mit Wegzeiten > 45 Minuten pro Strecke 1991 bzw. 2001 / Beschäftigte am Wohnort 1991 bzw. 2001
Anteil der Nichttagespendler 1991 bzw. 2001	Nichttagespendler 1991 bzw. 2001 / Beschäftigte am Wohnort 1991 bzw. 2001
Nächtigungsintensität 1991 bzw. 2001	Zahl der Übernachtungen 1991 bzw. 2001 / Wohnbevölkerung 1991 bzw. 2001
Steueraufkommen pro Kopf 1991 bzw. 2001	(Kommunalsteuer + Bundesertragsanteile 1991 bzw. 2001) / Wohnbevölkerung 1991 bzw. 2001

Tabelle 1: Indikatoren zur Erschließung des Konstrukts und deren Berechnung für die Zeitpunkte 1991 und 2001

Zu den gewählten Indikatoren im Detail: Über die Bevölkerungsentwicklung soll auf die Attraktivität einer Gemeinde als Lebensmittelpunkt geschlossen werden. Eine langfristige Abnahme der Bevölkerungszahl wird in diesem Sinn als sozioökonomische Problemsituation gedeutet (Stichwort „Schrumpfung“). Durch die Entwicklung der Beschäftigtenzahl können Aussagen über die Veränderung der Standortqualität der Gemeinden als Produktions- und Arbeitsstätten getroffen werden. Die Erwerbsquote der Frauen stellt einen Indikator zur grundsätzlichen Einschätzung der Beschäftigungschancen in der Region für Frauen dar. Eine geringe Frauenerwerbsquote in einer Gemeinde wird dabei als Hinweis auf Strukturschwäche gesehen. Der Indikator der so genannten „Problempendler“ (Nichttagespendler und Tagespendler mit über 45 Minuten Wegzeit pro Strecke) liefert ebenfalls Aussagen über das Arbeitsplatzangebot in der Region bzw. über den Ausstattungsgrad mit Verkehrsinfrastruktur und somit über die Erreichbarkeit von Zentren mit umfangreicheren Beschäftigungsmöglichkeiten. Der Anteil der Beschäftigten in der Land- und Forstwirtschaft gibt nicht nur Aufschluss über den Stellenwert des Primärsektors auf dem regionalen Arbeitsmarkt, sondern weist auch auf ein gewisses Unsicherheitspotential für die zukünftige regionale Entwicklung hin, da die Wertschöpfung und das Einkommensniveau im Primärsektor allgemein als unterdurchschnittlich bezeichnet werden kann. Anhand der Nächtigungsintensität wird der Grad der Tourismusbezogenheit einer Region abgebildet. Eine hohe Nächtigungsintensität bedeutet, dass der Fremdenverkehr wichtige Beiträge zur Einkommenslage der Bevölkerung liefert und damit eventuell vorhandene Problemlagen in anderen wirtschaftlichen Sektoren kompensieren kann.

3.1 **Der nutzwertanalytische Zugang**

Als methodische Vorgangsweise zur Erschließung des Konstrukts „Strukturstärke bzw. –schwäche“ wird ein nutzwertanalytisches Verfahren gewählt, welches auf die in Tabelle 1 angeführten sozioökonomischen Indikatoren als erklärende Variablen zurückgreift. Dieses kommt für die Zeitpunkte 1991 bzw. 2001 zur Anwendung, um so die Grundlage für eine Zeitreihenanalyse zu schaffen.

Um die einzelnen Indikatoren untereinander vergleichbar zu machen und somit eine spätere Aggregation zu ermöglichen, wird für jeden Indikator eine Standardisierung der Merkmalsausprägungen in einen Intervallbereich zwischen 0 und 100 vorgenommen. Es werden somit die Merkmalsausprägungen der Indikatoren mittels einer nutzwertanalytischen Transformation in dimensionslose Zielerfüllungswerte umgewandelt. Die normativ gesehen „schwächsten“ Merkmalsausprägungen eines Indikators (das Minimum

bzw. Maximum der jeweiligen Wertverteilung) erhält hierbei den Wert 0, die „stärkste“ Merkmalsausprägung den Wert 100. Die Normierung der Merkmalsausprägungen des Indikators j in der Gemeinde i wird folgendermaßen durchgeführt:

$$Ind_{ij\,std.} = \frac{Ind_{ij} - Ind_{j\,min\ bzw.\ max}}{Ind_{j\,max} - Ind_{j\,min}} * 100$$

$Ind_{ij\,std.}$ … Standardisierte Merkmalsausprägung des Indikators j in der Gemeinde i

Ind_{ij} … Merkmalsausprägung des Indikators j in der Gemeinde i

$Ind_{j\,max\,bzw.\,min}$ … Maximale bzw. minimale Merkmalsausprägung des Indikators j

Hier muss beachtet werden, dass bestimmte Indikatoren umgekehrt proportional zum Indikatorwert transformiert werden müssen, um eine inhaltliche Gleichrichtung der standardisierten Wertausprägungen zu erhalten. So wird beispielsweise ein hoher Anteil der Beschäftigten in der Land- und Forstwirtschaft tendenziell als „strukturschwach“ bewertet – im Gegensatz etwa zur Erwerbsquote der Frauen, bei der hohe Merkmalsausprägungen als „strukturstark“ interpretiert werden.

Die normierten Merkmalsausprägungen der Gemeinden für die acht Indikatoren werden schließlich einer additiven, ungewichteten Aggregation zugeführt. Von einer multiplikativen Aggregation wurde Abstand genommen, da hierdurch „Schwächen“ bzw. „Stärken“ in einzelnen Indikatoren stärker berücksichtigt werden, im Sinne dieser Arbeit jedoch das Konstrukt „Strukturstärke bzw. –schwäche“ als gleichgewichtete Summe von Indikatoren (mit wechselseitigen Substitutionsmöglichkeiten) verstanden wird. Weiters wird auf eine vorherige Gewichtung der Indikatoren mangels Kenntnis über den realen Einfluss der Indikatoren auf die Strukturstärke bzw. -schwäche verzichtet. Das Ergebnis der Aggregation ist ein Summenwert (in weiterer Folge als „Gesamtnutzwert“ bezeichnet) über alle Indikatoren, welcher die Grundlage für die Visualisierung des Konstrukts „Strukturstärke bzw. -schwäche“ mittels GIS bildet.

Das beschriebene Verfahren führt zu einer rein relativen Normierung der Merkmalsausprägungen. Das heißt, dass die damit erzielten Rangreihenfolgen für die Zeitpunkte 1991 und 2001 anhand des Gesamtnutzwerts nur innerhalb Österreichs gelten. Ein Vergleich mit Deutschland etwa wäre nur über a) eine integrative Betrachtung von Deutschland und Österreich mittels relativer Normierungsverfahren oder b) über entsprechende absolute Bewertungskriterien – beispielsweise durch Schwellenwerte – möglich.

Die Visualisierung der Rangreihung der Gemeinden anhand des Gesamtnutzwerts liefert als Ergebnis eine thematische Karte mit Abstufungen von „sehr strukturstarken“ bis „sehr strukturschwachen“ Gemeinden. Da eine symmetrische Unterscheidung zwischen Strukturstärke und –schwäche in Hinblick auf die Aussage der Karte wünschenswert ist, wird eine gerade Anzahl an Klassen gewählt, wobei sich 6 Klassen für die Lesbarkeit der Karte am besten eignen. Die Klassifizierung erfolgt dabei anhand von Sextilen – die Gesamtnutzwerte werden in sechs Klassen unterteilt, in denen jeweils die gleiche Anzahl an Fällen (Gemeinden) zusammengefasst ist.

Als Abschluss der Analyse werden die Erklärungsgehalte der einzelnen Indikatoren am aggregierten Gesamtnutzwert untersucht. Aufgrund des gewählten Normierungsverfahrens der Indikatoren wird hierzu auf das Verfahren der schrittweisen linearen Regression zurückgegriffen. Dabei werden die Indikatoren nacheinander in die Regressionsgleichung einbezogen, wobei im ersten Schritt derjenige Indikator mit der höchsten (absoluten) Korrelation mit dem erzielten Gesamtnutzwert zu dessen Erklärung herangezogen wird. Die restlichen 7 Indikatoren werden in den nachfolgenden Schritten anhand deren höchster partieller Korrelation zum Gesamtnutzwert dem Regressionsmodell hinzugefügt (vgl. Backhaus, Erichson et al., 2000, S. 55f.). Bei der hier präsentierten Verwendung dieses Verfahrens steht weniger (wie im Falle einer klassischen Regressionsanalyse) die Ermittlung der Regressionskoeffizienten im Vordergrund, da diese konstant und bekannt sind, sondern die Ermittlung der Reihenfolge der dem Regressionsmodell hinzugefügten Indikatoren, da *„aus der Rangfolge der Aufnahme […] sich die statistische Wichtigkeit der Variablen erkennen [lässt]“* (Backhaus, Erichson et al., 2000, S. 55f.). Als Maß für diese statistische Wichtigkeit eines Indikators wird die Veränderung des Bestimmtheitsmaßes durch dessen Hinzunahme zum Regressionsmodell (der sgn. „R^2 Change“-Wert) verwendet. Bedingung für diese Vorgehensweise ist, dass ein einmalig dem Regressionsmodell hinzugefügter Indikator aus diesem nicht mehr entfernt wird, was im gegenständlichen Modell aufgrund der Eingangsdaten (gleichgewichtete Linearkombination) stets der Fall ist.

Abbildung 1 zeigt den Verlauf einer solchen schrittweisen Regression betreffend die „Strukturstärke bzw. -schwäche“ österreichischer Gemeinden zum Stand 2001 anhand der Verbesserung des Bestimmtheitsmaßes (R^2) sowie die Ermittlung der „R^2 Change“-Werte für die jeweiligen Modellkonstellationen grafisch.

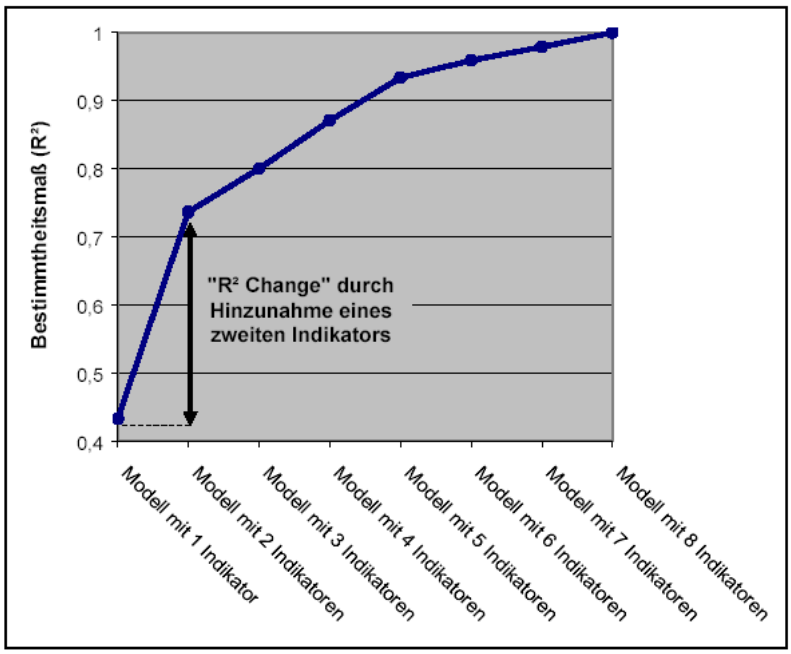

Abbildung 1: Verlauf des Bestimmtheitsmaßes zur Erklärung des Konstrukts "Strukturstärke bzw. –schwäche“ für die Gemeinden Österreichs (2001) mittels schrittweiser Regression

4 RAUM- UND ZEITBEZOGENE BEFUNDE ZUM KONSTRUKT “STRUKTURSTÄRKE BZW. –SCHWÄCHE” IN ÖSTERREICH

Die in Kapitel 3.1 beschriebene Vorgehensweise zur räumlichen Darstellung des Konstrukts “Strukturstärke bzw. –schwäche” anhand österreichischer Gemeinden zu einem bestimmten Zeitpunkt liefert für das Jahr 2001 folgendes Ergebnis:

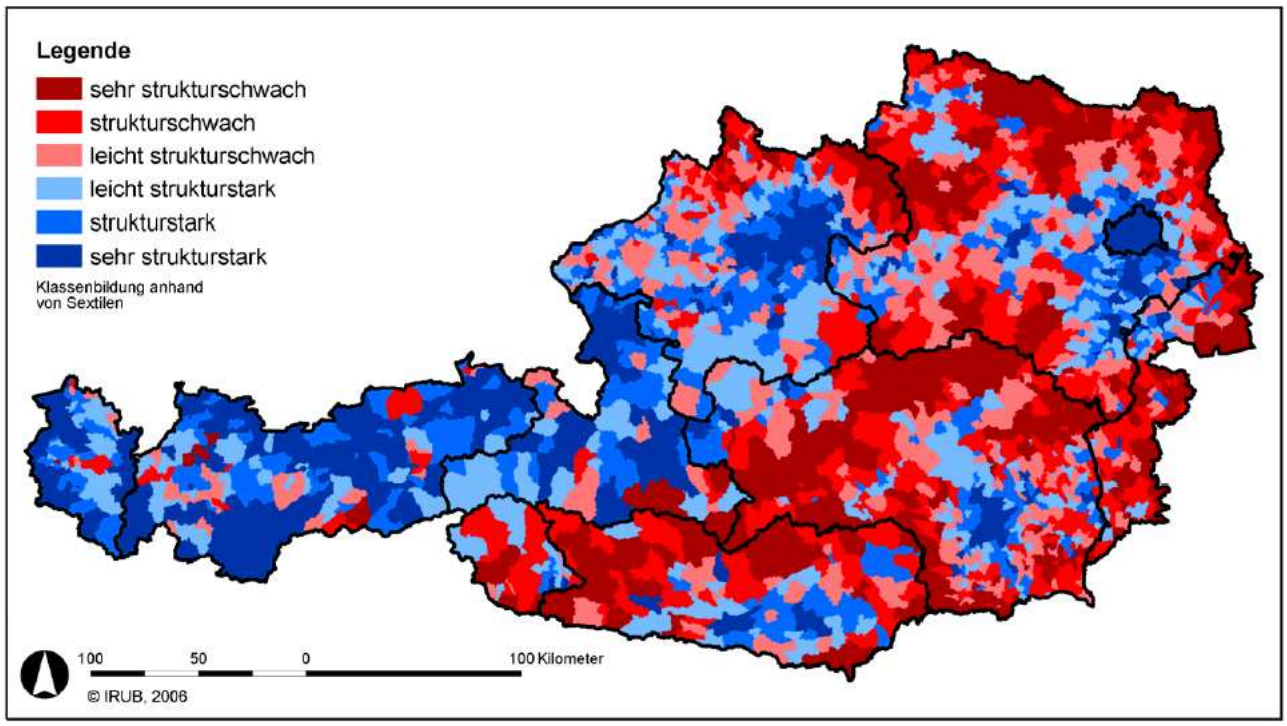

Abbildung 2: Ausprägung des Konstrukts "Strukturstärke bzw. -schwäche" in österreichischen Gemeinden zum Zeitpunkt 2001

Folgende Regionen können, basierend auf Abbildung 2, als strukturschwache Räume identifiziert werden:

- Nahezu alle Gemeinden entlang des ehemaligen „Eisernen Vorhanges“ einschließlich des nördlichen Wald- und Weinviertels sowie des Burgenlands
- Die Grenzregion zwischen Wald- und Mühlviertel
- Die Semmeringregion, der Wechsel und Gemeinden im Bereich der Fischbacher Alpen
- Gemeinden in der Obersteiermark und im südlichen Mostviertel
- Große Teile der inneralpinen Gemeinden in der Weststeiermark sowie Nord- und Westkärnten
- Teile Osttirols

Folgende Regionen fallen durch besondere Strukturstärke auf:

- Die Stadtregionen und Zentralräume – insbesondere Wien, Linz, Wels, Salzburg, Graz, Klagenfurt, Villach, Innsbruck und Bregenz
- Große Teile der Bundesländer Salzburg, Tirol und Vorarlberg, deren Strukturstärke unter anderem auf die starke touristische Aktivität zurückzuführen ist

In einem weiteren Schritt wird der Entwicklungsverlauf des Konstrukts „Strukturstärke bzw. –schwäche“ zwischen den Zeitpunkten 1991 und 2001 näher untersucht:

Zu diesem Zweck werden die Rangplatzveränderungen der 2359 Gemeinden im Rahmen der auf Grundlage des Gesamtnutzwertes durchgeführten Rangreihung (1 bis 2359) im angegebenen Zeitraum durch Subtraktion ermittelt. Dadurch wird ersichtlich, welche Gemeinden sich im Gesamtranking zwischen 1991 und 2001 verbessert oder verschlechtert haben und welche Gemeinden ihre Position in Relation zur Gesamtverteilung halten konnten. Gründe hierfür können aus dieser Analyse nicht abgeleitet werden, da eine solche Rangplatzveränderung stets ein Wechselspiel aus den absoluten Veränderungen einer Gemeinde und der daraus resultierenden relativen Position zu den restlichen Gemeinden Österreichs ist. Hierdurch ist es auch möglich, dass eine Gemeinde mit gleichen Gesamtnutzwerten 1991 und 2001 sich in der Rangreihenfolge aller Gemeinden 2001 verbessern bzw. verschlechtern kann. Abbildung 3 zeigt das Ergebnis dieser Analyse:

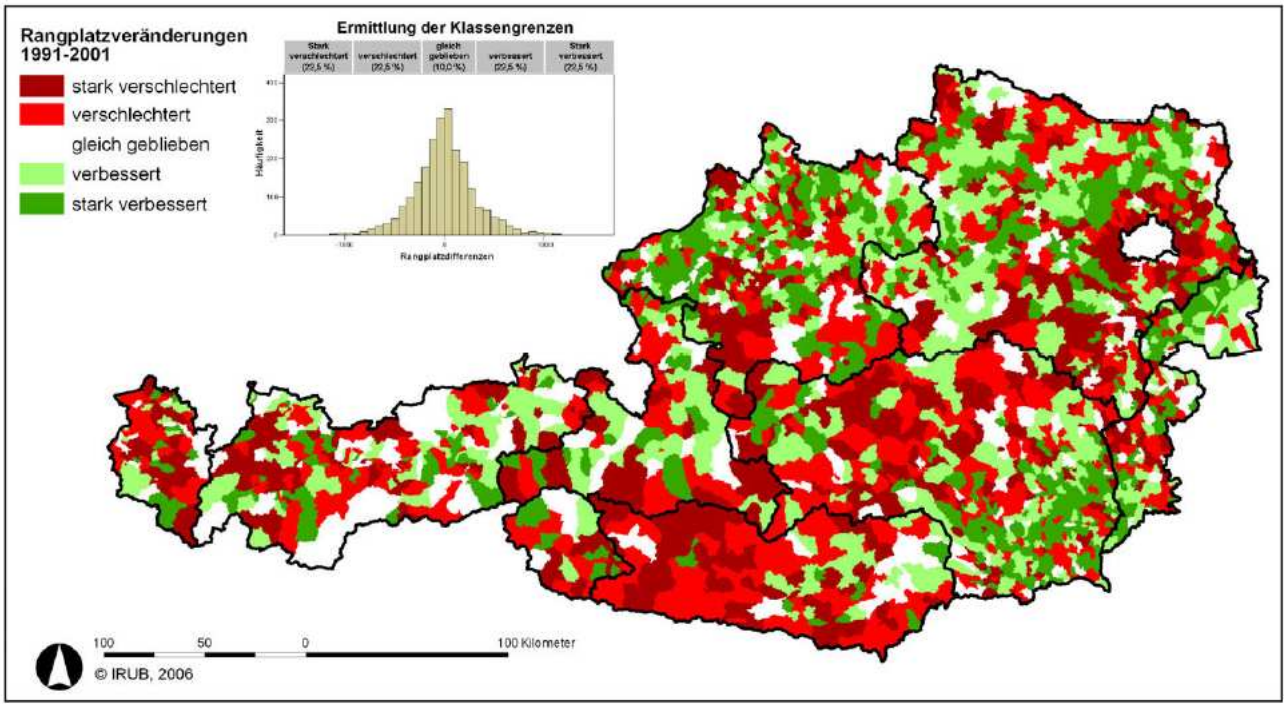

Abbildung 3: „Strukturstärken bzw. –schwächen“-basierte Rangplatzveränderungen österreichischer Gemeinden im Beobachtungszeitraum 1991-2001

Auffallende Rangplatzverschlechterungen gab es in Österreich zwischen 1991 und 2001 in folgenden Bereichen:

- Im Stadtumland von Wien, Salzkammergut sowie Teilen Tirols und Vorarlbergs – ein möglicher Grund hierfür könnte das Erreichen eines Sättigungsgrads hinsichtlich Strukturstärke sein: Diese Gemeinden konnten sich aufgrund des hohen Vorsprungs nicht mehr in dem Maße verbessern wie deutlich strukturschwächere Gemeinden und erzielten so 2001 ein verhältnismäßig schlechteres Ergebnis.
- In Gemeinden in Nord- und Westkärnten, im inneralpinen Raum der Steiermark sowie im südlichen Niederösterreich: Diese bereits 1991 als sehr strukturschwach eingestuften Gemeinden fallen 2001 noch weiter zurück.

Rangplatzverbesserungen treten besonders im Wald- und Mostviertel sowie in Teilen des Weinviertels, im Nordburgenland, in der Oststeiermark und im Südburgenland sowie im Mühl- und Innviertel auf.

Betrachtet man die Struktur der Veränderungen der Rangplätze nach Bundesländern so ergibt sich folgendes Bild:

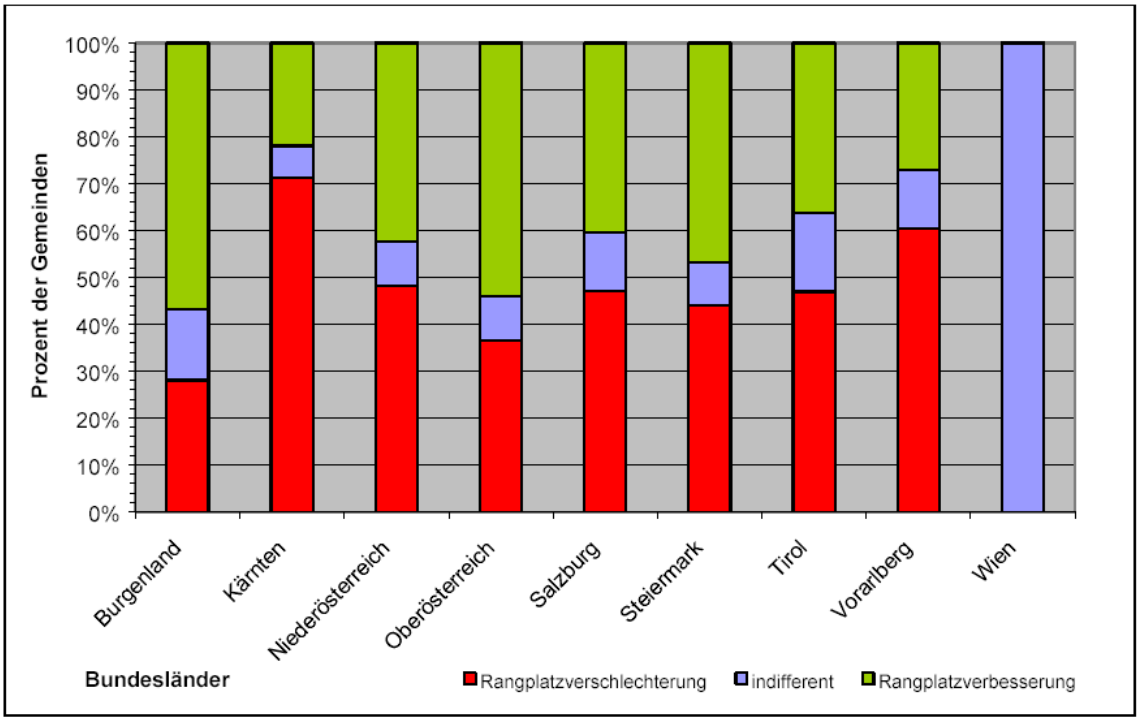

Abbildung 4: Rangplatzveränderungen österreichischer Gemeinden bezüglich des Konstrukts „Strukturstärke bzw. –schwäche“ zwischen 1991 und 2001 nach Bundesländern

Hierbei wurden die in Abbildung 3 dargestellte Kategorisierung der Rangplatzveränderungen wie folgt zusammengefasst: Die Klassen „stark verschlechtert“ und „verschlechtert“ (welche 45 % der Wertverteilung abdecken) bilden die Kategorie „Rangplatzverschlechterung“, analog wurde die Kategorie „Rangplatzverbesserung“ abgeleitet. Die Klasse „gleich geblieben“ (die um den Nullpunkt gruppierten 10 % der Wertverteilung) bildet die Kategorie „indifferent“.

In den Bundesländern Kärnten und Vorarlberg weisen 60 und mehr Prozent aller Gemeinden eine Verschlechterung ihres Rangplatzes im Vergleichzeitraum 1991 – 2001 auf. Im Gegenzug weisen über 50 % aller oberösterreichischen und burgenländischen Gemeinden einer Verbesserung ihres Rangplatzes auf. Als „konstantestes“ Bundesland erweist sich Tirol, wo 17 % aller Gemeinden ihren Rangplatz im Vergleichszeitraum halten konnten.

Um diese Veränderungen noch besser charakterisieren zu können erscheint eine Gewichtung dieser Veränderungen mit den jeweiligen Rangplatzverschiebungen sinnvoll, wodurch auf die durchschnittlichen Rangplatzveränderungen in den Bundesländern geschlossen werden kann (siehe umseitige Abbildung 5). Generell wird ersichtlich, dass sich die durchschnittlichen Rangplatzveränderungen in den Bundesländern bei einem Maximum von ca. 10 % der Rangspannweite einpendeln. Dieses Bild differiert dabei je nach Bundesland deutlich: Weist das Burgenland das wohl günstigste Verhältnis zwischen durchschnittlichen Rangplatzverlusten und -gewinnen auf (0,7) so bildet Vorarlberg hierzu den Gegenpol mit einem Verhältniswert von 1,7. Interpretiert man diese Ergebnisse der Rangplatzveränderungen in Kombination zu

den zugrunde gelegten Strukturstärken bzw. –schwächen, so sind vor allem das (relative) Aufholen des Burgenlands und scheinbare Sättigungseffekte in strukturstarken Regionen (z.B. im „Speckgürtel“ rund um Wien) bezüglich der Rangplatzveränderungen augenscheinlich.

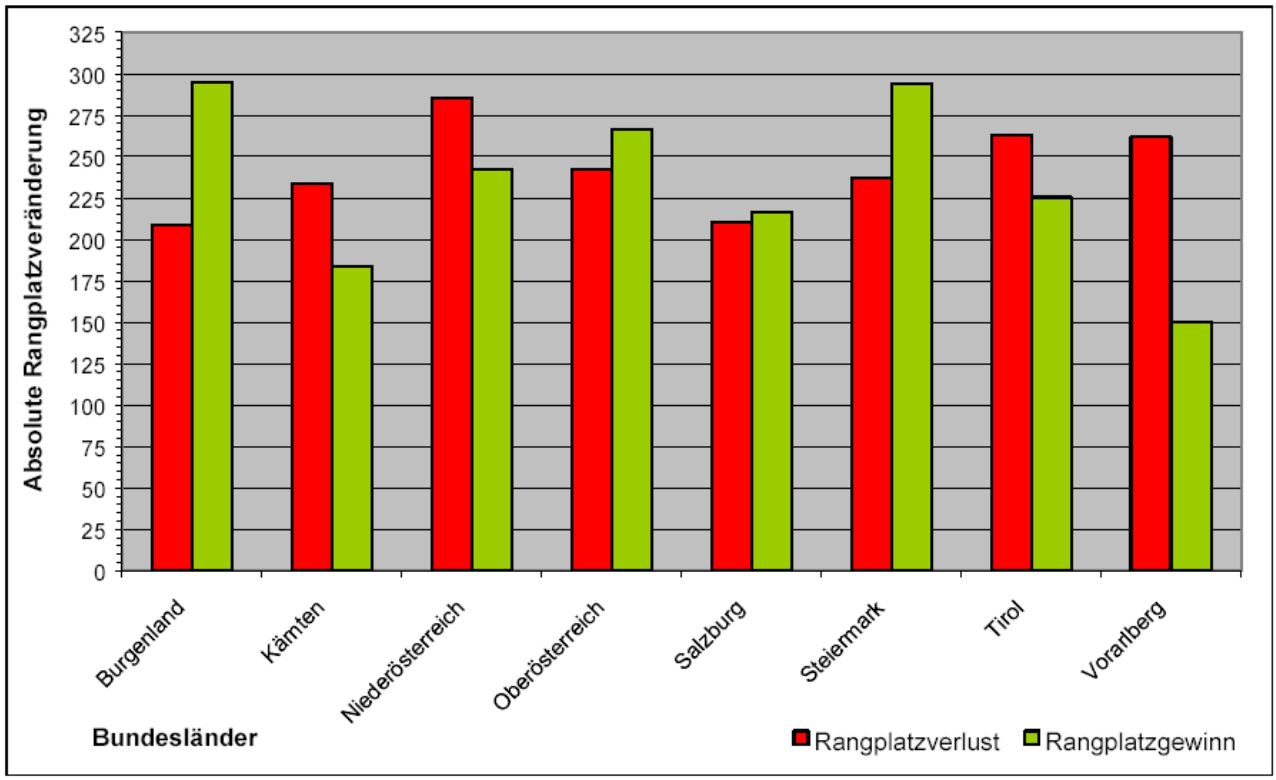

Abbildung 5: Durchschnittliche Rangplatzveränderungen österreichischer Gemeinden bezüglich des Konstrukts „Strukturstärke bzw. -schwäche“ zwischen 1991 und 2001 nach Bundesländern

Bezüglich der angestrebten Untersuchung der statistischen Erklärungsgehalte der eingesetzten Indikatoren zum ermittelten Gesamtnutzwert können folgende, in Abbildung 6 dargestellte Beobachtungen gemacht werden:

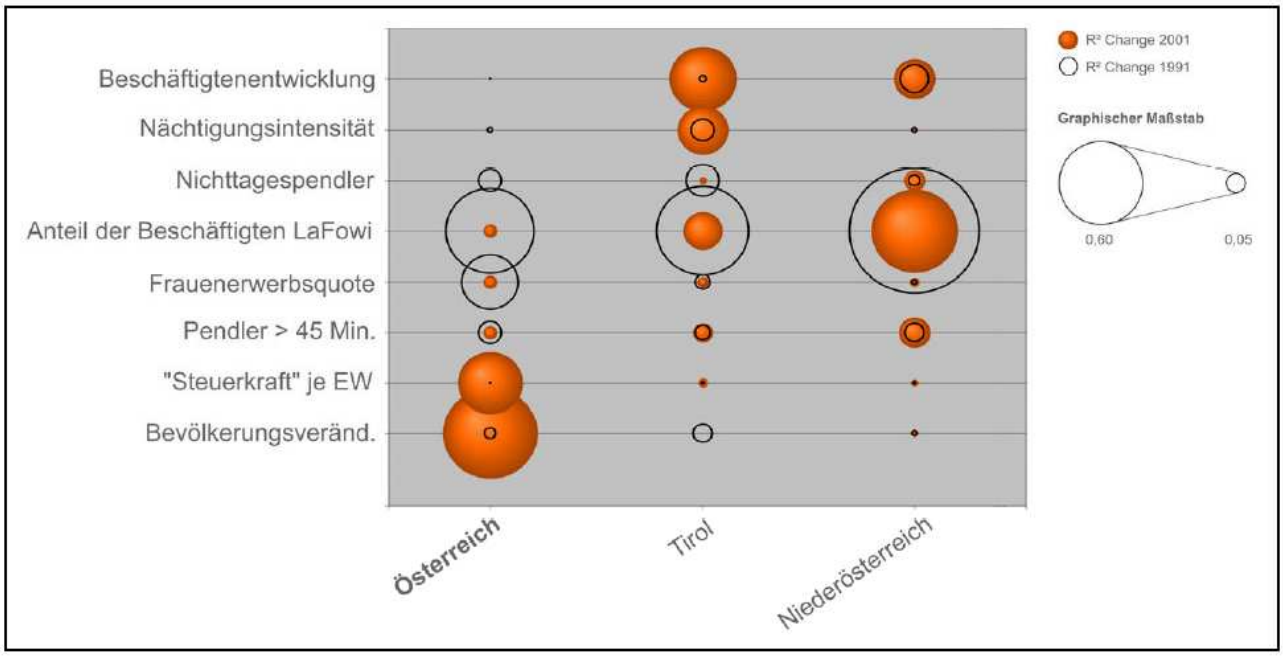

Abbildung 6: Statistische Relevanz der zur Abbildung von "Strukturstärke bzw. -schwäche" benutzten Indikatoren

Abbildung 6: Statistische Relevanz der zur Abbildung von "Strukturstärke bzw. -schwäche" benutzten Indikatoren 1
*Zur Interpretation der Darstellung: Je größer die abgebildeten Kreise (Ausgangswerte 1991) bzw. organgenen Flächen (Werte 2001) umso größer ist der statistische Erklärungsgehalt eines Indikators am ermittelten Gesamtnutzwert.)

Der anhand der schrittweisen Verbesserung des Bestimmtheitsmaßes („R^2 Change“-Wert) gemessene statistische Erklärungsgehalt der einzelnen Indikatoren zeigt für die Summe aller österreichischen Gemeinden eine klare Dominanz der Indikatoren „Bevölkerungsveränderung“ bzw. „Steuerkraft je Einwohner“. Der starke Erklärungsgehalt dieser beiden Indikatoren scheint sich jedoch erst zwischen 1991 und 2001 entwickelt zu haben, da 1991 noch die Indikatoren „Anteil der Beschäftigten in der Land- und Forstwirtschaft“ bzw. „Frauenerwerbsquote“ dominant in der Erklärung von Strukturstärke bzw. -schwäche waren. Dass sich dieser „Österreich-Schnitt“ im Erklärungsgehalt der Indikatoren nicht in allen Bundesländer so direkt widerspiegelt, belegen die Beispiele für Tirol und Niederösterreich: Sind es in Tirol die Indikatoren „Beschäftigtenentwicklung“ und „Nächtigungsintensität“, so weist in Niederösterreich der „Anteil der Beschäftigten in der Land- und Forstwirtschaft“ den höchsten Erklärungsgehalt auf.

5 RESÜMEE UND AUSBLICK

Durch den gewählten Zugang kann das wertende Konstrukt „Strukturstärke bzw. –schwäche“ österreichischer Gemeinden anhand von acht Indikatoren konkretisiert, empirisch erschlossen, klassifiziert und dessen Veränderung im Zeitablauf dargestellt werden. Unbeantwortet im Rahmen des hier vorgestellten Ansatzes bleibt die Frage nach der inhaltlichen Rechtfertigung der gewählten Indikatoren zur Erschließung des Konstrukts „Strukturstärke bzw. –schwäche“. Das vorgestellte Indikatorenset kann dabei als pragmatischer Kompromiss gesehen werden, welcher sicherlich nicht vollständig die geforderte inhaltliche Tiefe aller regionalpolitischen bzw. raumordnerischen Aufgabenstellungen befriedigen wird. Eine Möglichkeit zur Reaktion auf diesen Kritikpunkt würde sich in einer Delphi-Befragung zur Klärung der inhaltlichen und kriteriellen Facetten des Konstrukts (z.B. der Klärung von infrastrukturellen Mindestsversorgungsstandards etc.) bieten. Auf Basis einer solcherart abgesicherten begrifflichen Definition erscheint eine periodische Ermittlung des Konstrukts „Strukturstärke bzw. –schwäche“ im Sinne einer laufenden Raumbeobachtung als ein geeigneter Indikator zur Abbildung von Effekten durchgeführter regionalpolitischer bzw. raumordnerischer Maßnahmen.

Die vorgestellten Ergebnisse können in weiterer Folge z.B. auch als Baustein einer (planungsrelevanten) Raumtypisierung gesehen werden, welche wiederum eine Grundlage für die Ableitung typenspezifischer Entwicklungsstrategien darstellt. Dies wurde beispielsweise durch Weber und Seher (2006) für den ländlichen Raum Österreichs dargelegt. Eine solche Sichtweise erscheint insbesonders dahingehend sinnvoll, die häufig entstehende Kluft zwischen komplex hergeleiteten Sachverhalten und Prozessen zu deren Beeinflussung zu überwinden. Somit eröffnet sich durch die indikatorenbasierte Erschließung des Konstrukts „Strukturstärke- bzw. -schwäche“ die oftmals zitierte Chance (regionale) politische Diskussions- und Lernprozesse in Gang zu setzen. In diesem Sinn sei letztlich auf die Worte von Peter Schneidewind (2002, S. 25) verwiesen:

„Gleichgültig, ob einschlägige Vergleiche von der Gralshütern der amtlichen Statistik oder von akademischen oder kommerziellen Hofnarren vorgelegt werden, ein Mittel zur Beurteilung von regionaler Politik sind sie allemal.“

6 LITERATUR

Akademie für Raumforschung und Landesplanung, Hg. (2000): "Österreichisch-Slovakisch-Tschechisches Handbuch der Raumplanungsbegriffe". Hannover; Verlag der ARL.

Akademie für Raumforschung und Landesplanung (2006): "Gleichwertige Lebensverhältnisse: eine wichtige gesellschaftspolitische Aufgabe neu interpretieren!" Positionspapier der ARL Nr. 69; Hannover.

Backhaus, K., Erichson, B., et al. (2000): "Multivariate Analysemethoden: eine anwendungsorientierte Einführung"; Berlin; Springer Verlag.

Bätzing, W. (2000): Regionsspezifische Ausgestaltung der Nachhaltigkeitsziele. In: Akademie für Raumforschung und Landesplanung ARL (Hg.): Nachhaltigkeitsprinzip in der Regionalplanung. Handreichung zur Operationalisierung (Forschungs- und Sitzungsberichte der ARL Nr. 212). Hannover; Verlag der ARL; S. 162 - 168.

Bundesamt für Bauwesen und Raumordnung (2004):Endbericht zum Forschungsvorhaben "Öffentliche Infrastruktur und kommunale Finanzen"; Bonn.

Bundesamt für Bauwesen und Raumordnung (2006): "Gleichwertige regionale Lebensverhältnisse?" Informationen zu Raumentwicklung Nr. 6/7.2006; Bonn.

Europäische Kommission (1999): "EUREK - europäisches Raumentwicklungskonzept auf dem Wege zu einer räumlich ausgewogenen und nachhaltigen Entwicklung der Europäischen Union"; Luxemburg; Amt für Amtliche Veröff. der Europ. Gemeinschaften.

Irmen, E. (1995): "Strukturschwäche in ländlichen Räumen - ein Abgrenzungsvorschlag". Bundesforschungsanstalt für Landeskunde und Raumordnung BfLR-Arbeitsunterlagen Nr. 15; Bonn

Kanton Aarau - Departement Bau, Verkehr und Umwelt (2005): "Strukturschwache Regionen".Verwaltungsinterner Grundlagenbericht; Aarau.

Maretzke, S. (2001): "Die Unterschiede in der Regionalstruktur von heute prägen die Trends von morgen. Ostdeutsche Regionen in der Warteschleife?" In: Informationen zu Raumentwicklung. Bd. 2/3(2001); S. 81-108.

Österreichische Raumordnungskonferenz (2002): "Österreichisches Raumentwicklungskonzept 2001". Geschäftsstelle d. Österr. Raumordungskonferenz (ÖROK); Schriftenreihe der Österreichische Raumordnungskonferenz Nr. 163; Wien.

Pohn-Weidinger, S. und Gruber, M. (2002): "Innovation und Wettbewerbsfähigk - zwischen Wunsch und Realität". In: RAUM. Bd. 48(2002); S. 33-35.

Sammer, G. (2002): "Das Forschungsprojekt MOVE – Ziele, Methoden und Konzeption". In: Land + Raum. Bd. (2/2002); S. 4-6.

Schindegger, F. (1999): "Raum, Planung, Politik - ein Handbuch zur Raumplanung in Österreich"; Wien [u.a.]; Böhlau.

Schneidewind, P. (2002): "Nicht alles, was hinkt, ist ein Vergleich! Fug und Unfug regionalen Benchmarkings". In: RAUM. Bd. 48(2002); S. 22-26.

Weber, G. und Seher, W. (2006): "Raumtypenspezifische Chancen für die Landwirtschaft - Eine Annäherung aus österreichischer Sicht". In: DISP. Bd. 166(3/2006); S. 46-57.

Würdemann, G. und Sieber, N. (2004): "Raumwirksamkeitsanalyse in der Bundesverkehrswegeplanung 2003". In: Informationen zu Raumentwicklung. Bd. 6(2004); S. 365-377.

Wikipedia; de.wikipedia.org/wiki/Konstrukt; abgerufen im März 2007.

🏆 *reviewed paper*

„Früherkennung, Entscheidung und Kontrolle zur Steuerung und Kommunikation im Urban Management“

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1 AUSGANGSSITUATION UND RAHMENBEDINGUNGEN

Räumlich-bauliche Qualität unter Berücksichtigung vielfältiger ökonomischer, ökologischer und sozialer Rahmenbedingungen ist das Fundament für eine erfolgreiche Regional-, Stadt- und Projektentwicklung. Dies zu erreichen, erfordert allerdings ein sehr komplexes Prozessverständnis, das unter den gegenwärtig diskutierten Transformations- und Schrumpfungsbedingungen nicht nur die raumbeeinflussenden, sondern auch die raumstrukturellen Größen umfasst. Die Komplexität der Entwicklung ist u. a. auf die Gegensätzlichkeit der Verläufe von Wachsen und Schrumpfen innerhalb des städtischen Systems zurückzuführen.

Mit der daraus resultierenden Notwendigkeit für einen neuen planerischen Handlungsrahmen geht die Entwicklung neuer Leitbilder, Strategien und Instrumente einher. Ausgangspunkt für die Gestaltung lebenswerter und attraktiver Städte ist eine frühzeitige Analyse der Gegenwart und eine realistische Einschätzung der künftigen Möglichkeiten.[96] Demzufolge ist es notwendig, noch vor der Konzeptionierung sowie Maßnahmenumsetzung eine fundierte Grundlage über die derzeitige funktionale und räumliche Struktur in der Stadt zu schaffen.

1.1 Urban Management als Herausforderung und Aufgabenfeld

Die intensive Beleuchtung und damit die Kenntnis komplexer Zusammenhänge sollte demnach zur Grundlage jedes stadt- und regionalplanerischen Handelns gemacht werden. Hier setzt Urban Management an: Im Erkennen und Analysieren der Gegebenheiten, Aussichten und Interessen. Und im konstruktiven, ganzheitlichen, kooperativen, planerischen – hier kann auch der Weg das Ziel sein – Umgang mit Stadt.

Planung im engeren Sinn kann definiert werden als überwiegend konzeptioneller Ansatz, der auf dem Analyseelement aufbaut. Im weiteren Sinne beinhaltet Planung als „ein systematisches Vorgehen zur Entwicklung von Handlungszielen und -abfolgen über einen längeren Zeitraum“[97] die Analyse. Am weitesten greift Urban Management resp. Stadtmanagement, bei dem Planung im weiteren Sinne noch um den Vollzug ergänzt wird. Das Urban Management profitiert und agiert kontinuierlich von und mit einem strukturierten „Informationsmanagement“ (vgl. Abbildung 1).

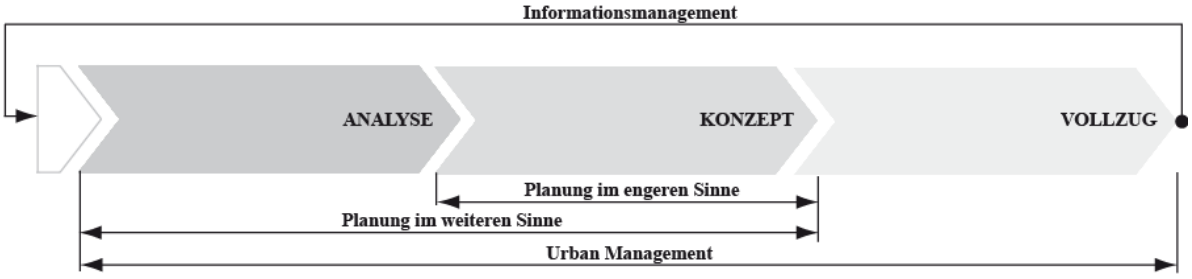

Abbildung 5: Elemente des Urban Management: Analyse, Konzept, Vollzug (eigene Darstellung)

Urban Management nimmt damit eine aktive Schnittstellenfunktion ein und benötigt Kompetenzen zur strategischen Steuerung und integrierenden Betrachtung. In diesem Verständnis ist auch die Unterscheidung zur Philosophie und Vorgehensweisen früherer Klassischer Entwicklungsplanungen bzw. dem Ansatz „Projekte statt Pläne“ zu erkennen.[98]

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96 Vgl. STIENS (2004), S. 10.

97 FÜRST; RITTER (2005), S.765.

98 Eine Gegenüberstellung von Planungsphilosophien und Ansprüchen in verschiedenen Epochen findet sich z.B. bei: WEIDNER (2005), S. 114-117, 124.

1.2 Dimensionen von Stadt

Das implizierte Aufgabenverständnis lässt sich über die zwei Wortteile des Urban Management herleiten: Betrachtet man zunächst die Begrifflichkeit „Stadt“, kristallisieren sich für Urban Managment[99] im Sinne des Städtischen mehrere Stränge heraus:

- Die Stadt als *Organismus* bzw. *Gegenstand* des Handelns. Als Basis und Zielebene des raumbezogenen Handelns besteht sie aus zwei Dimensionen, der gebauten Hülle – also dem physischen Element - und der gelebten Stadt als Lebens-, Arbeits- und Wirtschaftsraum. Beide funktionieren in engem Wechselverhältnis, eingebettet in einen Verflechtungsraum.
- Die Stadt als *Organisationsform*, herunter gebrochen auf die *Stadtverwaltung* als handelndem Akteur sowie *Stadtpolitik* als verantwortliche Instanz. Bei Erstgenanntem meint Urban Management – auch im Sinne der ressortübergreifenden Zusammenarbeit – vorwiegend Steuerungsaufgaben wie Verwaltungsmanagement, Akteurskoordinierung, integrierte Konzepterarbeitungen bis hin zur Ermöglichung von Mischfinanzierungen unter Verwendung komplexer auf interdisziplinäre Kräftebündelung ausgelegter Förderprogramme. Aufgrund der Neuartigkeit von Rahmenbedingungen aber auch von Handlungsnotwendigkeiten und -ansätzen in Transformationszeiten (vgl. Kap. 1), geht es hier aber auch um interne Vermittlung. Stadtpolitik fungiert über den Stadt- oder Gemeinderat als Synapse nach Außen. Sie fasst Selbstbindungsbeschlüsse und geht über informelle Instrumente Verabredungen ein – intern, aber auch gegenüber Dritten – und schafft durch die Verabschiedung von formellen Instrumenten Recht, im Sinne der städtebaulichen Ordnung und Entwicklung sowie dem Wohl der Allgemeinheit.
- Stadtentwicklungsplanung als *Vorgehensweise* mit entsprechendem „Instrumentenkoffer“ steht für die Gestaltung der Aufgabe, die Steuerung des Prozesses und die Kooperation mit Partnern. Der Begriff Stadtentwicklung, nicht -planung, verweist ein Stück weit auf ein immer komplexer werdendes Aufgaben- und Tätigkeitsfeld mit aufeinander aufbauenden Verfahrensansätzen und begleitender Prozesssteuerung.

1.3 Management

In den Raumwissenschaften ist die Identifikation mit dem Begriff „Management“ im Kontext von Stadt- und Regionalplanung nicht unumstritten. Manchen Wissenschaftlern erscheint er zu sehr ausgerichtet auf technische und effizienzbezogene Fragen, zu wenig Bezug nehmend auf kreative und visionäre Momente.[100] Beim Urban Management im hier dargelegten Sinne, lässt sich der zweite Wortteil jedoch sehr gut in das inhaltliche Verständnis einordnen: Management ist abgeleitet aus dem lat. *manum agere* und bedeutet „an der Hand führen“.[101]

In der Kopplung der Wortteile „Stadt“ bzw. „Urban“ und „Management“ ist damit das definiert, was als Handlungserfordernis analysiert und erkannt ist. Insbesondere in Ostdeutschland wird dieses Prozessverständnis auch bereits praktiziert. Es beinhaltet die Einbeziehung von Akteuren, Verantwortlichen wie „Betroffenen“ (an die Hand nehmen) sowohl auf inhaltlicher als auch auf organisatorisch koordinierender Ebene. Die kreative Planung stellt dabei ein wichtiges Teilelement dar.

Damit steht Urban Management als wichtige Aufgabe zwischen normativer Werterfüllung und operativer bzw. sogar pragmatischer Umsetzung mit dem Ziel der attraktiven und lebenswerten Quartiere, Städte und Regionen. Es bedarf deshalb bei allen aufgeführten Strängen innovativer Instrumente und Vorgehensweisen, die in Summe ihrer Anwendung eine fundierte Informationsbasis, Kommunikationsplattform sowie Entscheidungshilfe darstellen. Es gewinnen insbesondere solche Themen an Bedeutung, die Zukunft imaginieren sowie ungesteuerte bzw. manipulierte Entwicklungen erkennen und kontrollieren. Darauf zielen die folgenden Erläuterungen der beiden Forschungsfelder ab. Zum einen mit der Entwicklung eines sehr stringenten datenseitig basierten Instruments (stark quantitative Ausrichtung) und zum anderen mit der Entwicklung von deskriptiven und alternativen Szenarien. Diese können auf kommunaler Ebene zur

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[99] Eine umfängliche Auseinandersetzung zum Aufgabenverständnis und den Strategien des Urban Management resp. Stadtmanagement findet sich in: SINNIG (2006).

[100] Vgl. die Diskussion des Begriffes z.B. bei: DAVY, Benjamin (1998): S. 95-96.

[101] http://de.wikipedia.org/wiki/Management.

aktuellen Leitbilddiskussion beitragen und bieten Orientierung zur komplexen Strategienentwicklung in einzelnen Stadtquartieren unter Berücksichtigung gesamtstädtischer Zusammenhänge.

1.4 Ableitbare Aufgabenschwerpunkte

Stadtentwicklung als komplexer Prozess besteht aus einer Überlagerung von Kreisläufen (vgl. Abbildung 2). Denn in der Realität werden mehrere Planungsprozesse parallel durchgeführt, werden mehrere Projekte gleichzeitig entwickelt. Darüber hinaus erfolgt im Sinne eines revolvierenden Systems von Element zu Element und zwischen den einzelnen Phasen eine Rückkopplung.

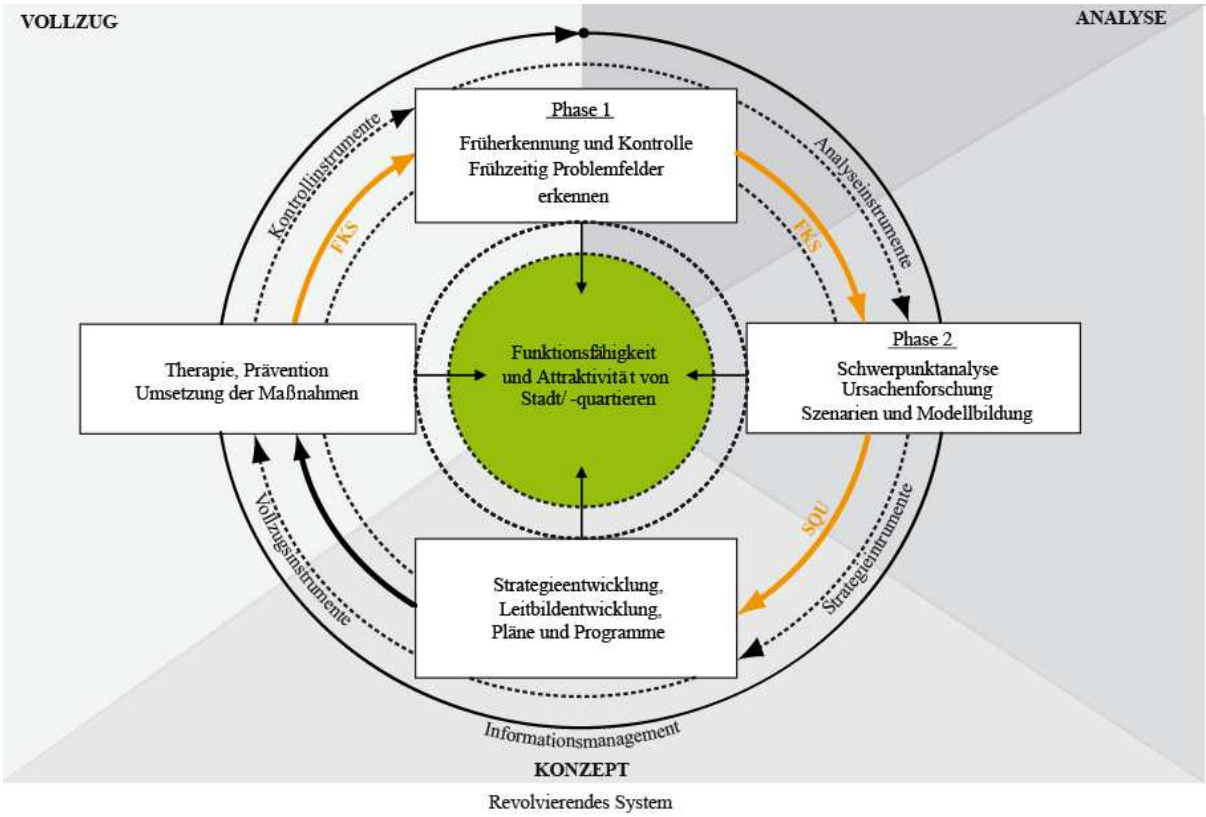

Abbildung 6: Vereinfachtes Phasenmodell des Urban Management (eigene Darstellung)

In der folgenden Auseinandersetzung wird das Element der Analyse herausgegriffen und in zwei Phasen unterteilt: Die Früherkennung, die die Kontrolle beinhaltet, sowie die vertiefende Schwerpunktanalyse, die einen diagnostischen Ansatz verfolgt. Bei den im Folgenden beschriebenen beiden Instrumenten (vgl. Kapitel 3 und 4) soll es außerdem um die Identifizierung und Zusammenstellung des nötigen Wissens für eine einzelne Fragestellung gehen, namentlich um die Auseinandersetzung mit der Struktur eines einzelnen Stadtquartiers.

Auch für die in Abbildung 1 angeführten Elemente, wie z.B. das Konzept[102], gibt es mehrere Phasen, die hier jedoch nicht Gegenstand der detaillierten Betrachtung sind. Die Elemente und Phasen stehen aber in unmittelbarem Zusammenhang, so dass aus Erkenntnissen und Handlungen immer auch Folgen für darauf folgende oder vorgelagerte Phasen entstehen und Berücksichtigung finden müssen.

2 UNTERSUCHUNG DER STADT – FRÜHERKENNUNG, SCHWERPUNKTANALYSE UND KONTROLLE

Informationsmanagement in der Stadt basiert zunächst auf den umfangreichen Erfahrungen und Erkenntnissen der öffentlichen Hand. Das Heranziehen der amtlichen Statistik sowie die Einschätzung eines Stadtteils durch die zuständige Behörde sind wertvolle Informationsquellen. Doch nutzt dieses Vorgehen nur einen Teil der *möglichen* Quellen. Vielmehr sind über die gesamte Stadt verteilt mehrere Quellen zu identifizieren, die über den derzeitigen Bestand und seine bisherige Entwicklung vertiefende Aussagen

[102] Vgl. ALBERS (2005), S. 1086-1087.

ermöglichen. Neben der amtlichen Statistik, einer Bevölkerungsumfrage und einer Begehung durch das Planungsamt ist die Auswertung von Daten Dritter (z. B. Infrastrukturanbieter, Wohnungsgenossenschaften etc.) ein wichtiger Informationslieferant, um die planerische Konzeption zur zukünftigen räumlichen Entwicklung auf ein festes Fundament zu stellen.

Daher ist ein kooperatives Instrument notwendig, das zentral alle relevanten Daten sammelt, diese auswertet und den Akteuren aufbereitete analytische Aussagen als Handlungsgrundlage zur Verfügung stellt. Neben Fragen an den Prozess[103] ergeben sich dabei Anforderungen an die Aufbereitung und Auswertung der Daten. Um einen ersten fundierten Überblick über die räumliche Entwicklung zu erhalten, ist es erforderlich, flächendeckend für alle Stadtteile Daten aufzubereiten.

Trotz allgemeiner Schrumpfungstendenzen und -probleme einer Stadt insgesamt unterscheiden sich die Quartiere im Vergleich untereinander erheblich, auch in den als „Schrumpfungskommunen“ erachteten ostdeutschen Gemeinden.[104] Eine fundierte Analyse kann aber auch zu neuen Erkenntnissen und zu einigen Überraschungen führen. Denn es kann sich herausstellen, dass die als „erheblich“ eingestuften Stadtteile derzeit nicht als Fördergebiet ausgewiesenen sind und damit bislang keine vertiefende Untersuchung unterzogen wurde. Neuere Entwicklungen können auch hier zum Handeln zwingen. Und im Vergleich zu den anderen Quartieren kann sich ein Fördergebiet möglicherweise wesentlich besser entwickelt haben, weshalb es aus der Förderung entlassen werden kann.

Doch in der Planungspraxis bleibt trotz der neueren Bemühungen um eine stärker informationsbasierte Erarbeitung des Konzepts eine umfassende und zugleich handhabbare Analyse aus. Monitoring und Evaluation werden in der Regel lediglich innerhalb der bereits ausgewiesenen Förderkulissen durchgeführt.[105] Daher ist ein Instrument erforderlich, mit dem kleinräumliche Aussagen getroffen werden können, die frühzeitig raumbeeinflussende und raumstrukturelle Entwicklung aufzeigt. Es gilt, das „Erkennen“ zu optimieren.

2.1 Erkennen in dreifacher Form

Für das Informationsmanagement sind drei Phasen des „Erkennens“ identifizierbar: die Phasen „Früherkennung“ und „Schwerpunktanalyse“, die beide dem „Analyse“-Element im Planungsprozess zuzuordnen sind, und darüber hinaus die Phase „Kontrolle“, die periodisch, in der Stadtentwicklung nach einem Jahr[106], erfolgt. Sie kann systemisch der „Phase“ Früherkennung zugeordnet werden, da sich aus der Kontrolle auch früherkennende Aussagen ergeben. Diese drei Phasen werden im Folgenden erörtert.

Phase „Früherkennung“

Der Begriff Früherkennung ist derzeit Gegenstand vieler Forschungsansätze und Vorhaben. Neben den Naturwissenschaften, die sich aufgrund von auftretenden Naturkatastrophen vermehrt mit der Reflexion von Gefahren beschäftigen, sind seit der Auseinandersetzung mit der „Risikogesellschaft“[107] auch andere Disziplinen in die Diskussion einbezogen. In der Stadtentwicklung belegen die Folgen zu späten Reagierens vor allem in ostdeutschen Städten, z. B. hohe Leerstandszahlen, Flächenexpansion trotz Nachfragerückgang sowie verstärkte Segregationstendenzen, die Notwendigkeit zum frühzeitigen Erkennen, noch bevor konzeptionelle Aussagen getroffen werden können. Mit der Zielstellung „Agieren statt Reagieren“, sollen Kommunen befähigt werden, abweichende Entwicklungen zeitnah zu erkennen und entsprechend im eigentlichen Planungsprozess prophylaktisch zu handeln.

Aus methodischer Sicht ist die Früherkennungsfunktion grundsätzlich auf zwei verschiedenen Wegen zu erreichen. Zunächst ergibt sich die Möglichkeit, mithilfe einer Trendverlängerung und von Szenarien frühzeitig auf die mögliche zukünftige Entwicklung aufmerksam zu machen (vgl. Kap 4).

Die zweite Möglichkeit bezieht sich auf die früherkennende Funktion einer ex-post- und einer Status-quo-Analyse, die den folgenden Ausführungen zugrunde liegt. Eine derartige Auseinandersetzung kann nur

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[103] Vgl. z.B.: BERNT, Matthias (2005).

[104] Vgl. für Leipzig: LÜTKE DALDRUP (2004), S. 99.

[105] Vgl. z.B. die neueren Monitoringsansätzen bei den Bund-Länderprogrammen „Stadtumbau Ost“ (z.B.: BUNDESTRANSFERSTELLE (2006)) und „Stadtumbau West“. Dort werden neben der Gesamtstadt lediglich die Fördergebiete einer detaillierten Analyse unterzogen.

[106] Ein einjähriger Rhythmus erscheint sinnvoll, da die amtliche Statistik in der Regel einmal im Jahr Daten liefert und zudem unterjährige Daten saisonalen Schwankungen unterliegen.

[107] Vgl. BECK (1986).

erfolgen, wenn die Analyse flächendeckend betrieben wird, weil die Werte der einzelnen Quartiere miteinander verglichen werden. Daraus ergibt sich aber der Vorteil, dass für alle Quartiere in der Stadt eine früherkennende Aussage vorliegt. Um dennoch ein handhabbares Instrument bereitzustellen, ist eine Begrenzung der Zahl der Indikatoren, aber auch des Erhebungsaufwandes[108] notwendig. Die Auswahl der geeigneten Indikatoren sollte sich demnach auf solche konzentrieren, die im Zentrum eines Wirkungsgefüges stehen oder einen Prozess vor Erreichen eines physisch wahrnehmbaren Zustandes beschreiben (performance-orientierte Indikatoren – „early bird"). Veranschaulichen lässt sich das an der Kausalität zwischen der Unzufriedenheit mit dem Wohnumfeld und dem Wohnungsleerstand. Wenn Bewohner eines Stadtviertels aus verschiedenen Gründen mit ihrem Umfeld bzw. mit ihrer Wohnsituation unzufrieden sind, entsteht meist der Wunsch nach einem Umzug. Lassen es zudem die sozioökonomischen Voraussetzungen zu, dann wird dieser Wunsch in die Tat umgesetzt. Bei einem bereits durch Nachfrageausfälle geprägten Wohnungsmarkt sind in der schrumpfenden Stadt Wohnungsleerstände und eventuell Abriss die Folge.

Mit Hilfe der erörterten Methodik können von einer Kommune periodisch für alle Stadtteile sowohl ein räumlicher Vergleich zwischen Quartieren als auch eine Untersuchung des zeitlichen Verlaufes innerhalb eines Quartiers oder der Gesamtstadt unternommen werden. Im Ergebnis entsteht ein differenziertes Bild der Stadt: Es werden die Stadtteile mit der größten Erheblichkeit im zeitlichen und im räumlichen Vergleich identifiziert.

Phase „Schwerpunktanalyse"

Die Schwerpunktanalyse dient als Untersuchung für diejenigen Quartiere, in denen durch die Früherkennung eine Erheblichkeit indiziert wurde. Dafür wird ein erweitertes Indikatorenset hinzugeschaltet. Aufgrund der häufig geringen Datendichte in Kleinstädten sind hierfür weniger komplexe Verfahren, wie etwa multivariate Regressionen, sondern vielmehr bivariate Korrelationen zielführend.

Die Unterteilung der Untersuchung von Quartieren ermöglicht, sich bei der Früherkennung auf wenige Indikatoren zu beschränken, um einen ersten Überblick über die Quartiere zu erhalten. Im zweiten Schritt werden bei der Schwerpunktanalyse einzelner Quartiere mehr Indikatoren herangezogen und gegebenenfalls auch weitere Daten zusammengestellt. Das Ergebnis der Untersuchung umfasst eine detaillierte Auseinandersetzung mit dem Quartier, indem aufgezeigt wird, welche Abhängigkeiten zwischen Indikatoren nahe liegen. Er erhält damit eine Interpretationsgrundlage für eine weitere Bewertung und Ergründung der Wirkungszusammenhänge und darüber hinaus Hinweise auf die Handlungsfelder, auf die die Planung eingehen sollte.

Phase „Kontrolle"

Eine „Kontrolle" ist als Erfolgskontrolle als Grundlage für eine Evaluation, etwa einer Fördermittelkontrolle denkbar. Wegen der Komplexität der Wirkungszusammenhänge einer Stadt bedarf es hierfür aber erneut vieler Daten. Vorrangig sollte daher eine einfache Form der Kontrolle verwendet werden. Nach Ablauf einer Untersuchungseinheit, in der Regel nach einem Jahr, werden die aktuell erhobenen Daten sowie die aktuellen Indikationen mit den Ergebnissen des vorherigen Zeitpunktes verglichen.

2.2 Forschen für die Praxis[109]

Das Verbundprojekt „FKS" hat ein Instrument für die früherkennende, vertiefend analytische und kontrollierende Phase des Informationsmanagements entwickelt. Neben der wissenschaftlichen Auseinandersetzung ging es vor allem um die Entwicklung einer Software, die unter dem Namen „umacs®" nun in der Praxis den stadtverantwortlichen Akteuren zur Verfügung steht.[110] Das Instrument verfolgt eine stark quantitative Ausrichtung. Es ist zwar möglich, qualitative Daten für die Analyse heranzuziehen, doch wird keine Bewertung der Untersuchungsergebnisse vorgenommen. Damit handelt es sich um ein Instrument, das als Grundlage für die Ausrichtung strategischer Steuerung in der Stadt herangezogen werden kann.

[108] Demgegenüber sollen die z.B. Förderkommunen in dem Forschungsprojekt „Stadtumbau West" u.a. die „Qualität des Gaststättenangebotes" erfassen.

[109] Die folgenden Erkenntnisse sind das Ergebnis eines dreijährigen interdisziplinären Verbundprojektes „Entwicklung eines Früherkenungs- und Kontrollsystems zur Unterstützung einer flexiblen Stadtentwicklungsplanung (FKS)", das durch das Ministerium für Bildung und Forschung der Bundesrepublik Deutschland gefördert wurde. Verbundpartner waren die Universität Leipzig, der Firma innova AG und die beiden kommunalen Praxispartner Forst (Lausitz) und Selb.

[110] Vgl. www.fks-stadtentwicklungsplanung.de.

Bei der Ausgestaltung der Software wurde gezielt auf die kommunalen Anforderungen sowie die bisherigen Erfahrungen mit Monitoring- und Kontrollinstrumenten zurückgegriffen. Der im Mittelpunkt der Zielgruppe stehende Stadttypus der Kleinstädte ist am meisten von den sich vollziehenden Schrumpfungsprozessen in Ost- und Westdeutschland betroffen. Zugleich verfügt dieser Typus nur über geringe Ressourcen in Verwaltung und Politik zur Bewältigung der anstehenden Aufgaben in der Anpassung der Raumstruktur an mögliche Transformationstendenzen.

Für ein Informationssystem resultieren daraus Maßgaben der Handhabbarkeit, einer leichten Verständlichkeit sowie der Reduzierung raumbezogener Analysen auf einfache Fragen – eine Gratwanderung bei komplexen Themen. Schließlich liegen die für eine Indikation notwendigen Daten in einer Kleinstadt nur in begrenztem Maße vor und können wegen der häufig unterbesetzten und gering ausgestatteten Statistikstelle nicht oder nur bedingt ergänzt werden. Daher sind umfangreiche Ansätze, wie sie etwa bei den im Aufbau befindlichen Monitoringsystemen der Bundesländer zum Stadtumbau verfolgt werden, für Kleinstädte nicht geeignet.

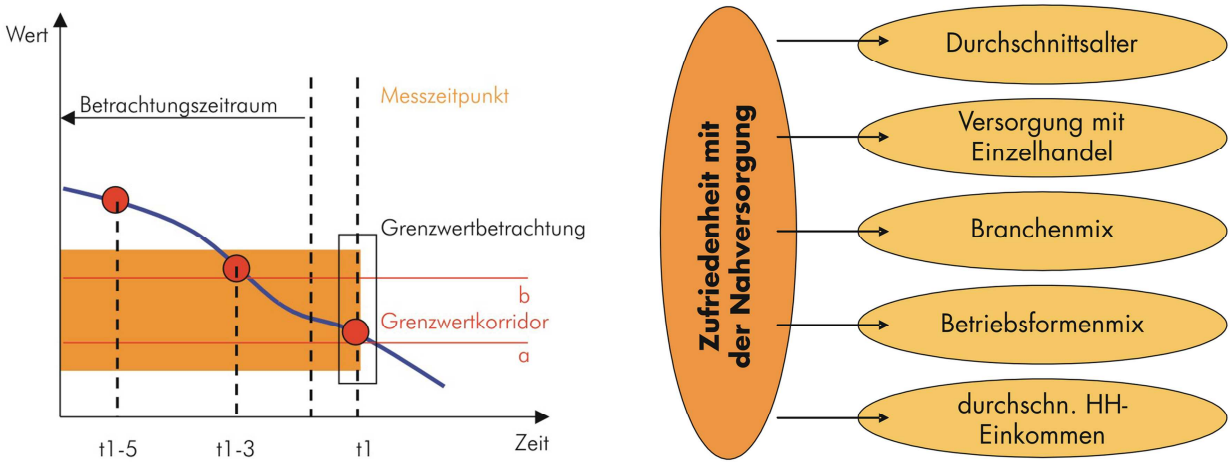

Abbildung 7: Ermittlung relationaler Grenzwerte und bivariater Zusammenhänge (eigene Darstellung)

Allgemeingültige Grenz- und Zielwerte, wie sie in den 1960er und 1970er Jahren im Zusammenhang mit kybernetischen Modellen formuliert wurden,[111] sind heute nicht mehr identifizierbar. Aber auch lokalspezifische kleinräumliche Ziel- und Grenzwerte in der schrumpfenden Stadt sind schwer zu definieren und liegen im Regelfall nicht vor. Weil die räumliche Entwicklung in Deutschland heterogen verläuft, bedarf es aber relativer Grenzwerte. Mit Hilfe einer statistischen Auswertung, die im Kern auf der Verwendung der Standardabweichung basiert, werden bei umacs® entsprechend lokalspezifisch obere und untere Grenzwerte berechnet, die als Leitplanken fungieren. Damit gelingt es, signifikante Veränderungen der zeitlichen Entwicklung und Erheblichkeiten im räumlichen Vergleich hervorzuheben.

Soll eine handhabbare Software entwickelt werden, ist nicht die wissenschaftlich am besten geeignete Methode, sondern ein Mittelweg zwischen theoretisch notwendiger inhaltlicher Aussage und praktischer Erhebbarkeit von Daten einzuschlagen. Demzufolge hat sich das Verbundprojekt den Anforderungen aus der Praxis verpflichtet.

2.3 Erkennen ist mehr als Monitoring

Im Ergebnis können mit umacs® diejenigen Stadtteile erkannt und herausgestellt werden, für die eine vertiefende Untersuchung vorgenommen und eine planerische Konzeption angefertigt sollen. Regelmäßig durchgeführte Untersuchungen ermöglichen eine kontinuierliche Kontrolle der Entwicklungsverläufe in den Quartieren einer Stadt. Mit umacs® wurden früherkennende Indikatoren identifiziert und in das System implementiert, und es wurde ein neuartiges statistisches Verfahren erarbeitet. Das Instrument ist damit mehr als Monitoring.

Den Erkenntnissen aus der Auseinandersetzung mit Urban Management folgend, wurde mit umacs® ein kooperatives Informationsinstrument entwickelt. Denn neben der öffentlichen Hand ist es auch den anderen stadtverantwortlichen Akteuren möglich, mit erweiterten oder eingeschränkten Zugriffsrechten Zugang zu dem System und in einer neuen Qualität Informationen über die Struktur des Quartiers und die Gesamtstadt

[111] Vgl. z.B.: ADERHOLD (1975).

zu erhalten. Schließlich kann die Standardversion von umacs® jeweils an die lokalspezifischen Fragestellungen angepasst werden.

Mit der Anwendung des beschriebenen Systems ist noch keine Konzeption erfolgt, noch befindet sich der stadtverantwortliche Akteur im Element der Analyse. Durch den neuartigen Erkenntniszuwachs *vor* der Konzeption kann der Aufwand der stadtverantwortlichen Akteure im Planungs- und Vollzugsprozess effizient reduziert, Fehlallokationen können vermieden werden. Um den Wissensstand zu erweitern, kann der Akteur nun, aufbauend auf diesen Erkenntnisgewinn, sich des zweiten Instrumentes bedienen, das nun vorgestellt wird.

3 STEUERUNG DER QUARTIERSENTWICKLUNG – SZENARIEN ALS ENTSCHEIDUNGSHILFE

Mit dem wachsenden Bewusstsein für die Komplexität aktueller Stadtentwicklungsprozesse und für die begrenzte Reichweite räumlicher Planung sowie den ermittelten Handlungsbedarfen, in einzelnen Stadtteilen zu agieren (vgl. Kap. 3), steigt die Nachfrage nach der Formulierung von Leitbildern und Handlungsprinzipien ohne die Festlegung von Endzuständen. Diese sollten möglichst auf kommunikativen und kooperativen sowie auf Konsens und Reflexion angelegten Prozessen basieren.[112] Für die Diskussions- und Entscheidungsphase zur Leitbildentwicklung kann die Untersuchung alternativer Entwicklungsmöglichkeiten in Form von Szenarien eine wichtige Grundlage bilden. Im Rahmen einer Schwerpunktanalyse als Basis für die Konzeption und Leitbildentwicklung sind kommunale Entscheidungen und strategische (Neu-)Ausrichtungen in erster Linie dann erforderlich, wenn durch Instrumente der Früherkennung und Kontrolle die Quartiere aus dem gesamtstädtischen System identifiziert wurden, in denen problematische Entwicklungen zu erwarten sind oder bereits ablaufen.

3.1 Szenariotechnik als Instrument

Im Unterschied zu anderen zeitlich vorausschauenden Denkweisen und Zukunftsphantasien (bspw. science fiction-Literatur) ist die in Szenarien angedachte und modellierte Zukunft auf Plausibilität überprüfbar. Die Szenariotechnik ist im Spannungsfeld zwischen der visionären Planungsphilosophie zu Beginn des 20. Jahrhunderts (bspw. „Charta von Athen“) und dem „planungspessimistischen Inkrementalismus“ der 1970- und 1980er Jahre angesiedelt. Diese Methodik berücksichtigt zwar die Vorteile beider Planungsphilosophien (bspw. die Anerkennung und Optimierung bestehender Strukturen unter Beachtung perspektivischer Entwicklungspotentiale und -ideale), eliminiert aber gleichzeitig deren Nachteile (bspw. die fehlende Konzeption einer Schritt-für-Schritt-Strategie).[113] Die seit den 1970er Jahren bereits vielfach erprobte und nur wenig modifizierte Szenario-Methode arbeitet mit prognostischen Aussagen, bietet gegenüber der reinen Prognose aber die Möglichkeit, die Komplexität von Stadtentwicklungsprozessen in Wenn-Dann-Annahmen abzubilden. Dies ist gerade auch dadurch möglich, weil sowohl qualitative als auch quantitative Faktoren in einer Stadt in den Untersuchungsrahmen einbezogen werden können.

Mehrere zur Verfügung stehende Szenariotypen (Trendszenarien, Leitbild- oder Strategie-Szenarien und alternative Szenarien) erfüllen verschiedene Einsatz- oder Aufgabenarten und bieten die Möglichkeit zur Beobachtung von einer Bandbreite gesellschaftlicher sowie räumlicher Entwicklungen und unterschiedlicher Wirkungszusammenhänge.[114] De Haan nennt sechs Funktionen von prozessualen Leitbildern und Szenarien: Orientierungs-, Integrations-, Motivations-, Kommunikations-, Abgrenzungs- sowie Differenzierungs- und Lernfunktion.[115] Sie verdeutlichen, welch hohe Erwartungen an die Anwendung von Szenarien und den anschliessenden Erkentnisgewinn geknüpft sind. Zusammengefasst sollten Szenarien als Impulsgeber fungieren, Kommunikation unterstützen und Orientierung bieten.

[112] Vgl. BOTT; FRICKE; JESSEN (2006), S. 87.
[113] Vgl. GÖSCHEL (2006), S. 7-9.
[114] Vgl. STIENS (2004), S. 2.
[115] Vgl. DE HAAN (2002).

3.2 Entwicklungsspielräume für Quartierstypen[116]

Vor der Zielstellung, für Kommunen ein Hilfsmittel zur Entscheidungsfindung und Strategieentwicklung sowohl für quartiersbezogene Maßnahmen als auch zu deren Einordnung in die gesamtstädtische Relation zu entwickeln, untersucht und dokumentiert das ISB mehrere Szenarien für verschiedene Quartierstypen.

Die vier Quartierstypen Gründerzeitquartier, Großwohnsiedlung, Mehrfamilienhaussiedlung der 1950 und 1960er Jahre sowie Einfamilienhausgebiete sind beispielhafte Ausschnitte aus der Siedlungsstruktur einer Stadt und der alltäglichen Erfahrungswelt ihrer Akteure.[117] Die Fokussierung auf die Quartierstypen ermöglicht eine Übertragbarkeit und Anwendbarkeit der Szenarien auf eine Vielzahl von Stadttypen in unterschiedlicher Größe, administrativer Funktion oder geografischer Lage. Beeinflusst hat die Auswahl dieser Typen auch, dass aus den Quartierstypen „Gründerzeit“ und „Großwohnsiedlung“, die bereits als „klassische“ Stadtumbaubereiche in (Ost-)Deutschland gelten, zahlreiche Erfahrungen für die Szenariobeschreibung herangezogen werden können. Dem gegenüber sind die Wohnsiedlungen der 1950er und 1960er Jahre und die Einfamilienhausgebiete für das Forschungsvorhaben von Interesse, da sie zunehmend von Transformationen betroffen sein werden. Anhand der Szenarien sollen Kommunen für diese beiden Quartierstypen langfristig strategische Entscheidungen treffen und die Entwicklung bereits frühzeitig steuern können.

Als möglichst unterschiedliche Entwicklungsrichtungen für Quartiere mit kritischem Leerstand oder unklarer Entwicklungsperspektive im Stadtumbau wurden folgende Varianten definiert und mit Annahmen für die Visualisierung über einen Untersuchungszeitraum von 15 Jahren versehen: „Liegenlassen“, „Renaturieren“, „Nischen und Nester“ sowie „Stabilisieren“. Mit diesem Zeithorizont lassen die Szenarien ausreichend Raum für die Abbildung vielfältiger Entwicklungen. Mit Blick auf die Kommunikationsfunktion von Szenarien ist die Zeitspanne jedoch kurz genug, um mögliche Ereignisse und deren Risiken in einem für alle Akteure überschaubaren Zeitraum abschätzen zu können. Die Überlagerung von Szenarien und Baustrukturtypen soll den Kommunen eine Bandbreite möglicher Strategien und deren Auswirkungen mittels multimedialer Visualisierung aufzeigen und gleichzeitig bewusst machen, welche Aufgabenstellung und Anforderungen mit der Entscheidung für bzw. gegen eine bestimmte Strategie verbunden sind.

Die Szenarien „Liegenlassen“ und „Nischen und Nester“ gehen davon aus, dass die Kommune nicht steuernd in die Entwicklung des Quartiers eingreift. Trotzdem unterscheiden sich die Annahmen zur Situation im Quartier am Ende des Untersuchungszeitraums stark: der dynamisch steigende Leerstand im Szenario „Liegenlassen“ führt in allen Quartierstypen zu einem fortschreitenden Imageverlust aufgrund zunehmender Verwahrlosung, zu einer Verschärfung sozialer Konflikte und trotz des Laufenlassens zu einem Anstieg der finanziellen Belastung für die Kommune. Grund dafür sind steigende Infrastrukturkosten sowie unvermeidbarer Sicherungs- und Ordnungsmaßnahmen. Im Gegensatz zu „Liegenlassen“ werden im Szenario „Nischen und Nester“ die Potenziale bürgerschaftlichen Engagements in den Vordergrund gestellt. Es wird untersucht, in welchen Quartierstypen und mit welcher Bevölkerungsstruktur eine Konsolidierung eines Gebietes ohne kommunale Steuerung, aber aufgrund der Initiative und Organisation aus der Bewohnerschaft möglich ist.

Mit einem umfassenden gesteuerten Rückbau von Bausubstanz bzw. von Infrastruktur im Szenario „Renaturieren“ wird die nachhaltige Umgestaltung eines Stadtquartiers mit dem Ziel der dauerhaften Kosteneinsparung bei der technischen und sozialen Infrastruktur sowie der Stärkung erhaltenswerter Bausubstanz an anderer Stelle verfolgt. Bei diesem Szenario kann auf die

[116] Das ISB bearbeitet im Auftrag des Bundesamtes für Bauwesen und Raumordnung (BBR) im Rahmen des Forschungsfeldes „Stadtquartiere im Umbruch“ (Experimenteller Wohnungs- und Städtebau des Bundesministeriums für Verkehr, Bau und Stadtentwicklung der Bundesrepublik Deutschland und des BBR) Arbeitsbaustein D: „Szenarien und Modellrechnungen zur Entwicklung von Quartieren im Stadtumbau“.

[117] Vgl. BOTT; FRICKE; JESSEN (2006): S. 89.

zahlreichen Erfahrungen mit großflächigem Rückbau in ostdeutschen Großwohnsiedlungen zurückgegriffen werden.

Das Szenario „Stabilisieren des Quartiers“ beschreibt die besonders erfolgreiche Umsetzung von Stadtumbaustrategien unter Einbeziehung realer Vollzugsinstrumente. Die Maßnahmen, die im Rahmen dieser Entwicklungsrichtung angewendet werden, erfordern ein hohes Maß der Steuerung durch die Kommune und die Investition von öffentlichen Geldern – mindestens als Anschub. Das Szenario zeigt eine Bandbreite an stabilisierenden Maßnahmen auf, um deren Konsequenzen für das Quartier, aber auch für die Entwicklungsarbeit der Kommune darzustellen.

Das folgende Ablaufschema für das Szenario „Stabilisieren“ in dem Baustrukturtyp „Großwohnsiedlung“ verdeutlicht die Komplexität, aber auch die Aussagekraft von Szenarien.

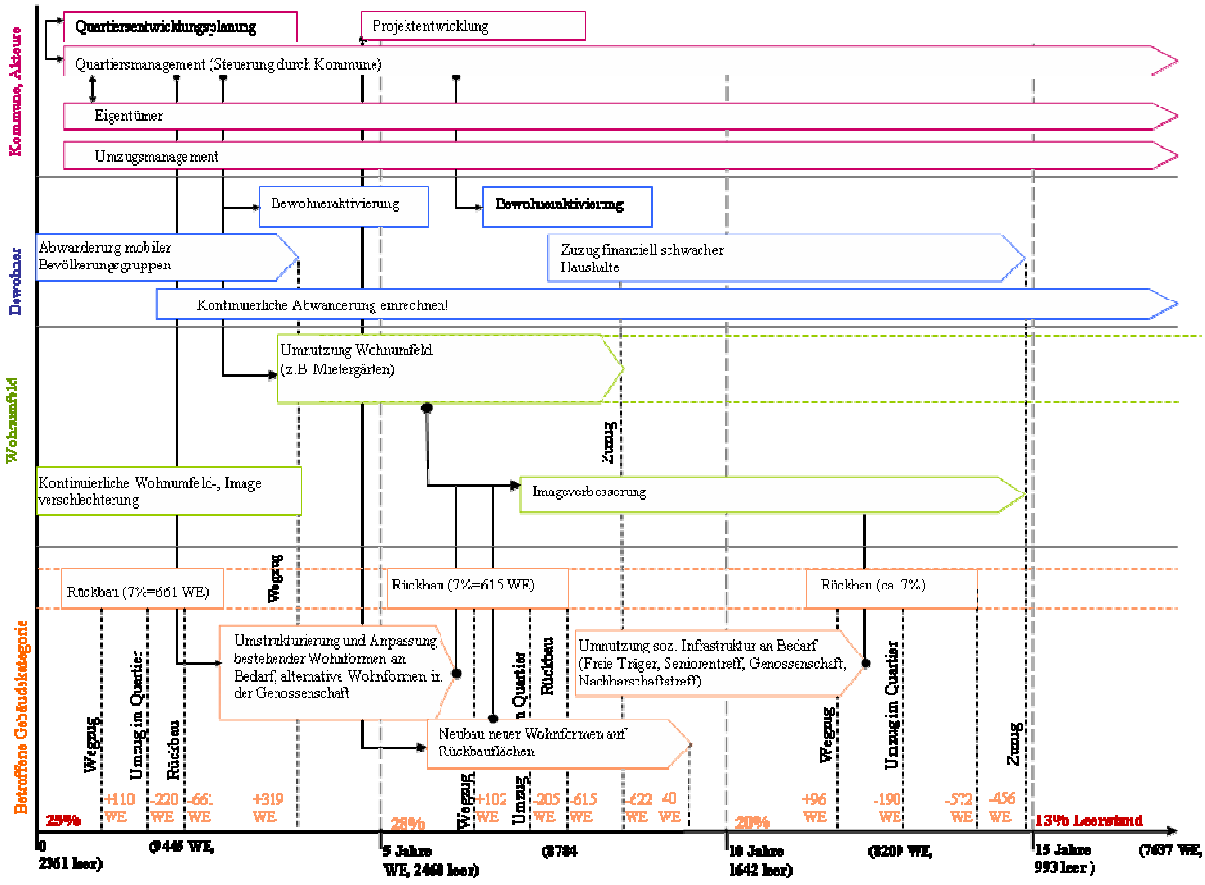

Abbildung 8: Ablaufschemen für das Szenario „Stabilisieren“ einer Großwohnsiedlung (eigene Darstellung)

Anhand der Quartierstypen und der Bestimmung von Indikatoren im Vorfeld wurde der Organismus Stadt in seine einzelnen Handlungsebenen und -felder aufgesplittet. Gleichzeitig wird erst mit der Aufteilung des komplexen städtischen Systems in einzelne Bausteine eine transparente Untersuchung und Bewertung der Szenarien möglich. Die ausgewählten Indikatoren Bevölkerungs-, Eigentümerstruktur, Gebäudebestand, soziale, technische, gewerbliche Infrastruktur und Wohnumfeld dienen darüber hinaus als Stellschrauben, die in ihrer Reichweite und ihrer Wirksamkeit auch im Bezug aufeinander sowie in ihrer Abhängigkeit zur Baustruktur in den Szenarien untersucht wurden.

Die Auswertung liefert über den bereits hohen Informationsgehalt der Dokumentation der Szenarien weiterführende Erkentnisse bspw. zu den spezifischen Funktionen und Potenzialen einzelner Indikatoren und bestimmter Vollzugsinstrumente des Urban Management in Abhängigkeit zum Quartierstyp und zum Szenario sowie den Anteil kommunaler Kosten zur Umsetzung bestimmter Strategien.

Mit der Leitbildentwicklung, die auf Basis von Szenarien erfolgen könnte, ist gleichzeitg die strategische Ausrichtung einer Kommune für einzelne Stadtquartiere verbunden. Danach müssen die ausgelösten Prozesse im Vollzug kontinuierlich überprüft und die Strategien gegebenenfalls neu justiert werden. Mit dem

Ziel einer rechtzeitigen Erfassung unerwünschter Entwicklungen, führt eine Kommune im weiteren Prozess idealerweise ein regelmäßiges Monitoring – auch im Sinne der Kontrolle (vgl. Kap. 3) – anhand von Früherkennungs- und Kontrollinstrumenten durch.

4 EINORDNUNG DER VORGESTELLTEN INSTRUMENTE IN DEN KONTEXT DES URBAN MANAGEMENT

Die beiden vorgestellten Instrumente können einen Beitrag zur Verbesserung des Steuerungsprozesses zur räumlichen Entwicklung leisten. Sie fundieren hier insbesondere das Element „Analyse“ mit den beiden Phasen „Früherkennung“ und „Schwerpunktanalyse“. Indirekt leisten sie aber auch einen Beitrag für die Elemente „Konzept“ und „Vollzug“.

„Planen ist nicht genug“ bedeutet in diesem Zusammenhang, dass die konzeptionelle Vorgehensweise bei einem engeren Verständnis von Planung nicht ausreicht, um den komplexen Steuerungsbedarf in der Stadt zu befriedigen. Neben dem hier nicht weiter untersuchten Element des Vollzugs bedarf es insbesondere einer Verbesserung des Erkenntnisstandes. Diese erfolgt sowohl aus einer ex-post- und Status-quo-Perspektive auf die bisherige Entwicklung und die derzeitige Struktur der Stadt als auch aus einer ex-ante-Abschätzung der Folgen beabsichtigten Handelns oder befürchteter Entwicklung.

Dieses erweiterte Verständnis von Erkenntnismaximierung zugrunde gelegt, ist die Vorwegnahme der Auswirkungen der Elemente „Konzept“ und „Vollzug“ Bestandteil eines umfassenden Informationsmanagements. Planen ist nicht genug, aber auch planloser Aktionismus reicht nicht aus. Am Anfang steht das Wissen.

5 LITERATURVERZEICHNIS

ADERHOLD, Dieter: Kybernetische Regierungstechnik in der Demokratie. Planung und Erfolgskontrolle. Deutsches Handbuch der Politik Band 7. München, Wien 1973

ALBERS, Gerd: Stadtplanung, in: Akademie für Raumforschung und Landesplanung (ARL): Handwörterbuch der Raumordnung. Hannover, 2005, S. 1085-1092

BECK, Ulrich: Risikogesellschaft. Auf dem Weg in eine andere Moderne. Frankfurt a.M. 1986

BERNT, Matthias: Stadtumbau im Gefangenendilemma, in: WEISKE, Christine; KABISCH, Sigrun; HANNEMANN, Christine (Hrsg.): Kommunikative Steuerung des Stadtumbaus. Interessengegensätze, Koalitionen und Entscheidungsstrukturen in schrumpfenden Städten. Wiesbaden 2005, S. 109-130

BOTT, Helmut; FRICKE, Axel; JESSEN, Johann: Soziale Stadtentwicklungsperspektiven und teilräumliche Szenarien – Neue Medien als Instrumente der Partizipation in Zukunft von Stadt und Region IV, Wiesbaden 2006, S. 85-122

BUNDESTRANSFERSTELLE STADTUMBAU OST: Stadtumbau Ost – Stand und Perspektiven. Erster Statusbericht der Bundestransferstelle. Im Auftrag des Bundesministeriums für Verkehr, Bau und Stadtentwicklung und des Bundesamtes für Bauwesen und Raumordung. Berlin 2006.

DAVY, Benjamin: „Nachhaltige städtebauliche Entwicklung“. Zur Neuorientierung der deutschen Planungs- und Bodenpolitik, in: Arbeitskreis Stadterneuerung an deutschsprachigen Hochschulen und Institut für Stadt- und Regionalplanung der Technischen Universität Berlin (Hrsg.): Jahrbuch Stadterneuerung. Berlin, 1998, S. 91-107

De HAAN, Gerhard: Leitbild Analysis – A new Method for Future Science. Presented at the Annual Conference of the World Future Society „World View 2002: Futures unlimited!“, Philadelphia 2002

FÜRST, Dietrich; RITTER, Ernst-Hasso: „Planung“, in: Akademie für Raumforschung und Landesplanung (ARL): Handwörterbuch der Raumordnung. Hannover, 2005. S. 765-769

GÖSCHEL, Albrecht: Der Forschungsverbund „Stadt 2030“: Planung der Zukunft – Zukunft der Planung in Zukunft von Stadt und Region IV, Wiesbaden 2006, S. 7-17

LÜTKE DALDRUP, Engelbert: Leipzig – ein urbanes Projekt, in: DOEHLER-BEHZADI, Marta; LÜTKE DALDRUP, Engelbert (Hrsg.): plusminus Leipzig 2030. Stadt in Transformation. Wuppertal 2004, S. 92-123

SINNIG, Heidi (Hrsg.): „Stadtmanagement. Strategien zur Modernisierung der Stadt(-Region)“, Dortmund, 2006

STIENS, Gerhard: Raumentwicklungsszenarien aus Nachbarstaaten, Informationen zur Raumentwicklung Heft 1/2, 2004, S. 1-9

WEIDNER, Silke: „Stadtentwicklung unter Schrumpfungsbedingungen – Leitfaden zur Erfassung dieses veränderten Entwicklungsmodus von Stadt und zum Umgang damit in der Stadtentwicklungsplanung“, Norderstedt, 2005

http://de.wikipedia.org/wiki/Management, abgerufen am 12.03.2007

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Alpenquerender Güterverkehr Entwicklungen und Herausforderungen unter besonderer Berücksichtigung des Umwegverkehrs

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1 EINLEITUNG

Die Transitkorridore durch die Alpen sind von großer Bedeutung für die wirtschaftlichen und sozialen Verflechtungen in Europa und im Alpenraum selbst. Über diese Korridore erfolgt der Austausch von Dienstleistungen, Waren und Personen zwischen Norden und Süden. Auch für die Wettbewerbsfähigkeit der Alpenregionen bilden diese Verbindungsachsen eine wichtige Grundlage. Dem gegenüber stehen die negativen Konsequenzen des Verkehrs entlang der alpenquerenden Korridore. Staus, Unfälle, Flächenverbrauch, Landschaftszerschneidung, Lärm und Luftverschmutzung beeinträchtigen die Gesundheit und die Lebensqualität der in diesem Raum lebenden Menschen.

Im Alpenraum verschärfen die spezifischen klimatischen und topografischen Gegebenheiten die negativen Auswirkungen des Verkehrs. Aufgrund der begrenzten Luftabfluss- und austauschmöglichkeiten sowie der häufig auftretenden Inversionswetterlagen verweilen Schadstoffe länger in den bodennahen Luftschichten (BMU 2004). Die von Verkehrsinfrastrukturen ausgehenden Belastungen wirken häufig über den gesamten Talboden, die Hangfußlagen bis hin zu den mittleren Hanglagen. Erschwerend kommt hinzu, dass in Berggebieten nur ein geringer Anteil der gesamten Fläche als Dauersiedlungsraum geeignet ist (Tab. 1). Damit konzentrieren sich die Nutzungen auf wenige Raumausschnitte und konkurrieren um die verfügbare Fläche.

Region	Einwohner (2005)	Fläche [km²]	Bevölkerungs-dichte [Einwohner/km²]	Dauersiedlungs-raum [km²]	Bevölkerungs-dichte [Einwohner/km²]
1	2	3	2/3	4	2/4
Tirol	692.281	12.648	54,7	1.542	449,0
Autonome Provinz Bozen-Südtirol	477.067	7.400	64,5	612	779,5
Vorarlberg	363.237	2.601	139,7	621	583,0
Deutschland – Gebiet der Alpenkonvention	1.473.881	11.072	133,1	5.650	260,9
Schweiz – Gebiet der Alpenkonvention	1.827.754	11.072	165,1	3.475	525,8

Tab. 1: Übersicht über die Bevölkerungsdichte in ausgewählten Alpenregionen (Quelle: Vorarlberg: Bundesministerium für Verkehr, Innovation und Technologie 2005; Tirol: Amt der Tiroler Landesregierung 2004; Bolzano/Bozen: Autonome Provinz Bozen-Südtirol 2004; Deutschland: Bayerisches Landesamt für Statistik und Datenverarbeitung 2004; Schweiz: Schweizer Bundesamt für Statistik 1985).

Der Verkehr stellt damit eine konstante politische Herausforderung für die Alpenländer dar sowohl in Bezug auf die eigenen, inhärenten Entwicklungsfragen als auch hinsichtlich der Minimierung negativer Auswirkungen. Der alpenquerende Verkehr benötigt länderübergreifende Lösungsansätze und ein international abgestimmtes Handeln insbesondere im Hinblick auf den Umwegverkehr. Ein solches koordiniertes und abgestimmtes Vorgehen ist notwendig, damit sich getroffene Maßnahmen auf alle Regionen gleichermaßen positiv auswirken.

2 VERKEHR DURCH DIE ALPEN

Der alpenquerende Güterverkehr setzt sich aus dem Binnen-, Import-, Export- und Transitverkehr (Abb. 1) auf den unterschiedlichen Vektoren (Schiene und Straße) zusammen. Auf der Schiene wird zudem unterschieden zwischen:

- Wagenladungsverkehr,
- unbegleiteter kombinierter Verkehr (UKV) und
- begleiteter kombinierter Verkehr (Rollende Landstraße).

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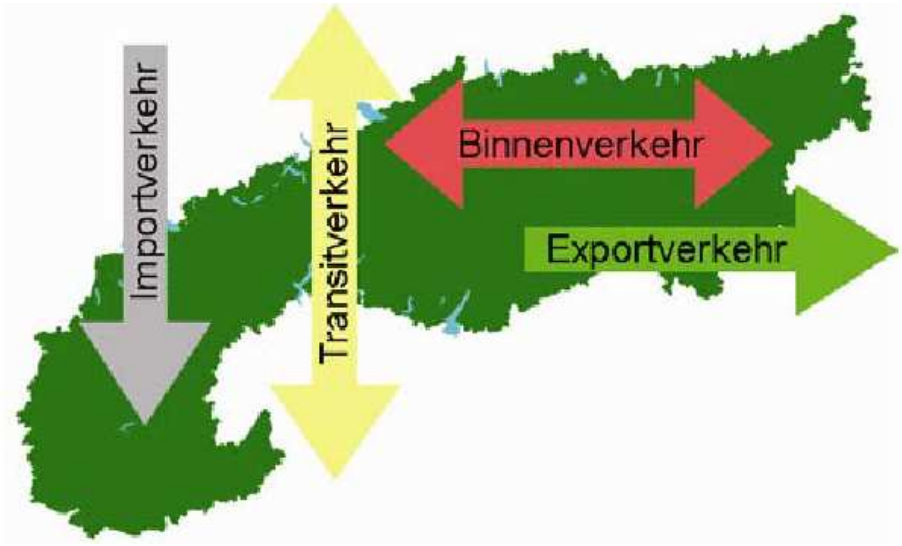

Abb. 1: Alpenquerender Güterverkehr definiert als Summe aus Binnen-, Import-, Export und Transitverkehr.

2.1 **Entwicklung des Straßen- und Schienengüterverkehrs**

Der alpenquerende Güterverkehr ist während der letzten beiden Jahrzehnte kontinuierlich gewachsen. Zwischen 1986 und 2005 hat sich der alpenquerende Güterverkehr über die 16 wichtigsten Alpenübergänge fast verdoppelt und belief sich im Jahr 2005 auf 193,3 Mio. t (1986: 97,7 Mio. t)[118]. Mit einer Zunahme von +125 % wurde dieses Wachstum überwiegend von der Straße aufgenommen und nur in geringerem Ausmaß von der Schiene (+59 %). Innerhalb des Schienenverkehrs verzeichnete der unbegleitete kombinierte Verkehr (UKV) den größten Zuwachs.

Diese Entwicklung spiegelt sich auch im Modalsplit wider. Wurden 1986 noch 41 % der Güter auf der Schiene transportiert waren es 2005 nur noch 33 %. Der Verlust von Marktanteilen der Schiene gegenüber der Straße ist in allen Ländern zu beobachten, jedoch bestehen in den Alpenstaaten nach wie vor große Unterschiede beim Modal Split. Der Straßengüterverkehr dominiert deutlich in Frankreich und Österreich mit 86 % bzw. 69 % im Jahr 2005. In der Schweiz dagegen lag 2005 der Anteil der auf der Straße beförderten Güter nur bei 35 %.

Einen wesentlichen Anteil am alpenquerenden Güterverkehr nimmt der Transitverkehr ein: 105,9 Mio. t (55 %) aller 2005 auf Straße und Schiene über die Alpen transportierten Güter entfallen auf den Transitverkehr. Am Brenner ist der Transitanteil mit 89 % mit Abstand am größten. Ihm folgen der Gotthard mit 76 % und der Reschen mit 68 %. Letzterer fällt jedoch von der Gesamtmenge transportierter Güter derzeit nicht stark ins Gewicht (Brenner: 41,7 Mio. t; Gotthard: 25,8 Mio. t; Reschen: 1,9 Mio. t).

Auch für die Zukunft wird ein weiteres Verkehrswachstum prognostiziert. Der Trend zum Gütertransport auf der Straße wird sich dabei weiter fortsetzen, wenn die Konkurrenzfähigkeit der Schiene nicht deutlich verbessert wird (ProgTrans AG & Rapp Trans AG 2004; ARE 2002). Die Europäische Kommission nimmt für den Zeitraum 2000–2020 eine Zunahme des Straßengüterverkehrs um ca. 55 % und des Schienengüterverkehrs um ca. 13 % innerhalb der Europäischen Union (EU-25) an (Europäische Kommission 2006). Eine Prognose für den Brenner geht von einem Wachstum der transportierten Gütermenge um etwa 100 % von 1999 bis 2015 aus (Prognos AG 2002). Die Vergangenheit hat jedoch auch gezeigt, dass viele Prognosen besonders in Bezug auf den Straßengüterverkehr oft zu tief angesetzt werden.

Wie eine Studie der Arge Alp unterstreicht, werden die prognostizierten Werte im alpenquerenden Güterverkehr von der Realität zumeist deutlich übertroffen (Arge Alp 2002).

2.2 **Politische und wirtschaftliche Rahmenbedingungen und ihr Einfluss auf die Verkehrsentwicklung**

Das Verkehrssystem ist eingebettet in ein politisches und wirtschaftliches Umfeld. Veränderungen in diesem Umfeld bedeuten auch neue Rahmenbedingungen für den Verkehr und beeinflussen Umfang, Form und

[118] Datengrundlage für die Darstellung der Entwicklung des alpenquerenden Güterverkehrs in Kapitel 2.1 sind die Erhebungen des alpenquerenden Güterverkehrs, die jährlich vom Schweizer Bundesamt für Raumentwicklung (ARE) veröffentlicht werden (ARE 1985-2006).

Wege des Verkehrs. Diese Rahmenbedingungen haben bisher zu einem Wachstum statt zu einer Verminderung des Verkehrs geführt (Perlik 2006). Für die Verkehrsentwicklung im Alpenraum von Bedeutung sind u.a.:

- ***Neue Bedürfnisse der Wirtschaft:*** Neue Bedürfnisse der Wirtschaft verändern die Verkehrsnachfrage. Dazu zählen neue Produktionsstrukturen, internationale Arbeitsteilung, zunehmende Spezialisierung in der Produktion und die mengenmäßige Ausweitung der Warenproduktion zur Erzielung von Größenvorteilen.
- ***Bessere Anpassungsfähikgeit des Straßengüterverkehrs:*** Die bessere Anpassung des Straßengüterverkehrs an die Produktionsbedürfnisse (Miniaturisierung, höhere Lieferhäufigkeit, Abbau von Lagerkapazitäten) und an geänderte gesellschaftliche Paradigmen (beschleunigter Produktwechsel, höhere Stellung der Kundenzufriedenheit) sowie die fehlende Kostenwahrheit im Straßengüterverkehr[119] erklärt dessen Dominanz. Dazu weist die Bahn gegenüber der Straße einige strategische Nachteile auf, wie längere Transportzeiten, mangelnde Verlässlichkeit, Kapazitätsengpässe und die mangelnde Interoperabilität im europäischen Schienenverkehr.
- ***Einfluss der Entwicklung Europas:*** Die übergeordneten funktionalen Ziele der EU (Binnenmarkt, wirtschaftliche und soziale Kohäsion, Beziehungen zu Drittländern, Osterweiterung) bestimmen die instrumentellen Ziele der EU-Verkehrspolitk (funktionierender Verkehrsmarkt, Ausbau der Infrastruktur).
- ***Knappe öffentliche Ressourcen***: Die angespannte Finanzsituation der öffentlichen Hand verändert die Rahmenbedingungen und Konkurrenzverhältnisse im Kampf um öffentliche Mittel für alle Politikbereiche. Dieser Verteilkampf betrifft die einzelnen Verkehrsträger aber auch die Prioritätensetzung des Verkehrs gegenüber anderen Politkbereichen (z.B. Arbeitsmarktpolitik) (Lundsgaard-Hansen, Oetterli & Berger 2006).

Die Europäische Union und die Mitgliedsstaaten reagieren mit unterschiedlichen Politiken und Programmen auf diese Entwicklung. Die Position der EU in Bezug auf Verkehr differenziert sich zunehmend. Sie ist nicht mehr nur auf die Konsolidierung des EU-Binnenmarktes gerichtet, für den Mobilität und Austausch wichtige Elemente darstellen. In ersten Ansätzen wird im europäischen Kontext die Notwendigkeit einer nachhaltigen Verkehrspolitik nun stärker betont:

- Das Weißbuch Verkehr der EU (2001) zielt auf ein nachhaltiges Verkehrssystem und beinhaltet Maßnahmen für eine nachhaltigere Verkehrspolitik. Wichtige Elemente sind die Verkehrsverlagerung von der Straße auf die Schiene und die Internalisierung externer Kosten.
- Die EU-Strategie zur nachhaltigen Entwicklung (2006) fordert eine Entkopplung von Wirtschaftswachstum und Verkehrsnachfrage mit dem Ziel negative Auswirkungen auf Umwelt (u.a. Schadstoffemissionen aus dem Verkehr) zu reduzieren und eine Verlagerung auf umweltfreundlichere Verkehrsträger zu erreichen.
- Die "Wegekostenrichtlinie"[120] trägt der spezifischen Situation des alpenquerenden Verkehrs bei der Erhebung von Straßenbenutzungsgebühren Rechnung und erlaubt eine Differenzierung der Straßenbenutzungsgebühren (entsprechend Emissionen oder Tageszeit). Ziel sind Straßenbenutzungsgebühren auf Grundlage des Verursacherprinzips und der Kostenwahrheit.
- Das Verkehrsprotokoll der Alpenkonvention[121] wurde am 12.10.2006 von den EU-Verkehrsministern unterzeichnet. Der Vertrag verpflichtet die Staaten zum „Verzicht" auf den Bau neuer

[119] Der Güterverkehr muss die von ihm verursachten externen Kosten (z.B. Lärm, Gesundheit, Unfälle) nicht decken, was bedeutend mehr auf die Straße als auf die Schiene zutrifft.

[120] Richtlinie 2006/38/EG des Europäischen Parlaments und des Rates vom 17. Mai 2006 zur Änderung der Richtlinie 1999/62/EG über die Erhebung von Gebühren für die Benutzung bestimmter Verkehrswege durch schwere Nutzfahrzeuge. Veröffentlicht im Amtsblatt der Europäischen Union L 157/8 vom 09.06.2006

[121] Die Alpenkonvention ist ein Abkommen zwischen den Alpenstaaten zum Schutz der nachhaltigen Entwicklung der Alpen und wurde 1991 in Salzburg unterzeichnet. Bereits in der Rahmenkonvention werden Maßnahmen im Verkehrsbereich betont und das Ziel gesetzt, die „Belastungen und Risiken im Bereich des inneralpinen und transalpinen Verkehrs auf ein Maß zu senken, das für Menschen, Tiere und Pflanzen und deren Lebensräume erträglich ist, unter anderem durch eine verstärkte Verlagerung des Verkehrs, insbesondere des Güterverkehrs, auf die Schiene, (…)" (Alpenkonvention 1991).

alpenquerender Straßen, zur Senkung verkehrsbedingter Schadstoffe und zur Kostenwahrheit nach dem Verursacherprinzip.

Auch die einzelnen Alpenländer, insbesondere Österreich und die Schweiz, haben Maßnahmen gesetzt, um die wachsenden verkehrsbedingten Belastungen zu vermindern und berücksichtigen diesen Aspekt verstärkt in nationalen Verkehrsstrategien sowie Strategien zur nachhaltigen Entwicklung (Alpenkonvention 2006). In der Schweiz ist die Nachhaltigkeit im Verkehr als Ziel sogar in der Schweizer Verfassung verankert[122]. Dieses Ziel wird im Verkehrsverlagerungsgesetz[123] konkretisiert. Es ist vorgesehen, den alpenquerenden Güterverkehr durch die Schweiz bis ca. 2009 auf rund 650.000 Fahrzeuge pro Jahr zu senken. Gegenüber 2001 entspricht dies einer Reduzierung des Schwerverkehrs auf die Hälfte. Als Nicht-EU-Staat hat die Schweiz die wesentlichen Inhalte seiner Verkehrspoltik im Landverkehrsabkommen mit der EU geregelt[124].

Die wichtigsten Instrumente der Schweizer Verlagerungspolitik sind die Einführung der leistungsabhängigen Schwerverkehrsabgabe (LSVA) am 01.01.2001, sukzessive Aufhebung der Tonnagebeschränkung, Förderung des Kombiverkehrs, Fahrverbote, Modernisierung der Schieneninfrastruktur (insb. NEAT) und der Betriebsqualität (Bahn 2000, Lärmsanierung) sowie die intensiveren Kontrollen des Straßenschwerverkehrs. Die Verlagerungspolitik zeigt Wirkung und konnte letztendlich auch die Anhebung der Gewichtslimite kompensieren. Durch die Erhöhung der Gewichtslimite von 28 t auf 34 t im Jahr 2001 und weiter auf 40 t im Jahr 2005 hat die transportierte Gütermenge auch an den Schweizer Alpenübergängen zugenommen. Die Anzahl der Lkw hat sich dagegen zwischen 1999 und 2004 um 5,1 % (am Gotthard um 12 %) reduziert (zum Vergleich: die Anzahl der Lkw am Brenner ist um 28 % gestiegen). Diese Entwicklung lässt sich mit einer durch die LSVA bedingten höheren Auslastung der Fahrzeuge und einem Rückgang der Leerfahrten (Rudel 2007) sowie flankierenden Maßnahmen einschließlich Subventionierung des Kombiverkehrs erklären. Dazu hat auch die Begrenzung des Lkw-Transits durch den Gotthard[125] auf 3.000 bis 3.500 Lkw pro Tag als Folge der Brandkatastrophe im Oktober 2001 spürbare Auswirkungen auf den Straßengüterverkehr. Das allgemeine Nachtfahrverbot setzt einen zusätzlichen Anreiz zur verstärkten Nutzung der Schiene und anfallende Grenzwartezeiten und -kontrollen vermindern die Attraktivität für Transitfahrten.

In Österreich zählen der EU-Beitritt 1995, das Auslaufen der Öko-Punkte-Regelung[126] Ende 2003 und die Einführung des Road-Pricing für Lkw auf Autobahnen mit 01.01.2004 zu verkehrspolitischen Meilensteinen. Das ersatzlose Auslaufen der Ökopuntke-Regelung Ende 2003 führte beispielsweise dazu, dass sich das Aufkommen der Rollenden Landstraße nach einem konstanten Wachstum zwischen 1999 und 2003, zwischen 2003 und 2004 halbiert hat (BMVIT 2005). Entsprechend wurde das größte jährliche Wachstum des Straßengüterverkehrs am Brenner zwischen den Jahren 2003 und 2004 verzeichnet (+4,5 Mio. t; +17 %). Hinzu kommt, dass seit der Erweiterung der Europäischen Union zum 01.05.2004 Fahrzeuge aus den neuen Mitgliedsländern mit einem zulässigen Gesamtgewicht über 7,5 Tonnen nicht mehr an ein Kontingentsystem gebunden sind. Seit November 2005 ist wieder ein deutlicher Aufwärtstrend beim begleiteten kombinierten Verkehr festzustellen. Auf der Verbindung Wörgl–Brenner verkehren seit 06.11.2005 zehn (früher zwei) Zugpaare täglich (Köll 2005). Besonders die Attraktivität der Rollenden Landstraße hängt ganz entscheidend von begleitenden verkehrspolitischen Maßnahmen ab. Hierzu zählen neben der Subventionierung der Rollenden Landstraße auch beschränkende Maßnahmen für den Straßengüterverkehr, wie beispielsweise das lokale/regionale Nachtfahrverbot (Euronorm 0-3), das Wochenendfahrverbot und das Fahrverbot für Sattel-Anhänger (Euronorm 0, 1).

In Frankreich führte die Brandkatastrophe am 24.03.1999 im Mont-Blanc Tunnel und dessen anschließende Sperrung zu einer kompletten Verlagerung des Straßengüterverkehrs auf den Frejus Korridor. Der Mont-

[122] Artikel 84 „Alpenquerender Transitverkehr“, Bundesverfassung der Schweizerischen Eidgenossenschaft vom 18.04.1999.

[123] Bundesgesetz zur Verlagerung von alpenquerendem Güterschwerverkehr auf die Schiene (Verkehrsverlagerungsgesetz) vom 08.10.1999, in Kraft getreten am 01.01.2001.

[124] Abkommen zwischen der Schweizerischen Eidgenossenschaft und der Europäischen Gemeinschaft über den Güter- und Personenverkehr auf Schiene und Straße, abgeschlossen am 21. Juni 1999 und in Kraft getreten am 1. Juni 2002.

[125] Bis Ende September 2002 wurde der Schwerverkehr unter der Bezeichnung „Dosierung“ nur im Einbahnverkehr durch den Gotthard-Tunnel geführt. Ab Oktober 2002 wurde die Dosierung durch das so genannte „Tropfenzählerystem“ abgelöst. Dabei wird der Schwerverkehr in gleichmäßigen Abständen auf die Fahrt durch den Tunnel geschickt (ARE 2006).

[126] Der Straßengüterverkehr durch Österreich war nach dem Protokoll Nr. 9 zum Vertrag über den Beitritt Österreichs zur Europäischen Union bis Ende 2003 durch ein so genanntes Ökopunktekontingent reglementiert: Österreich konnte für jede Lkw-Transitfahrt die Entrichtung von „Ökopunkten“ verlangen. Die Zahl der benötigten Ökopunkte richtete sich nach dem NOx-Ausstoß des jeweiligen Lkw. Die Zahl der jährlich ausgegebenen Ökopunkte war kontingentiert und wurde von Jahr zu Jahr reduziert.

Blanc Tunnel wurde 2002 wieder geöffnet und der Verkehr verlagerte sich zurück auf den Mont-Blanc Korridor, jedoch langsamer und letztendlich nicht in dem ursprünglichen Ausmaß, was auf die neu eingeführten Maßnahmen (z.B. Abstandsbestimmungen, Dosierung) zurückzuführen ist.

Wie diese Beispiele zeigen, ist Straßengüterverkehr Ausdruck der jeweiligen geltenden Rahmenbedingungen und damit auch durch verschiedene Maßnahmen beeinflussbar. Die Transitkorridore bilden dabei ein „kommunizierendes System" (Schmutzhard 2005). Drei Einflussebenen mit unterschiedlicher Sensitivität auf Maßnahmen können identifiziert werden:

- die Verkehrsmenge,
- die Wahl des Verkehrsmittels und
- die Wahl der Route.

Im Straßengüterverkehr erfolgt die Wahl der Route wesentlich flexibler und spontaner als die Wahl des Verkehrsmittels (welche in den meisten Fällen kurzfristig nicht veränderbar ist) und ist somit auch leichter durch Maßnahmen zu beeinflussen (Amt der Tiroler Landesregierung, Abteilung Verkehrsplanung 2006; Rapp Trans 2003). Die fehlende Abstimmung von Maßnahmen zwischen einzelnen Ländern und Regionen führte daher letztendlich vor allem zu Verlagerungen des Lkw-Verkehrs zwischen den Korridoren. Restriktivere verkehrspolitische Maßnahmen in der Schweiz führen zu Umwegverkehr auf anderen inneralpinen und alpenquerenden Routen.

Um eine nachhaltige Verkehrsverlagerung von der Straße auf die Schiene zu erreichen, müssen zuerst Verlagerungen auf andere Routen vermieden werden. Erst dann greifen Maßnahmen zur Verkehrsverlagerung und -vermeidung. Nicht umsonst nennt das bereits zitierte Landverkehrsabkommen Schweiz–EU explit das Ziel der Vermeidung von Umwegverkehr neben dem Ziel der nachhaltigen Mobilität und des Umweltschutzes (Art. 30, Abs. 2).

3 METHODISCHER ANSATZ ZUR ANALYE DES UMWEGVERKEHRS

Im Rahmen des INTERREG Projektes MONITRAF[127] wurden die Güterverkehrsströme über die westösterreichischen und Schweizer Alpenübergänge auf Basis der Datensätze der CAFT (Cross Alpine Freight Transport Survey) aus dem Jahr 2004 analysiert und Umwegfahrten identifiziert (Köll 2005).

3.1 Kriterien zur Definition von Umwegfahrten

Bei der Definition des Umwegverkehrs kommt eine Vielzahl von Kriterien zur Anwendung. Deren Festlegung bestimmt maßgeblich die Ergebnisse. Zentrale Fragen, die es zu definieren gilt, sind nach Köll (2005):

3.1.1 Welche Variable wird als Umwegkriterium, d.h. zum Vergleich mit den Alternativrouten angesetzt (z.B. Streckenlänge oder betriebswirtschaftliche Gesamtkosten)?

Unter dem Gesichtspunkt der Ökologie betrachtet, macht die Streckenlänge Sinn, wobei genau genommen auch das Streckenprofil, Ortsdurchfahrten usw. mitberücksichtigt werden müssten. Aus dem Blickwinkel der Ökonomie sind jedoch die betriebswirtschaftlichen Gesamtkosten anzusetzen, die sich aus Streckenlänge, Fahrzeit, Mautkosten und anderen Kostenfaktoren (wie z. B. Treibstoffkosten) zusammensetzen

3.1.2 Wo liegen die Schwellen zum Umwegverkehr, werden diese als Absolut- oder Relativwerte oder als Kombination aus beiden angesetzt?

Beim Umwegkriterium Streckenlänge werden von Köll (2005) die absoluten Schwellenwerte mit 60 km und 120 km festgesetzt. Bei einer Lkw-Durchschnittsgeschwindigkeit pro Stunde auf der Brennerautobahn (zwischen Brenner und Brixen) von 85 km/h im Jahr 2003 (Autobrennero 2004) entspricht ein Umweg von 60 km ungefähr einer Lkw-Fahrtzeit von 45 min., ein Umweg von 120 km einer Fahrtzeit von knapp 90 min.

[127] MONITRAF wird von der Europäischen Union im INTERREG III B Alpenraumprogramm unterstützt und hat das Ziel die Auswirkungen des inneralpinen und alpenquerenden Straßenverkehrs zu analysieren sowie mögliche Handlungsansätze für eine nachhaltigere Gestaltung des Verkehrs entlang der Transitkorridore zu erarbeiten. Darauf aufbauend werden gemeinsame Maßnahmen entwickelt, um die negativen Auswirkungen des Straßenverkehrs zu mildern und die Lebensqualität der Bewohner in den Transittälern zu erhöhen. Bei der Entwicklung der Maßnahmen wird insbesondere darauf geachtet, dass sich diese auf keine der Regionen nachteilig auswirken. Probleme dürfen also nicht von einer Verkehrsachse auf eine andere Achse verlagert werden.

Diese oftmals genannten 60 km sind nach Köll (2005) jedoch recht niedrig angesetzt. Beispielsweise macht bei der Fahrtstrecke von Frankfurt am Main nach Modena die Route über den Brenner (896 km) gegenüber der über den Gotthard (837 km) mit einem Umweg von knapp 60 km nur 7 % der gesamten Fahrtstrecke aus. Aber auch die öfter angesetzten 120 km sind zu hinterfragen. Bei der Route Stuttgart – Brescia beträgt der Umweg über den Brenner mit 702 km gegenüber der Fahrtstrecke über den Gotthard (592 km) schon 110 km und nimmt damit einen Anteil von fast 20 % der Gesamtfahrtstrecke ein. Daher kann es sinnvoll sein, auch Relativwerte als Schwellenwerte für den Umwegverkehr anzusetzen. Köll (2005) verwendet hierfür 10 % und 20 %.

3.1.3 Welche Alternativen werden bei den Berechnungen berücksichtigt?

Wenn alle möglichen Alpenübergänge als Alternativen in der Berechnung zugelassen werden, liegt beispielsweise die Differenz der Streckenlänge zwischen der San Bernardino- und der Brennerroute über dem Schwellenwert – die Fahrt über den Brenner ist demnach eine Umwegfahrt. Wird jedoch nur der Gotthard „geöffnet" (d.h. als Alternative zugelassen), wird die „Umweggrenze" nicht erreicht, die Fahrt verbleibt definitionsgemäß am Brenner.

3.1.4 Wie werden die Routenalternativen berechnet?

Bei der Berechnung der Alternativrouten muss festgelegt werden, welche Kriterien bei der Routenentscheidung von der Quelle bis zum (alternativen) Alpenübergang und von diesem bis zum Ziel angesetzt werden. Bei der Wahl der streckenkürzesten Route erreicht man ein Maximum von Umwegen, allerdings führt der unter diesem Gesichtspunkt optimale Weg des Lkw häufig über Landes- und Gemeindestraßen sowie durch Ortsdurchfahrten, was unerwünscht und unwahrscheinlich ist. Ähnlich verhält es sich auch bei der kostengünstigsten Alternative. Als weitere Möglichkeit bietet sich die schnellste Route im Vor- und Nachlauf zum Alpenübergang an. Diese Route verläuft auf dem hochrangigen Straßennetz, die Anzahl der Umwege geht aber zurück.

Diese Überlegungen zeigen, dass es unabdingbar ist, die bei der Analyse des Umwegverkehrs zugrunde gelegten Kriterien zumindest offen zu legen. Im Sinne einer differenzierten Betrachtung wird im Folgenden außerdem versucht, die unterschiedlichen Ergebnisse nach mehreren Ansätzen gegenüberzustellen.

3.2 Methodisches Vorgehen

Für die Untersuchung des Umwegverkehrs wurden die Datensätze der CAFT (Cross Alpine Freight Transport Survey) von Österreich und der Schweiz aus dem Jahr 2004 herangezogen (BMVIT & ARE 2005). Der Schwerpunkt der Analyse liegt auf den Alpenübergängen in Westösterreich und der Schweiz. Von den realisierten Fahrten sind Ausgangs- und Zielzone, Alpenübergang und höchstens noch Einreise- und Ausreisegrenzübergang bekannt. Die Ausgangs- und Zielzonen wurden so aggregiert und einem Start- bzw. Zielort zugeordnet, dass einerseits die Anzahl der Fallbeispiele möglichst reduziert wird, andererseits kein bzw. nur ein vernachlässigbarer Einfluss auf die Umwegbetrachtung gegeben ist (Köll 2005). Beispielsweise ist aus der Sicht der absoluten Längendifferenzen unter den Alternativen unerheblich, ob eine Fahrt in Hannover, Bremen oder Hamburg beginnt. Die Routen unterscheiden sich ab Hannover nicht, die Betrachtung von Absolutdifferenzen beim Umwegverkehr ist korrekt. Bei relativen Schwellenwerten können sich geringfügige Abweichungen ergeben, da sich 100 km Differenz in der Gesamtstreckenlänge entsprechend dem angesetzten Prozentsatz auf den Schwellenwert auswirken.

Aus den knapp 35.000 Interviews der Güterverkehrserhebung 2004 (CAFT) wurden etwa 7.600 verschiedene Wege ermittelt, für welche bis zu 9 Alternativen erzeugt wurden:

- Tauern
- Felbertauern
- Brenner/Brennero – Kufstein
- Brenner/Brennero ohne weitere Einschränkung (d.h. auch Fernpass – Brenner etc. möglich)
- Reschen/Resia
- San Bernardino
- Gotthard

- Simplon
- Großer St. Bernhard

Auch war es notwendig, neben den vorhandenen Routeninformationen wie Start- und Zielort, jeweils einen Ort als Zwischenpunkt beim Alpenübergang und 0 bis 2 Zwischenstationen an den Grenzen anzugeben. Bei den Alternativen mussten 1 bis 2 Zwischenpunkte sehr sorgfältig ausgewählt werden. Anderenfalls bestand die Gefahr, dass unplausible Routenverläufe erzeugt werden. Beispielsweise wurde für die Route über den Reschen neben Schlanders (Vinschgau/Italien) noch Landeck (oberes Inntal/Österreich) als zweite Zwischenstation eingefügt. Erfolgt dies nicht, wird in einem automatisierten Verfahren als geeignete Route die Strecke über das Engadin simuliert.

Um den Umwegverkehr zu analysieren wurden folgende Festlegungen getroffen:

- Als Umwegkriterium wird die Streckenlänge herangezogen und ausgewertet.
- Als Schwellenwerte werden im Sinne einer differenzierten Betrachtung unterschiedliche Absolut- und Relativwerte angesetzt: 60 km, 120 km, 10 % und 20 %.
- Bei den zugelassenen Alternativen werden ebenfalls im Sinne einer differenzierten Betrachtung mehrere Fälle berücksichtigt: Gotthard und Brenner sowie alle 9 Alternativen.
- Der Berechnung wird die schnellste Route im Vor- und Nachlauf zu Grunde gelegt. Damit erfolgen die Fahrten überwiegend auf dem hochrangigen Straßennetz.

Die Berechnung der Streckenlängen erfolgte dann mit dem Programmsystem CargoRoute. Die Berechnungsergebnisse wurden mit der Datenbank verknüpft, so dass es möglich war, über die Hochrechnungsfaktoren die Anzahl der Umwegfahrten für jeden Berechnungsmodus zu ermitteln (Köll 2005).

4 UMWEGVERKEHR IM ALPENBOGEN

4.1 Transitkorridore im Überblick

Von den neun betrachteten Alpenübergängen über den Alpenhauptkamm (Kap. 3.2), die für den Güterverkehr von Bedeutung sind, ist der Brenner die am stärksten belastete Verbindungsachse. Mit ca. 1347 m ü. NN ist er der niedrigste, ganzjährig befahrbare Übergang über den Alpenhauptkamm und nahm im Jahr 2004 mit 1.996.000 Lkw/Jahr den höchsten Anteil (45 %) aller Lkw-Fahrten über die Alpen auf. Ihm folgten der Gotthard mit 22 % (969.000 Lkw/Jahr) und der Tauern mit 21 % (941.000 Lkw/Jahr) (Tab. 2).

Wie bereits gezeigt gelten für den Straßengüterverkehr zum Teil sehr unterschiedliche Rahmenbedingungen an den einzelnen Routen bzw. in den einzelnen Ländern (Kap. 2.2). Die unterschiedliche Ausgestaltung von fiskalischen Maßnahmen, Fahrverboten, Geschwindigkeitsbegrenzungen und Subventionen im Schienenverkehr entlang der einzelnen Korridore bildet den Hintergrund für die Routenentscheidung, also auch für einen Umweg. Dabei beeinflussen vor allem die unterschiedlichen Mautgebühren (Tab. 2) die Routenwahl im Güterfernverkehr, da die Route von den Transportunternehmen primär nach betriebswirtschaftlichen Gesichtspunkten gewählt wird (Tiroler Landesregierung, Abteilung Verkehrsplanung 2006). Auch die Unterschiede bei den Treibstoffpreisen (Tab. 2) bilden ein zusätzliches Kriterium für die Routenwahl. Die Preisdifferenzen beim Diesekraftstoff bieten beträchtliche Einsparpotenziale, berücksichtigt man die Tankfüllung solcher Fahrzeuge.

	Gotthard	Brenner	Tauern
Streckenlänge	Basel – Chiasso: 300 km	Kufstein – Verona: 335 km	Salzburg – Palmanova: 321 km
Verkehrsstärke, 2004	969.000 Lkw/Jahr	1.996.000 Lkw/Jahr	941.000 Lkw/Jahr
Mautgebühren*, 2004	140 Euro (Jahr 2005: 200 Euro)	99 Euro	92 Euro
Treibstoffpreise (Diesel), 2006	1,079	0,972	0,972

Tab. 2: Ausgewählte Rahmenbedingungen für den Straßengüterverkehr an drei Alpenhauptübergängen (Quelle: Verkehrsstärke: BMVIT & ARE 2005; Mautgebühren: Tiroler Landesregierung, Abteilung Gesamtverkehrsplanung 2004; Treibstoffpreise: ÖAMTC, 02.10.2006). *Mautgebühren bezogen auf 300 km, für 40 t-Lkw, 5 Achsen, Euro 3. Preise exkl. MwSt.

4.2 **Anzahl und Anteil von Umwegfahrten**

Die Analyse der Lkw-Fahrten über die Alpenübergänge der Schweiz und Westösterreichs zeigt, dass vielfach nicht die kürzesten Wege zwischen Ausgangs- und Zielort gewählt werden. Tatsächlich läßt sich entlang der Korridore eine signifikante Anzahl von Umwegfahrten ermitteln. Der größte Teil der Umwegfahrten erfolgt über die österreichischen Alpenübergänge, insbesondere über den Brenner.

Werden die Alternativen Brenner und Gotthard betrachtet, nimmt von allen Alpenübergängen der Brenner am meisten Umwegverkehr auf (Tab. 3). 562.500 Lkw/Jahr die derzeit über den Brenner fahren, hätten über den Gotthard eine um mindestens 60 km kürzere Strecke. Dies entspricht einem Anteil von 28,2 % aller derzeitigen Lkw-Fahrten über den Brenner. An zweiter Stelle liegt der Tauern: 75.700 Lkw/Jahr (8 %) von den insgesamt 941.000 Lkw-Fahrten pro Jahr hätten eine um mindestens 60 km kürzere Alternativroute über den Gotthard und 50.900 Lkw/Jahr (5,4 %) über den Brenner.

Wird der Schwellenwert auf >120 km festgelegt, halbieren sich diese Ergebnisse fast. Bei 363.800 Fahrten/Jahr ist im Vergleich zur gewählten Route die Alternative über den Gotthard kürzer. Die Brennerroute ist dagegen für nur 28.100 Fahrten/Jahr im Vergleich zur gewählten Strecke um mehr als 120 km kürzer. Auch bei diesem Schwellenwert nimmt der Brenner den meisten Umwegverkehr auf (289.100 Lkw/Jahr; 14,5 % aller Lkw-Fahrten über den Brenner), gefolgt von der Tauernroute (Tab. 3). Der San Bernardino verzeichnet dagegen bei der 120 km-Schwelle kaum noch Umwegfahrten. Wird als Schwellenwert 10 % der gesamten Fahrtweite angenommen, erreicht der Umwegverkehr an diesem Schweizer Alpenpass sehr hohe Werte (Tab. 4). Dies bedeutet, dass einerseits die Gesamtstrecke der über den San Bernardino fahrenden Lkw in der Regel kurz ist. Dadurch andererseits die Umwegstrecken eine Länge von 120 km kaum erreichen. Dies trifft, wenn auch in geringerem Ausmaß, auch auf den Reschen zu.

Route über Alpen-übergang	Verkehrs-stärke 2004	Alternative kürzer um											
		> 60 km						> 120 km					
	[Lkw/ Jahr]	keine		über Brenner		über Gotthard		keine		über Brenner		über Gotthard	
		[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]
Tauern	941.000	814.300	86,5 %	50.900	5,4 %	75.700	8,0 %	855.500	90,9 %	22.100	2,3 %	63.200	6,7 %
Felbertauern	82.500	80.800	97,9 %	1.100	1,3 %	600	0,7 %	82.200	99,6 %	0	0,0 %	300	0,4 %
Brenner/ Brennero	1.996.000	1.433.000	71,8 %	0	0,0 %	562.500	28,2 %	1.706.400	85,5 %	0	0,0 %	289.100	14,5 %
Reschen/ Resia	135.000	122.700	90,8 %	5.800	4,3 %	6.700	5,0 %	129.300	95,7 %	1.100	0,8 %	4.700	3,5 %
San Bernar-dino	154.000	135.000	87,4 %	1.200	0,8 %	18.200	11,8 %	153.200	99,3 %	400	0,3 %	700	0,5 %
Gotthard	969.000	963.400	99,4 %	6.000	0,6 %	0	0,0 %	965.000	99,6 %	4.300	0,4 %	0	0,0 %
Gr. St. Bernhard	65.000	58.000	89,1 %	100	0,2 %	7.000	10,8 %	62.500	96,2 %	100	0,2 %	2.400	3,7 %
Simplon	67.000	56.300	84,4 %	300	0,4 %	10.100	15,1 %	63.200	94,8 %	100	0,1 %	3.400	5,1 %
Summe	4.409.500	3.663.400	83,1 %	65.300	1,5 %	680.700	15,4 %	4.017.400	91,1 %	28.100	0,6 %	363.800	8,3 %

Tab. 3: Anzahl und Anteil der Alternativrouten über den Brenner oder Gotthard bei Schwellenwerten > 60 km und > 120 km (Quelle: Köll 2005).

Betrachtet man die um mehr als 20 % kürzeren Alternativrouten im Vergleich zur gewählten Route über den Gotthard und den Brenner verringert sich die Anzahl der Umwegfahrten weiter. Insgesamt verbleiben bei diesem Schwellenwert noch 151.600 Umwegfahrten/Jahr, die über den Gotthard und 5.800 Fahrten/Jahr, die über den Brenner eine kürzere Alternative hätten. Erstere werden derzeit zu einem großen Teil (135.000 Fahrten/Jahr) vom Brenner-Korridor aufgenommen, letztere weichen hauptsächlich auf die Tauern- (6.400 Fahrten/Jahr) und Reschenstrecke aus (3.300 Fahrten/Jahr).

Route über Alpen-übergang	Alternative kürzer um											
	> 10 %						> 20 %					
	keine		über Brenner		über Gotthard		keine		über Brenner		über Gotthard	
	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]	[Lkw/ Jahr]	[%]
Tauern	869.300	92,4%	21.000	2,2%	50.500	5,4%	931.800	99,0%	2.600	0,3%	6.400	0,7%
Felbertauern	81.600	98,9%	600	0,7%	300	0,4%	82.200	99,6%	300	0,4%	0	0,0%
Brenner/ Brennero	1.713.400	85,9%	0	0,0%	282.100	14,1%	1.860.500	93,2%	0	0,0%	135.000	6,8%
Reschen/ Resia	122.400	90,5%	6.900	5,1%	5.900	4,4%	130.200	96,3%	1.700	1,3%	3.300	2,4%
San Bernar-dino	134.400	87,0%	400	0,3%	19.600	12,7%	150.000	97,2%	100	0,1%	4.200	2,7%
Gotthard	965.700	99,6%	3.700	0,4%	0	0,0%	968.200	99,9%	1.200	0,1%	0	0,0%
Gr. St. Bernhard	60.300	92,8%	100	0,2%	4.600	7,1%	64.200	98,6%	0	0,0%	900	1,4%
Simplon	61.300	92,0%	100	0,2%	5.200	7,8%	64.800	97,3%	0	0,0%	1.800	2,7%
Summe	4.008.400	90,9%	32.600	0,7%	368.300	8,4%	4.251.900	96,4%	5.800	0,1%	151.600	3,4%

Tab. 4: Anzahl und Anteil der Alternativrouten über den Brenner oder Gotthard bei Schwellenwerten > 10 % und > 20 % (Quelle: Köll 2005).

Ferner wurden die Routen über alle neun Alternativen gegeneinander verglichen und die Streckendifferenzen im Vergleich mit der tatsächlich gefahrenen Route berechnet. Daraus lässt sich die Route mit der größten Differenz (kürzeste Alternativroute) ermitteln. Dabei fällt auf, dass am Gotthard nur sehr wenige Umwegfahrten erfolgen. Die Gotthardroute weist mit knapp 6 % den geringsten Anteil an Umwegfahrten auf. Am Brenner hingegen nehmen von den insgesamt 1.996.500 Lkw-Fahrten knapp 50 % einen Umweg von mehr als 60 km in Kauf. Bei Reschen und Tauern hätten ca. 20 % eine um mindestens 60 km kürzere Alternativroute. Rund 425.000 Lkw/Jahr hätten über den Gotthard und 252.000 Lkw/Jahr über den San Bernardino die kürzeste Alternativroute. Auf den Kufstein – Brenner Korridor ist dagegen keine einzige Fahrt verlagerbar.

Die wichtigste Alternativroute zum Brenner ist nach wie vor der Gotthard. Dieser würde rund 18 % des Verkehrs vom Brenner aufnehmen. Auf den San Bernardino würden 12 % des Brenner-Verkehrs verlagert. In der Schweiz sticht vor allem die Verlagerung von 14.000 Lkw/Jahr (9,1 %) vom San Bernardino auf den Gotthard und 9.000 Lkw/Jahr (13,5 %) vom Simplon auf den Gotthard hervor. Auf alle österreichischen Alternativrouten können von der Schweiz insgesamt etwa 25.000 Lkw/Jahr verlagert werden.

Bei den um 120 km kürzeren Alternativrouten nimmt die Anzahl des Umwegverkehrs stark ab. Am Brenner verbleiben nur noch 365.000 Umwegfahrten (18 %), rund 150.000 Umwegfahrten (7,6 %) entfallen auf den Gotthard und 100.000 (5,1 %) auf den San Bernardino. Die Umwegfahrten über die Schweizer Alpenübergänge sind bei diesem Schwellenwert marginal.

4.3 **Verkehrsstärke nach rechnerischer Verlagerung der Umwegfahrten**

Abb. 2 zeigt die Mehrbelastung bzw. Entlastung der Alpenübergänge bei Verlagerung der Umwegfahrten über 60 km. Bei diesem Schwellenwert würde der Gotthard um + 38 % mehr belastet. Entlastet würden der der Brenner (–31 %) und der Tauern (–16 %). Brenner und Gotthard würden dann beide jeweils von rund 1,35 Mio. Lkw/Jahr gequert und hätten somit ungefähr die gleiche Verkehrsstärke. Starke relative Zunahmen würden auch am San Bernardino (+149 %) und am Gr. St. Bernhard (+118 %) erfolgen, allerdings ausgehend von einem niedrigen absoluten Niveau. Der einzige österreichische Alpenübergang mit einer Mehrbelastung ist der Reschen.

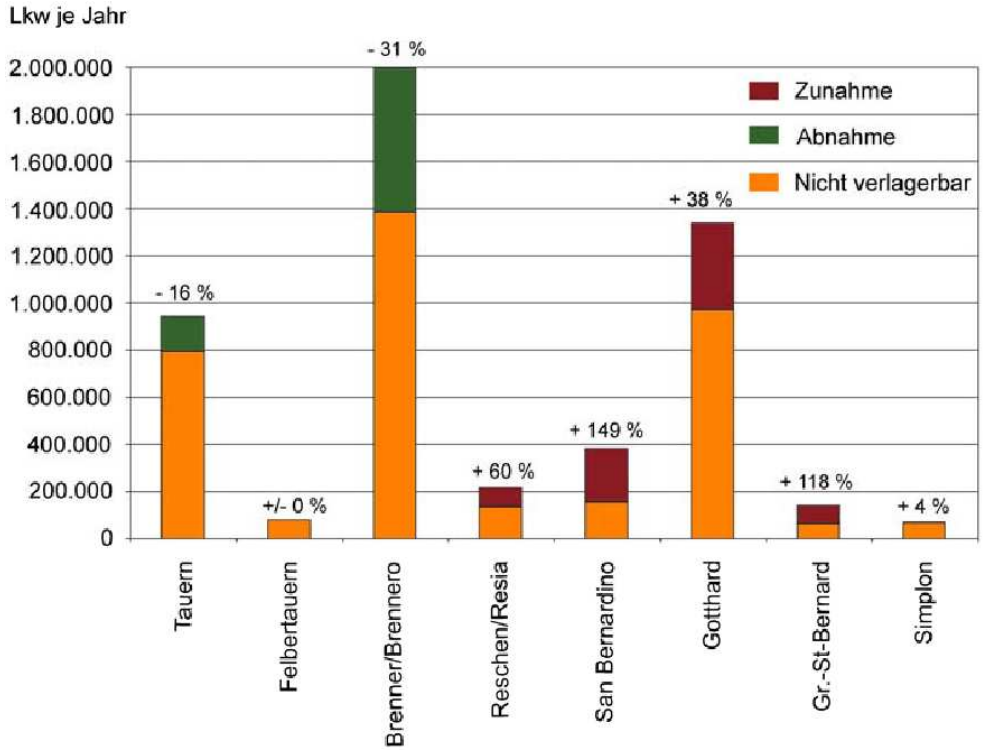

Abb. 2: Mehrbelastung bzw. Entlastung der Alpenübergänge bei Verlagerung der Umwegfahrten über 60 km (Quelle: Köll 2005).

Eine Verlagerung der Umwegfahrten über 120 km hätte eine Verkehrszunahme am Gotthard um +18 % und eine Abnahme am Brenner um –15 % zur Folge (Abb. 3). Auf den Brenner würden damit insgesamt 1,7 Mio. Lkw/Jahr und auf den Gotthard 1,1 Mio. Lkw/Jahr entfallen. Zunehmen würde die Verkehrsstärke wie bei der 60 km-Grenze vor allem am San Bernardino, Gr. St. Bernhard und Reschen. Abnahmen könnten dagegen am Tauern mit –11 % oder 108.000 Lkw/Jahr festgestellt werden.

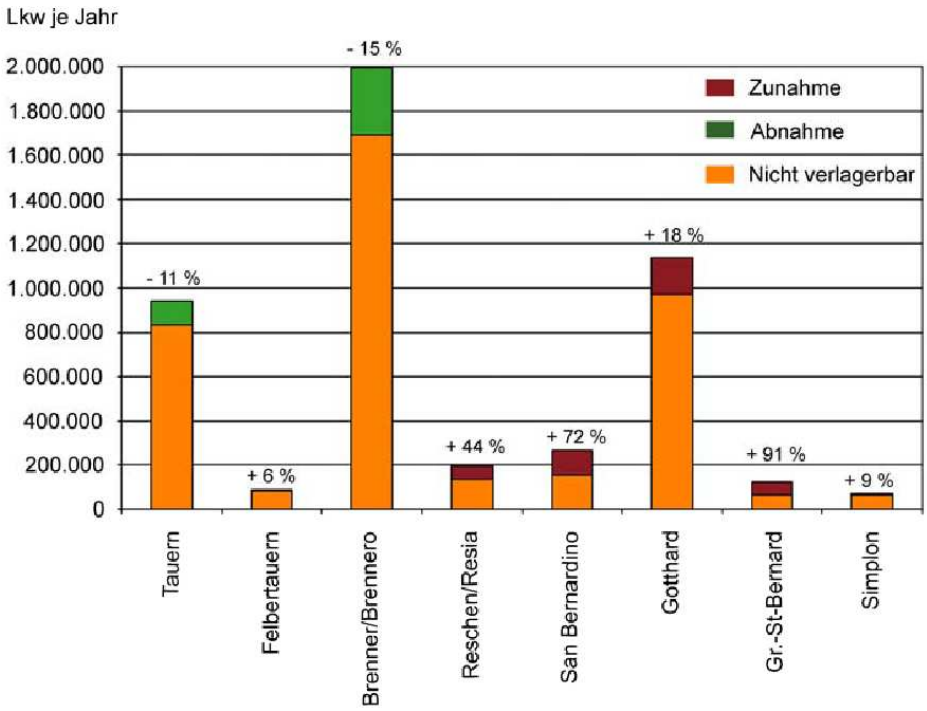

Abb. 3: Mehrbelastung bzw. Entlastung der Alpenübergänge bei Verlagerung der Umwegfahrten über 120 km (Quelle: Köll 2005).

5 RESÜMEE UND SCHLUSSFOLGERUNGEN

Der Güterverkehr im Alpenraum nimmt stetig zu. Dieser Trend wird sich entsprechend verschiedener Prognosen auch in der Zukunft fortsetzen. Entgegen politischer Absichtserklärungen wird der Zuwachs primär noch immer von der Straße aufgefangen. Die Ursachen hierfür sind vielfältig. Letztlich konnte die

Position der Schiene trotz zahlreicher Ansätze nicht ausreichend gestärkt werden. Gleichsam nimmt die betroffene Bevölkerung in den Tranisttälern der Alpen die negativen Auswirkungen des Verkehrs immer stärker wahr und artikuliert zunehmend ihren Unmut.

Damit wird die dringende Notwendigkeit für ein alpenweites koordiniertes Vorgehen im Bereich des alpenquerenden Verkehrs generell und im Güterverkehr speziell deutlich. Die fehlende länderübergreifende Abstimmung einzelner Maßnahmen führt letztendlich auch zu einer Verlagerungen des Lkw-Verkehrs zwischen den einzelnen Korridoren. Aus den Analysen der Lkw-Fahrten im Alpenraum geht hervor, dass vielfach nicht die kürzesten Wege gewählt und teilweise erhebliche Umwege in Kauf genommen werden. Der größte Teil der Umwegfahrten verläuft über die österreichischen Alpenübergänge. Aufgrund seiner geostrategischen Position ist der Brenner-Korridor davon besonders stark betroffen.

Verkehr folgt dem insgesamt „besten" Weg entsprechend seiner eigenen systeminhärenten Logik. Der „beste" Weg ist hierbei der für den Spediteur wirtschaftlich attraktivste. Insofern ist es wichtig, den komplexen Prozess der Routenwahl im Detail zu verstehen. Die Entscheidung eines Spediteurs für eine bestimmte Route basiert auf verschiedenen Faktoren. Je nach Kontext des Kundenunternehmens (z.B. die Produktion in einem „Just in Time" (JIT) Kontext) sind diese Faktoren von unterschiedlicher Bedeutung. Wichtige Entscheidungsvariablen sind z.B.:

- Transportkosten (u.a. Mautgebühren, Benzinpreise),
- Transportzeit (u.a. Entfernung, Kombination von Be- und Entladevorgängen auf einer Fahrt),
- Verläßlichkeit,
- Flexibilität (u.a. kurze Bestellzeiten, variable Gestaltung einzelner Transportvorgänge) und
- Pünktlichkeit (Bolis & Maggi 1999; Rudel, Abel, Maggi & Stoppa 2006).

Dieses komplexe Entscheidungsmuster macht es schwierig die detaillierte Routenentscheidung von außen nachzuvollziehen. Insofern kann Umwegverkehr nur teilweise über einen einzelnen Faktor beeinflusst werden. Zudem muss zwischen direkt bzw. indirekt zu beeinflussenden Faktoren unterschieden werden. So lassen sich Unterschiede in den Mautgebühren und Treibstoffpreisen bei entsprechendem politischen Willen schneller beseitigen als sich innerbetriebliche Strategien, Kooperationen und Kundenprofile verändern lassen. Letztere sind von zahlreichen betriebswirtschaftlichen Rahmenbedinungen geprägt.

Eine grundlegende Angleichung der unterschiedlichen Bedingungen entlang der einzelnen Korridoren ist ein erster wichtiger Ansatz zur Vermeidung von Umwegverkehr. Diese Angleichung muss jedoch nach oben und keinesfalls nach unten erfolgen. Dies betrifft insbesondere die verschiedenen Gebühren (Maut, Sonderabgaben und Treibstoffpreise). Bei einer Fahrt über österreichische Alpenkorridore können infolge günstiger Maut und Dieselpreise (Kap. 4.1) die Transportkosten um insgesamt rund 200 bis 300 €/Fahrt reduziert werden. Bei den niedrigen Gewinnspannen in der Transportwirtschaft (von nur wenigen Prozentpunkten) wird die Bedeutung dieses Einsparpotenziales für die Routenwahl im Güterfernverkehr erkennbar (Tiroler Landesregierung, Abteilung Verkehrsplanung 2006).

Das Beispiel der Mauten zeigt auch, dass bei der Gestaltung der Maut nicht nur die Höhe sondern auch die Art der Maut entscheidend ist. Sondermauten für die Benutzung bestimmter Infrastrukturen (Brücke, Tunnel) wirken anders auf die spezifischen Transportkosten je km als Streckenmauten. So ist der Einfluss von Sondermauten bei Langstreckentransporten wesentlich geringer als im regionalen Gütertransport (Schmutzhard 2005). Dies liegt am degressiven Charakter dieser Bemautungsform (Abb. 4). Von einer Streckenmaut sind Langstrecken wesentlich stärker betroffen, da sich Streckenmauten nach den effektiv gefahrenen Kilometern richten.

Die Analyse der durchschnittlichen Fahrtweiten der Lkw auf der Brenner- und Gotthardroute bestätigt diese Überlegungen. Auf der Brennerroute (Kufstein-Verona) setzen sich die Mautgebühren ungefähr zur Hälfte aus Streckenmaut (42 €, Jahr 2004) und Sondermaut (49 €, Jahr 2004) zusammen, auf der Gotthardroute wird dagegen nur eine Streckenmaut erhoben. Die mittlere Fahrtweite aller Lkw war im Jahr 2004 Brenner um 440 km länger als am Gotthard (mittlere Fahrtweite Brenner: 1.160 km, Gotthard: 720 km) (Tiroler Landesregierung, Abteilung Verkehrsplanung 2006).

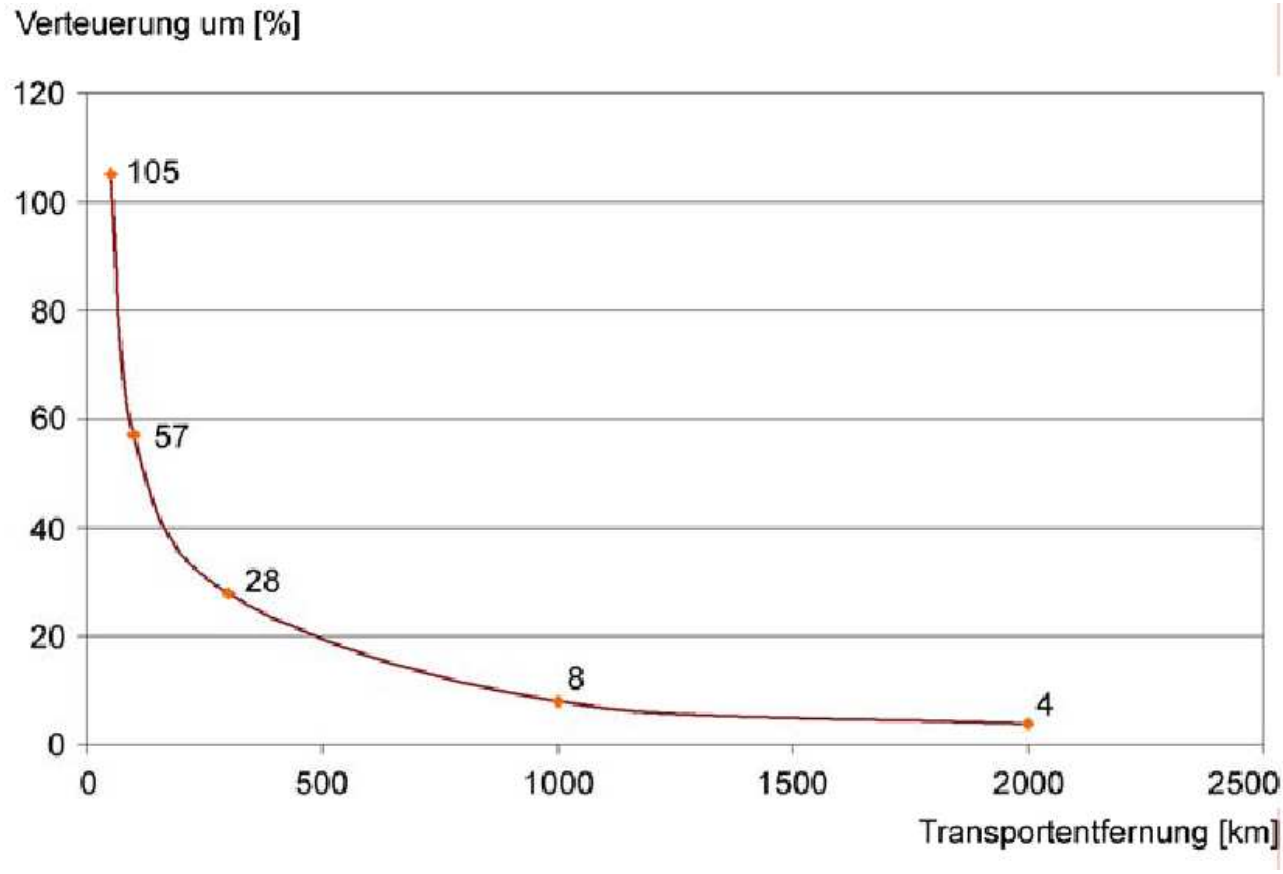

Abb. 4: Auswirkungen der Sondermaut am Brenner (49 €) auf die Transportkosten, 2004 (Quelle: Schmutzhard 2005).

Einfluss auf die Routenwahl haben auch die unterschiedlichen Niveaus der Treibstoffpreise in den einzelnen Ländern. Um diese teilweise hohen Kostenvorteile zu nutzen, werden bewusst Umwege in Kauf genommen (u.a. Köll & Bader 2006). So kommt auch der Verkehrsbericht 2005 des Landes Tirol zu dem Ergebnis, dass Unterschiede bei der Mineralölsteuer in der EU einen zusätzlichen Anreiz für eine Routenwahl über österreichisches Territorium darstellen (Tiroler Landesregierung, Abteilung Verkehrsplanung 2006). Bei einem Tankinhalt von 1.000 Liter und dem bestehenden Preisunterschied von 0,10 bis 0,20 €/l leitet sich ein Einsparpotenzial von rund 100 bis 200 € je Tankfüllung ab.

Mit der Angleichung dieser Bedingungen kann ein bestimmtes Ausmaß an Umwegfahrten vermieden werden, da der Anreiz für eine Verlagerung auf andere Routen abnimmt. Maßnahmen zur Vermeidung von Umwegverkehr müssen kooperativ und koordiniert entwickelt, umgesetzt und kontrolliert werden.

Einen möglichen Ansatz zur Vermeidung von Umwegverkehr stellt die Alpentransitbörse dar. Bei der Alpentransitbörse spielt das Preiselement eine wesentliche Rolle, denn Fahrten werden über den Preis gesteuert, vergleichbar mit einer Auktion. Die Alpentransitbörse, erarbeitet von der Alpeninitiative[128] zielt auf eine gleiche Verteilung einer bestimmten Anzahl von Lkw-Fahrten auf die einzelnen Alpenübergänge. Zwei Grundmodelle können unterschieden werden. Interessant ist vor allem das Modell Cap and Trade (Plafonierung und Handel). Mit diesem Modell könnte das Ziel einer mengenmäßigen Begrenzung der alpenquerenden Fahrten auf der Straße marktwirtschaftlich umgesetzt werden (Küng & Balmer 2007). Eine feste Anzahl von Lkw-Fahrten würden entweder kostenlos vergeben oder zu einem festen Preis verkauft oder versteigert. Nach der Zuteilung könnten die Durchfahrtsrechte frei gehandelt werden, entweder direkt zwischen den Transportunternehmen, via Intermediäre oder über eine spezielle Plattform.

Nach wie vor fehlt aber noch ein einheitliches Verständnis darüber, was als Umwegverkehr zu betrachten ist. Verschiedene Definitionsansätze können zu unterschiedlichen Ergebnissen und somit unterschiedlichen Schlussfolgerungen führen. Ein gemeinsames Vorgehen wird damit verhindert. Insofern ist es gerade im Alpenbogen wichtig einen Konsens über die Definition von Umwegverkehr zu erzielen.

[128] Die Schweizer Vereinigung „Alpeninitiative“ wurde am 25. Februar 1989 gegründet und zielt auf den Schutz der Alpenregionen vor den negativen Effekten des Transitverkehrs und auf die Erhaltung des Lebensraumes für Menschen, Tiere und Pflanzen.

Nur wenn ein Konsens darüber erzielt wird, lassen sich auch Push- und Pull-Faktoren des Umwegverkehrs identifizieren und offensiv bearbeiten. Erst auf dieser Basis kann das übergeordnete Ziel der Verlagerung des Verkehrs von der Straße auf die Schiene effektiv und effizient angegangen werden.

6 LITERATURVERZEICHNIS

ALPENINITIATIVE: Factsheet Alpentransitbörse. Altdorf, 2005

ALPENKONVENTION: Report on the State of the Alps. Transport and Mobility in the Alps. Unveröffentlichter Entwurf, 2006

AMT DER TIROLER LANDESREGIERUNG, ABTEILUNG VERKEHRSPLANUNG: Verkehr in Tirol. Bericht 2005. Innsbruck, 2006

AMT DER TIROLER LANDESREGIERUNG, ABTEILUNG GESAMTVERKEHRSPLANUNG: Verkehr in Tirol, Bericht 2003. Innsbruck, 2004

ARE (SCHWEIZER BUNDESAMT FÜR RAUMENTWICKLUNG): Alpinfo 1984, 1994, 1999 und 2005. Alpenquerender Güterverkehr auf Straße und Schiene. Bern, 1985-2006

ARE: Güterverkehr durch die Schweizer Alpen 2005. Bern, 2006

ARE: Alpinfo 2004. Alpenquerender Güterverkehr auf Straße und Schiene. Bern, 2005

ARE: Aggregierte Verkehrsprognosen Schweiz und EU – Zusammenstellung vorhandener Prognosen bis 2020. Bern, 2002

ARGE ALP (ARBEITSGEMEINSCHAFT ALPENLÄNDER): Verkehrskonzept der Arge Alp. Leben und Verkehr in den Alpen. Bellinzona, 2002

AUTOSTRADA DEL BRENNERO: Velocità media sulla tratta Brennero-Bressanone nell´anno 2003. 2004

BMU (DEUTSCHES BUNDESMINISTERIUM FÜR UMWELT, NATURSCHUTZ UND REAKTORSICHERHEIT): Alpenkonvention konkret. Ziele und Umsetzung. Alpensignale 2. Bonn, 2004

BMVIT (BUNDESMINISTERIUM FÜR VERKEHR, INNOVATION UND TECHNOLOGIE): Alpenquerender Güterverkehr in Österreich. Wien, 2006 BMVIT: Straßengüterverkehr am Brenner 2004. Vorauswertung zum Projekt Erhebung des alpenquerenden und grenzüberschreitenden Güterverkehrs, 2005

BMVIT & ARE: Cross Alpine Freight Transport Survey (CAFT), Austauschdatensatz der Erhebungen 1994, 1999 und 2004. Wien und Bern, 2005

BOLIS, S. & MAGGI, R.: „Modelling the transport and logistics choice of a shipper“. Swiss National Science Foundation, Research Programme 41 Transport and Environment. Bern, 1999

EUROPÄISCHE KOMMISSION: Für ein mobiles Europa – Nachhaltige Mobilität für unseren Kontinent. Halbzeitbilanz zum Verkehrsweißbuch der Europäischen Kommission von 2001. Mitteilung der Kommission an den Rat und das Europäische Parlament. KOM(2006) 314 endgültig vom 22.06.2006. Brüssel, 2006

EUROPÄISCHE KOMMISSION: Weißbuch – die europäische Verkehrspolitik bis 2010: Weichenstellungen für die Zukunft. Luxemburg, 2001

KÖLL, H.: Die Entwicklung des alpenquerenden Straßengüterverkehrs. Schlussbericht MONITRAF – WP 5 Fundamentals. Im Auftrag der Landesagentur für Umwelt der Autonomen Provinz Bozen-Südtirol. Reith bei Seefeld, 2005

KÖLL, H. & BADER, M.: Alpenquerender Straßengüterverkehr – Umwegfahrten in Westösterreich und Schweiz. Amt der Tiroler Landesregierung, Abteilung Verkehrsplanung. Innsbruck, 2006

KÜNG, C. & BALMER, U.: Unterwegs zur Nachhaltigkeit – die Verlagerungspolitik der Schweiz. In: MONITRAF (Hrsg.): Verkehr durch die Alpen: Entwicklungen, Auswirkungen, Perspektiven. S. 33-35. Haupt-Verlag, Bern/Stuttgart/Wien, 2007

LUNDSGAARD-HANSEN, N.; OETTERLI, J. & BERGER, H.-U.: Mehr Bewegung in der Verkehrspolitik. Leitlinien zur schweizerischen Verkehrspolitik. In: BIEGER, T.; LAESSER, C. & MAGGI, R.: Jahrbuch 2005/2006 Schweizerische Verkehrswirtschaft. Universität St. Gallen. Institut für Öffentliche Dienstleistungen und Tourismus. St. Gallen, 2006

PERLIK, M.: Europäische Integration und räumliche Differenzierung. Auswirkungen der politischen und ökonomischen Rahmenbedingungen auf Mobilität, Güterproduktion und den Verkehr durch die Alpen. Schlussbericht MONITRAF – WP 5 Fundamentals. Im Auftrag der Landesagentur für Umwelt der Autonomen Provinz Bozen-Südtirol. Bolzano-Bozen, 2006

PROGNOS AG: Verkehrsprognosen. Personen- und Güterverkehrsprognosen für den Brenner 2015. Im Auftrag der Brenner Basistunnel EWIV. Bericht 2002. Basel, 2002

PROGTRANS AG & RAPP TRANS AG: Alpenquerender Verkehr 2020. Entwicklung und Beurteilung des alpenquerenden Verkehrs mit Fokus auf die Gotthard-Achse. Basel, 2004

RAPP TRANS: Technische Möglichkeiten für die Verkehrslenkung. Referat am 13.05.07 von Dr. Matthias Rapp am Cargo Forum Schweiz in Bürgenstock, 2003

RAT DER EUROPÄISCHEN UNION: Die erneuerte EU-Strategie für nachhaltige Entwicklung. Brüssel, 2006

RUDEL, R.: Schweizer Politik zur Verkehrsverlagerung am Gotthard. Ein Zwischenbericht. In: MONITRAF (Hrsg.): Verkehr durch die Alpen: Entwicklungen, Auswirkungen, Perspektiven. S. 49-55. Haupt-Verlag, Bern/Stuttgart/Wien, 2007

RUDEL, R.; ABEL, H.; MAGGI, R. & STOPPA, R.: Bewertung von Qualitätsmerkmalen im Güterverkehr. Stated-Preference Analyse im Schweizer Güterverkehrsmarkt. Bundesamt für Straßen (ASTRA). Bern, 2006

SCHMUTZHARD, L.: Brenner/Brennero: Does the expansion of infrastructures replace transport policy? Vortrag am 01.12.2005 auf der Konferenz “Transport across the Alps – MONITRAF” in Luzern, 2005

🏆 *reviewed paper*

Gebäudebasierte, vollautomatische Erhebung und Analyse der Siedlungsstruktur – Grundlage für Monitoring und Bewertung der Siedlungsentwicklung

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1 PROBLEM

Viele überörtliche Raum- und Fachplanungen benötigen sehr kleinteilige Informationen zu Bestands-, Nutzungs-, Belegungs- und Ausstattungskennzahlen von Siedlungsflächen. Diese Informationen werden insbesondere für die Planung der Daseinsvorsorge unter Schrumpfungsbedingungen im Kontext notwendiger ressourcenschonender Siedlungsstrukturen immer wichtiger. Kleinteilige, flächendeckend und bis auf Gebäude herabreichende Daten sind in Deutschland nur in Form der Automatisierten Liegenschaftskarte ALK verfügbar (wird derzeit durch Integration des Automatisierten Liegenschaftsbuches ALB in ALKIS und später zusammen mit dem Amtlichen Festpunktinformationssystem AFIS in das AAA-Modell überführt, GeoInfoDok 2006). Die ALK wird auf Grund ihres großen Maßstabes (1 : 1 000), der aus rechtlichen Gründen eingeschränkten allgemeinen Datennutzbarkeit und der sehr hohen Datenkosten derzeit nicht in der mittelmaßstäbigen Planung verwendet.

Die Planung der Daseinsvorsorge benötigt neben der Siedlungsstruktur auch demographische, sozioökonomische, Wirtschafts- und Umweltdaten der Statistik. In Deutschland ist die kleinste flächendeckend erhobene statistische Gebietseinheit die Gemeinde. Kleinteiligere intrakommunale Daten sind nur für ca. 100 große Städte in Deutschland verfügbar (WWW.KOSTAT.DE). Hier ist die kleinste Einheit der statistische Block, der im Mittel immer noch 176 ha mit ca. 3 000 Einwohnern umfasst. Auch diese Raumgliederung ist für viele Fragen der Siedlungsstruktur und ihrer Entwicklung ungenügend räumlich auflösend. Über eine Regionalstatistik, z. B. auf Basis geographischer Rastereinheiten, wie sie in Dänemark, Finnland, der Schweiz und Österreich schon seit einiger Zeit verfügbar ist, wird in Deutschland zwar nachgedacht (SZIBALSKI 2006, ESCHWEGE 2006), sie wird aber erst nach der geplanten Volkszählung 2010/11 nicht vor 2013 verfügbar sein.

Welche räumliche Präzisierung der siedlungsstrukturellen Kennzahlen – angefangen von der Betrachtung der administrativen Gebietseinheiten (meist Gemeinde) hin zur Untersuchung einzelner Gebäudeflächen mit ihren unterschiedlichen gebäudetypabhängigen Einwohnerdichten – erreicht werden kann, wird durch folgende Zahlen deutlich: Die Bevölkerungsdichte in Deutschland beträgt 231 Einwohner/km², wobei die Stadt München mit 4 017 Einwohnern/km² die höchste und die Gemeinde Wiedenborstel mit 1 Einwohner/km² die niedrigste Siedlungsdichte aufweist (Stand 2006). Die Stadt Dresden hat eine Bevölkerungsdichte von 1 537 Einwohner/km². Auf Ebene der statistischen Bezirke Dresdens werden Dichten von 0 bis zu 45 705 Einwohnern/km² (Gorbitz-Süd) und auf Baublockebene sogar bis zu 92 985 Einwohner/km² erreicht (Stand 2006). Innerhalb der Wohngebäudefläche wiederum ist die Wohndichte extrem unterschiedlich. So variiert die Gebäudefläche pro Einwohner je nach Gebäudetyp zwischen 36 m² für Einfamilienhäuser bis hin zu 1,3 m² für vollbelegte 15-geschossige Hochhäuser. Diese enorme Spreizung der Dichtewerte spricht für eine möglichst kleinteilige Betrachtung der Siedlungstruktur auf Gebäudeebene.

Kleinteilige Informationen zur Siedlungsstruktur können prinzipiell aus Fernerkundungs- oder kartographischen Datengrundlagen gewonnen werden. Dabei ist die Bestimmung der Bebauungsdichte allein aus Fernerkundungsdaten ein etabliertes Verfahren. So werden z. B. in dem auf Grundlage von Satellitendaten abgeleiteten Datensatz LaND25 (WWW.INFOTERRA-GLOBAL.COM) städtische Bebauungsdichten in drei Klassen in einer Rasterauflösung von 25 m differenziert. In einem weiteren Schritt können Statistikdaten, wie z. B. Einwohnerzahlen, mit den abgeleiteten Bebauungsdichten verknüpft und kleinräumige Einwohnerverteilungen berechnet werden (z. B. STEINNOCHER et al. 2005). Diese Herangehensweise wird als räumliche Disaggregation bezeichnet.

Der hier beschriebene Ansatz geht aber nicht von Fernerkundungsdaten, sondern von digitalen topographischen Rasterkarten aus, welche auch Gebäude in flächenhafter Darstellung beinhalten. Auf Basis einer automatischen Gebäudeerkennung, -vermessung und -klassifikation wird eine Fülle siedlungsstruktureller Kennzahlen mit Planungsrelevanz auf Baublockebene abgeleitet. Einige statistische Kennzahlen, wie die auf Gemeinde oder statistischen Block bezogene Einwohner- und Wohnungszahl,

lassen sich damit auf Basis der siedlungsstrukturellen Kennzahlen bis auf Baublockebene räumlich disaggregieren.

2 DATENGRUNDLAGEN FÜR DIE SIEDLUNGSSTRUKTURELLE INFORMATIONS-GEWINNUNG

Die Datengrundlagen eines Verfahrens zur Generierung kleinteiliger Siedlungskennzahlen müssen einer Reihe von Anforderungen genügen. Da die Gebäude mit ihrer flächenhaften Ausdehnung und speziellen Nutzung Träger der Elementarinformationen der Siedlungsstruktur sind, müssen die Daten alle wesentlichen Einzelbaukörper abbilden, wobei kleinere Generalisierungen, wie Gebäudeformvereinfachungen oder Gebäudevereinigungen, hinnehmbar sind. Weiterhin sollten die grundlegenden Daten in ihrer Fortschreibung gesichert sein - am wirkungsvollsten in Form eines gesetzlichen Fortführungsauftrags. Auch müssen die Daten deutschlandweit möglichst in homogenisierter Form (Vergleichbarkeit) verfügbar sein und zentral vorgehalten werden (Beschaffungsaufwand). Letztlich sollten die Grundlagendaten auch digital und zu entsprechend geringem Preis angeboten werden.

Insbesondere durch die Datenfortschreibungsgarantie, die auch aktuelle Daten in der Zukunft gewährt, schränkt sich die Datenauswahl auf die Geobasisdaten der staatlichen Vermessungsämter ein. So wurden die in Deutschland durch das Bundesamt für Kartographie und Geodäsie (BKG) angebotenen digitalen Geobasisdaten hinsichtlich der formulierten Anforderungen geprüft. An dieser Stelle sei gleich vermerkt, das die alleinige Verwendung des ATKIS Basis-DLM nicht ausreicht. Zwar ist im Objektartenkatalog die Objektart „Gebäude“ (2135) definiert, allerdings ist die Erfassung erst in der Realisierungsstufe 3 geplant. Auch muss die Gebäudeerfassung nicht zwingend flächenhaft, sondern kann auch punktförmig erfolgen. So liegen Gebäudeerfassungen im ATKIS Basis DLM (Stand 12/2006) derzeit nur für die Länder Sachsen-Anhalt und Mecklenburg-Vorpommern vollständig und flächenhaft, in Rheinland-Phalz und Schleswig-Holstein nur punktuell sowie für die anderen Bundesländer überhaupt nicht vor. Eine telefonische Umfrage bei den zuständigen Landesvermessungsämtern ergab, dass sich diese Situation nicht schnell ändern wird. Die Gebäudeintegration stöße auf technische Probleme (Lagegenauigkeit) und wird auch aus strategischen Gründen nicht forciert, tangiert diese Entwicklung doch in starkem Maße auch den Vertrieb anderer Geodatenprodukte (z. B. Digitale Stadtkarten, ALK).

2.1 Gebäudedaten aus der DTK25-V

Für die Extraktion der Einzelgebäude wird z. Z. auf die Digitale Topographische Karte 1 : 25 000 (DTK25-V) zurückgegriffen, die Grundlage für den Druck der TK25 ist. Während die DTK200, DTK100 und DTK50 die Gebäude zu stark generalisieren, werden in der DTK25 und der DTK10 die Gebäude vollständig wiedergegeben. Auch wenn die Gebäudedarstellung in der DTK10 noch genauer und vollständiger erfolgt, wurde für die Verfahrensentwicklung die DTK25 ausgewählt. Die Gebäude sind hier bei wesentlich kleinerem Datenumfang (1/4 der DTK10) und einfacherer Darstellung für eine automatische Gebäudeextraktion (Vollton der Gebäudegrundfläche statt Gebäudeumriß) leichter und schneller zu extrahieren. Auch werden die DTK25-Daten am BKG homogenisiert und zentral durch das BKG vertrieben, was bei der DTK10 nicht der Fall ist.

Der Gebäudebestand wird in der DTK25-V bis auf sehr wenige Ausnahmen vollständig dargestellt. Teilweise generalisierte Gebäude (Mindestgröße, Vereinfachungen von Gebäudegrundrissen, Einbeziehung von Neben- in Hauptgebäude bei geringem Abstand) und geringfügige Lageverschiebung (Verdrängung durch verbreiterte Kennzeichnung des Straßennetzes) sind keine Einschränkung der Dateneignung. Derzeit sind 65 % der ca. 3 000 DTK25-V-Blätter in Deutschland jünger als 5 Jahre. Durch den abgeschlossenen Technologiewechsel in der Kartenerstellung ist aber in Zukunft eine höhere Aktualität der Karten zu erwarten.

Derzeit muss meistens noch auf die vorläufige Version DTK25-V der Topographischen Karte zurückgegriffen werden, da die Version DTK25, die vollständig aus dem vektorbasierten ATKIS Basis-DLM abgeleitet wird, erst ca. 2011 flächendeckend für die Bundesrepublik zur Verfügung stehen wird. Die DTK25-V wird durch Scannen der Einzellayer (gegliedert nach Kartenfarben) der analogen Originale mit 200 Linien/cm (508 dpi) in ein digitales Rasterformat gebracht.

Der schwarze Grundriss-Layer (auch Siedlungslayer genannt) der DTK25-V enthält neben der Gebäudedarstellung die Kartenschrift und andere punkt-, linien- und flächenhafte Signaturen, wie z. B.

Grenzen, Straßen, Vegetationssignaturen oder Stromleitungen. Diese Elemente sind in einem binären Rasterlayer untrennbar verschmolzen. Hier besteht die Herausforderung in der sicheren Selektion der Gebäude.

2.2 Baublockabgrenzung und -nutzung aus dem ATKIS Basis-DLM

Neben der Gebäudedarstellung ist auch eine räumliche Abgrenzung der Baublöcke notwendig. So können die auf Gebäudebasis berechneten Kennwerte auf die nächste höhere räumliche Ebene aggregiert werden. Als Baublock wird gemeinhin eine durch ein Straßengeviert abgetrennter Siedlungsteil bezeichnet. Dieses geht konform mit der Digitalisierungsvorschrift für die Objektgruppe „baulich geprägte Fläche“ (2100) von ATKIS. Neben den Baublockgrenzen weist ATKIS auch die Hauptnutzung im Block aus. Das Basis-DLM unterscheidet in der Objektgruppe „Baulich geprägte Fläche“ (2100) die Nutzungsarten „Wohnbaufläche“ (2111), „Industrie- und Gewerbefläche“ (2112), „Fläche gemischter Nutzung“ (2113) sowie „Fläche besonderer funktionaler Prägung“ (2114).

3 GEBÄUDESELEKTION AUS DER DTK25-V

Kern des Verfahrens ist die Gebäudeextraktion aus der rasterbasierten digitalen Topographischen Karte 1 : 25 000. In dem Layer Siedlung sind die Gebäude, zusammen mit Verkehrs- und Grenzlinien, Vegetations- und weiteren Signaturen, in einem Binärlayer gespeichert. Die Gebäude werden nun durch digitale Bildverarbeitung in einem mehrstufigen Prozess vollautomatisch selektiert. Es erfolgt anschließend eine Abtrennung der Verkehrs- und Grenzlinien durch morphologische Operationen (Opening). Die nachfolgende Schriftentfernung kann nicht durch Schrifterkennungssoftware (OCR) erfolgen, da Schriftart, -schnitt und -größe der einzelnen Kartenzeichen zu unterschiedlich sind und die kurzen Ortsnamen und Abkürzungen keine geschlossenen Texte darstellen. Darum wurde eine spezielle Objekterkennung für Schriften und Signaturen entwickelt, die mit Bildpyramiden (gestaffelte Bildauflösung) arbeitet.

Die Schriftzeichenentfernung basiert auf einer automatischen Parameteranalyse aller Objekte des segmentierten Binärbildes bezüglich ihrer morphologischen Eigenschaften, wie z. B. ihrer Kompaktheit, Konvexität, Anisometrie und Orientierung. Für die Analyse der Signaturobjekte werden spezielle Strukturelementparameter verwendet, da viele Signaturen im Ergebnislayer nur noch fragmentarisch enthalten sind und keine Unterscheidung mehr ermöglichen. Abschließend werden noch vorhandene Signaturen, wie Kirchen, Türme, Bergwerke, Umspannwerke usw., extrahiert und vom Originalbild subtrahiert. Problematisch bei der Festlegung der Bildverarbeitungsparameter sind unter anderem die unterschiedliche Qualität und Eigenheiten der DTK25-V der einzelnen Bundesländer. Die wenigen Gebäude, die durch kartographisch bedingte Schriftfreistellung in der DTK nicht oder nur teilkartiert sind, können zwangsläufig nicht rekonstruiert werden. Da die angewandten fortgeschrittenen Bildverarbeitungsoperationen nicht in GIS- (z. B. ArcGIS) bzw. fernerkundlicher Bildverarbeitungssoftware (z. B. Erdas-Imagine) implementiert sind, wurde auf die Bildanalysesoftware HALCON (WWW.MVTEC.COM) zurückgegriffen.

4 GEBÄUDEKLASSIFIKATION

Die Gebäude liegen nach der Extraktion als unklassifizierte Polygone vor. Ziel ist es nun im zweiten Verarbeitungsschritt, den gesamten Gebäudebestand definierten Gebäudetypen zuzuordnen. Tabelle 1 zeigt die gewählte hierarchisch aufgebaute zweistufige Gebäudetypologie. Auf Hauptebene (Level 1) werden drei Klassen von Wohngebäuden und eine Klasse von Nichtwohngebäuden entsprechend ihrer baustrukturellen Merkmale grob unterschieden: Blockstrukturen und offene Strukturen im Mehrfamilienhausbestand, kleinteiligere Strukturen im Ein- und Zweifamilienhausbestand sowie unregelmäßige Strukturen der Nichtwohnnutzung. Auf Level 2 wird weiter differenziert unter Beachtung der Baukörpergröße der einzelnen Gebäudekomplexe.

Als Grundlage einer anschließenden automatischen regelbasierten Klassifikation wird der gesamte Gebäudebestand in der Form, Lage und Orientierung (z. B. Gebäudefläche, -umfang, Kompaktheit, Abstand

Level 1	Level 2 (Kurzbezeichnung)
MFH in (geschlossener) Blockstruktur	Mehrfamilienhaus traditionell in geschlossener Bauweise (MFH-G)
	Mehrfamilienhaus (traditionell o. neu) freistehend (MFH-F)
MFH in offener	Mehrfamilienhaus traditionell in Zeile (MFH-TZ)

Blockstruktur	Mehrfamilienhaus industriell in Zeile (MFH-IZ)
	Hochhaus >50m (MFH-HH)
Ein-, Zweifamilien- und Reihenhäuser	Ein- und Zweifamilienhaus (EZFH)
	Reihenhaus (RH)
	Dörflich Traditionelles Haus (DH)
Nichtwohnnutzung	Industrie/Gewerbe (IG)
	Besondere funktionale Prägung (BFP) wie Verwaltung, Gesundheit/Soziales, Bildung/Forschung, Kultur usw.

Tabelle 1: Gewählte Gebäudetypologie

zum Nachbargebäude, Abstand zur Blockgrenze, etc.) vermessen und in Form von Attributwerten mit den Gebäudegeometrien verknüpft.

Für die automatische Klassifikation wurde ein regelbasiertes Entscheidungsnetzwerk aufgebaut. Es zeigte die höchste Effizienz in der Datenverarbeitung bei höchster Flexibilität in der Modifikation der Regelbasis gegenüber anderen geprüften Klassifikationsstrategien (multinomiale logistische Regression, Kompromissoptimierung mit Fuzzy Methoden). Ein weiterer Vorteil der regelbasierten Klassifikation ist, dass mit wenigen Regeln in kurzer Zeit ein akzeptables Ergebnis geliefert werden kann. Die Elemente eines regelbasierten Systems sind die aus einem Bedingungsteil (Prämisse) und einem Aktionsteil (Konklusion) bestehenden Regeln. Die Gebäude mit ihren charakteristischen Parameterwerten werden mittels Wenn-Dann-Regeln in Verbindung mit statistisch erhobenen Schwellwerten klassifiziert. Ein Beispiel für eine einfache Regel zur Klassifikation von Einfamilienhäusern, wäre z. B. die Selektion aller Gebäude, welche eine Grundfläche von 200 m² unterschreiten.

Der Prozess der Gebäudeklassifikation wurde in zwei Phasen realisiert. In der ersten Phase erfolgt eine Klassifikation der Einzelgebäude nach ihrer Form (z. B. kleines, zeilenförmiges, sehr breites oder komplexes Gebäude). Auf dieser Ebene werden keine nachbarschafts- oder blockbezogenen Kennwerte verwendet, sondern allein auf Basis der gebäudebezogenen Parameterwerte auf die grundsätzliche Gebäudeform geschlossen. Diese lässt allerdings noch keine eindeutige Zuordnung der Gebäude in die definierte Zielklasse (Tab. 1) zu. Erst in der zweiten Klassifikationsphase können durch die Verwendung von Nachbarschaftsbeziehungen, blockbezogener Kennwerte, die ATKIS-Objektart und den berechneten Flächenanteilen einzelner Klassen aus Phase 1 Rückschlüsse auf den Gebäudetyp gemacht werden. Im Entscheidungsnetzwerk werden insgesamt 61 Indikatoren verwendet, welche sich aus 17 gebäude- und 46 blockbezogenen Indikatoren zusammensetzen. Die Optimierung der vorab statistisch ermittelten Schwellwerte für die Regelbasis erfolgte durch einen Abgleich mit Hilfe von Ortholuftbildern und einem Referenzdatensatz.

a b c

Abbildung 1: a) Grundrisslayer der DTK25-V, b) Ergebnis der Gebäudeselektion, c) Ergebnis der Gebäudeklassifikation am Beispiel Dresden-Gruna (Legende: s. Abb. 5)

Abbildung 1 zeigt an einem Ausschnitt die Ergebnisse der Gebäudeselektion und -klassifikation für ein Dresdner Untersuchungsgebiet. Die Gebäude der Nichtwohnnutzung (Industrie/Gewerbe sowie Gebäude besonderer funktionaler Prägung) ergeben sich aus der Objektart 2112 sowie 2114, während die Wohngebäude innerhalb der ATKIS-Objektarten 2111 und 2113 in 7 Gebäudetypen klassifiziert werden.

5 BERECHNUNG VON SIEDLUNGSKENNWERTEN

5.1 Abgeleitete Siedlungskennwerte

Der typisierte Gebäudebestand bildet die Grundlage für die Ableitung siedlungsstruktureller Grundlagendaten. Folgende blockbezogene planungsrelevante Kennwerte werden vollautomatisch berechnet:

5.1.1 Baublocktyp

Der Baublocktyp (7 Wohnnutzungs- und 2 Nichtwohnnutzungstypen) wird über die Gebäudezusammensetzung im Block bestimmt. Die Entscheidung für einen Strukturtyp wird über ein Regelwerk mittels berechneter Flächendominanzen der Gebäudetypen getroffen, da es auch bei manuellen Luftbildinterpretationen Entscheidungskriterium ist. Abbildung 2 zeigt das Prinzip der automatisierten Baublocktypisierung.

a b c

Abbildung 2: a) Klassifizierte Gebäude, b) Klassifizierte Baublöcke, c) Orthophoto

Beispiel Dresden-Gruna (Legende: s. Abb. 5)

Die für jeden Block berechneten Flächen- und Fallzahlanteile der im Block befindlichen Gebäudetypen liefern noch differenziertere Aussagen über die Gebäudezusammensetzung, so dass Planungsprozesse durch den Einsatz dieser hochaufgelösten Strukturdaten noch bessere Grundlagen haben. Für die Untersuchungsstädte Dresden und Bonn konnte eine Klassifikationsgüte der Baublöcke von 76 % erreicht werden. Während die geschlossene Bebauung (94 %), die EZFH-Bebauung (91 %) sowie die Hochhausbebauung (80 %) eine sehr hohe Klassifikationsgüte aufweisen, kommt es gerade bei physiognomisch ähnlichen Strukturen zur Überlagerung der Klassen Reihen- und Zeilenbebauung, sodass bei diesen Typen nur eine geringe Klassifikationsgüte erreicht wird. Hierzu sind noch weitere Untersuchungen erforderlich, um die Ergebnisse zu verbessern.

5.1.2 Anzahl der Gebäude/Gebäudedichte

Die Anzahl der Gebäude im Block kann durch berechnete Flächenschwerpunkte eindeutig bestimmt werden. Die Gebäudedichte (Gebäudeanzahl pro ha Blockfläche) liefert quantitative Aussagen zur Gebäudedichte. Allerdings werden „zusammenhängende“ Gebäude wie Reihenhäuser, Zeilenbauten, geschlossene Bebauung nur durch einen Schwerpunkt repräsentiert. Durch Berücksichtigung der individuellen Gesamtgebäudelänge in Verknüpfung mit gebäudetypischen Einzelgebäudelängen könnte auch für diese Gebäudetypen auf die Einzelgebäudezahl geschlossen werden.

5.1.3 Gebäudegrundfläche/Gebäudegrundflächendichte

Die Gebäudegrundfläche (m²) ist durch die Summe aller Gebäudegrundflächen im Block bestimmt. Im Bezug zur Blockfläche, die den Anteil der Gebäudegrundfläche an der Blockfläche beschreibt, spricht man von der Gebäudegrundflächendichte (m²/m²), welche vergleichbar mit der Grundflächenzahl (GRZ) ist (dort aber der Bezug zur Flurstücksgröße). Dieser Parameter hat sich in der Stadt- und Umweltplanung als ein wichtiger Schlüsselindikator etabliert. Durch Anwendung pauschaler blocktypenspezifischer Zuschläge für versiegelte Flächen wie Verkehrs- und Hofflächen kann in erster Näherung eine Abschätzung des Versiegelungsgrades erfolgen.

5.1.4 Mittlere Geschosszahl

Die mittlere Geschossanzahl gibt den gewichteten Mittelwert der Anzahl der Geschosse aller Gebäude im Block unter Berücksichtigung der Gebäudetypflächenanteile an. Es wird dabei eine gebäudebezogene Geschossanzahl implizit über den Gebäudetyp angenommen. Die gebäudetypischen Geschosszahlen und –höhen wurden durch statistische Auswertungen gewonnen. Durch Ersatz der derzeit verwendeten bundesweiten Referenzwerte durch regional erhobene Kennzahlen können die Ergebnisse weiter verbessert werden.

5.1.5 Geschossfläche/Geschossflächendichte

Die blockbezogene (Brutto-)Geschossfläche ist die Summe aller Gebäudegrundflächen multipliziert mit der mittleren Geschosszahl in m². Zur Berechnung der Geschossfläche wird eine gebäudebezogene Geschossanzahl implizit über den Gebäudetyp angenommen. So ist für ein Ein- bzw. Zweifamilienhaus die durchschnittliche Geschosszahl ca. 1,2, während das Mehrfamilienhaus eine mittlere Geschossigkeit von 3,5 besitzt. Die Geschossflächedichte (m²/m²) beschreibt den Anteil der Geschossfläche an der Blockfläche und ist vergleichbar mit der Geschossflächenzahl GFZ. Abbildung 3 zeigt ein Ergebnis der abgeleiteten blockbezogenen Geschossflächendichte für Dresden-Gorbitz. Des Weiteren kann auf Grundlage der Geschossflächendichte in Verbindung mit einer errechneten Wohnungszahl (s. 5.1.7) eine Abschätzung der Wohnungsgröße erfolgen.

Abbildung 3: Karte der Geschossflächendichte für Dresden-Gorbitz

5.1.6 Gebäudevolumen/Gebäudevolumendichte

Das Gebäudevolumen (m³) wird durch die Summe aller Einzelgebäudevolumen im Block bestimmt. Das Gebäudevolumen wird aus der Gebäudegrundfläche und regional differenzierten gebäudetypabhängigen Geschosszahlen und -höhen errechnet. Gerade für Stoffstrommodellierungen können Gebäudevolumen von Interesse sein. Die Gebäudevolumendichte (m³/m²) beschreibt das Verhältnis vom Gebäudevolumen zur Blockfläche und ist ein Indikator zu Quantifizierung von Bebauungsdichten.

5.1.7 Wohnungszahl/Wohnungsdichte

Für das Untersuchungsgebiet Dresden und Bonn lagen durch visuelle Interpretation typisierte Gebäude (insgesamt 13 120 bzw. 25 176) sowie blockbezogene Einwohner- und Wohnungsdaten aus der Intrakommunalstatistik vor. Für die Ermittlung typischer Dichtereferenzwerte wurden nun die Baublöcke ausgewählt, die einen weitestgehend homogenen Gebäudetypbestand haben. Dabei wird ein Bezug zwischen der Wohnungszahl zu der Gebäudegrundflächensumme im Block für jeden Gebäudetyp hergestellt, so dass man aus mehreren Messungen sichere gebäudetypenabhängige Dichtekennwerte erhält. Der so errechnete gebäudespezifische Referenzwert Wohnungsgrundflächendichte WGD (Wohnungen/m²), wird im Berechnungsprozess mit den typisierten Gebäuden verknüpft. Aus dem Gebäudetyp und der -fläche kann durch diese Verknüpfung die Wohnungszahl aller Gebäude geschätzt werden. Nach Summierung aller

Wohnungen im Block erhält man die blockbezogene Wohnungszahl bzw. Wohnungsdichte (1/ha). Diese Schätzwerte werden anschließend bis auf die nächstbekannte Gebietseinheit mit verfügbaren statistischen Kennziffern (in der Regel die Gemeinde oder wenn verfügbar auch Teile davon) aggregiert, mit den statistischen Wohnungsdaten verglichen und korrigiert wieder auf die Gebäude bzw. Blöcke verteilt. Die Abweichung der Erstschätzung (ohne Abgleich) im Vergleich zur Referenz betrug für das Untersuchungsgebiet Dresden für die Wohnungen +1,1 %.

5.1.8 Einwohnerzahl/Einwohnerdichte

Ähnlich der Wohnungsschätzung, können ausgehend von einer ermittelten Einwohnergrundflächendichte EGD (Einwohner/m²) die gebäude- und anschließend die blockbezogene Einwohnerzahl geschätzt und über die nächstbekannte statistische Einheit korrigiert werden. Lokale Wohnungsleerstände sind allerdings nur sehr schwer oder mit hochgenauen regionalisierten Parameteranpassungen modellierbar.

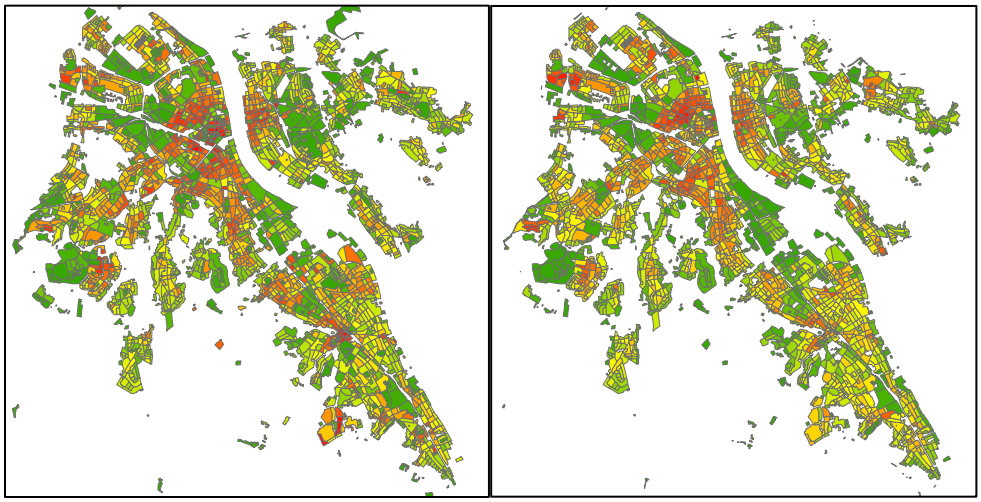

Abbildung 4: Einwohnerdichte der Stadt Bonn: a) Vorhersage (mit Abgleich): 157 499 EW b) Referenz: 157 581 EW

Abbildung 4 zeigt das Ergebnis der Einwohnerdichte für Bonn. Die Abweichung der Erstschätzung (ohne Abgleich) im Vergleich zur Referenz betrug für die Einwohner +10,4 %.

5.2 Implementierung

Die beschriebenen Vorverarbeitungs-, Bildverarbeitungs- (Gebäudeextraktion), Objektvermessungs- (Kennwertberechnung) und Klassifizierungsprozesse sowie die Ableitung der siedlungsstrukturellen Parameter wurden mit Hilfe einer entwickelten Programmerweiterung in einem GIS vollständig automatisiert. Um die Bedienung und Steuerung der verschiedenen Module soweit wie möglich zu vereinfachen, wurde eine intuitiv gestaltete Benutzeroberfläche in Form einer Werkzeugsammlung (Toolbar) für ArcMap (ESRI) geschaffen. Die Realisierung erfolgte in der Programmiersprache C# als Dynamic-Link Library (DLL). Die Programmgrundlagen sowie das Programm selbst wurde zum Patent angemeldet und auf den Namen SEMENTA (SettlementAnalyzer) getauft.

In dem Menü-gesteuerten Programm können die Eingangsdaten (DTK25, Objektarten 2111-2114 des ATKIS-Basis-DLM, Statistikdaten für den Abgleich) ausgewählt, Programmeinstellungen vorgenommen und die Programmparameter Einwohnergrundflächendichte EGD (1/m²), Wohnungsgrundflächendichte WGD (1/m²) sowie die mittlere Geschosszahlen und –höhen (m) der definierten Gebäudetypen modifiziert werden.

Am Ende der aufwendigen Prozessierung wird neben den Ergebnis-Shape-Dateien eine EXCEL-kompatible Statistikdatei erzeugt und automatisch ein ArcMap-Projekt geöffnet, welche die wichtigsten Ergebnis-Layer mit vordefinierten Legenden visualisiert (vgl. Abbildung 2, 3, 4). Auch kann eine schnelle dreidimensionale Darstellung der Gebäude- und Blockklassifikation durch Verknüpfung der Ergebnisse mit einem ArcScene-Projekt realisiert werden. Abbildung 5 zeigt beispielhaft ein Ergebnis - die klassifizierten Gebäude, sowie die daraus abgeleiteten Baublocktypen.

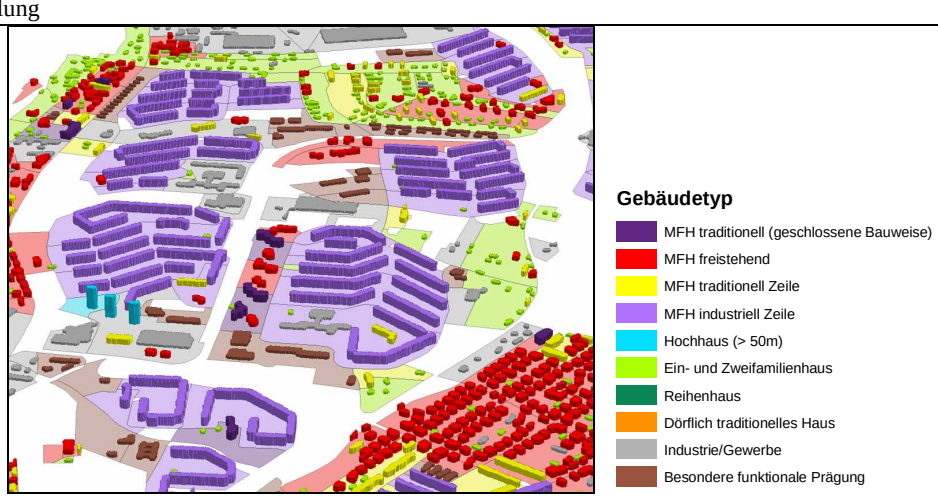

Abbildung 5: Ergebnis der automatischen Gebäude- und Blockklassifikation für Dresden-Gorbitz

6 ANWENDUNG

Das in seinen Grundzügen entwickelte Verfahren ist für verschiedenste Anwendungen insbesondere im mittelmaßstäbigen Planungsumfeld interessant. Es kann zu einem wichtigen Hilfsmittel in der überörtlichen Verkehrsplanungspraxis (Bundesverkehrswegeplan), der Raum- und Stadtplanungspraxis sowie der Raumbeobachtung werden. Somit sind eine Fülle an Anwendungen sowohl des entwickelten Verfahrens zur automatischen Generierung siedlungsstruktureller Grundlagendaten als auch der Verfahrensergebnisse denkbar. Einige davon seien im Folgenden kurz angedeutet.

- Verkehrstrassenplanung: Mit vergleichsweise sehr geringem Aufwand ist eine siedlungsstrukturelle Anaylse für größere Planungsprojekte bzw. Trassen möglich. Durch die Ergebnisse der vorliegenden Arbeit kann nun auch das Maß der baulichen Nutzung automatisiert und in hoher Genauigkeit abgeleitet werden. Damit wird eine wesentliche Effizienzsteigerung erreicht und die bisher nur pauschalisierten Annahmen von Kennwerten könnte durch reale Messwerte ersetzt werden. Auch morphologische Kennwerte, wie die Gliederung einer Stadt in Dichtezonen, könnten auf Grundlage des Verfahrens in Zukunft standardisiert und automatisiert erhoben werden. Diese betrifft sowohl funktional-strukturelle Kennzahlen, wie die Bauweise, Art und Maß der Nutzung, Bebauungsabstand, Abstand Hausfront-Straßenachse, Zahl Betroffener, als auch morphologische Kennzahlen, wie Gemeinde-, Dorf- und Lagetypisierungen. Das Verfahren würde die Berechnung weiterer Kennzahlen ermöglichen: minimaler und mittlerer Gebäudeabstand zur Straßenachse, Straßenschluchtbreitenverhältnis (für Lärm- und Immissionsrechnungen), Lückenanteil (Anteil unbebaute Bauflucht/Straßenabschnittlänge) und die Einwohnerzahl in der ersten Gebäudereihe (wichtig für Verkehrslärmberechungen).
- Grundlage für die Erstellung von Lärmkarten: Bis 30.06.2007 sind nach der EU-Umwelt-Richtlinie (2002/49/EG) für alle Städte mit mehr als 250 000 Einwohnern Lärmkarten zu erstellen. Dabei sind u. a. für Hauptstraßen mit mehr als 6 Millionen Kfz/Jahr bzw. 60 000 Zügen/Jahr sowie für große Industrie- und Gewerbegebiete kleinteilige Lärmkarten einschließlich einer Abschätzung der lärmbetroffenen Einwohnerzahlen zu erstellen. Daraus sollen dann strategische Lärmkarten und Lärmaktionspläne abgeleitet werden. Diese Arbeiten erfordern die Abschätzung der Zahl betroffener Personen, was auf Grundlage der generierten siedlungsstrukturellen Daten durch Pufferzonenbildung um die relevanten Verkehrstrassen leicht möglich ist.
- Gefährdungskataster/Gefahrenkarten: Gefahrenkarten für das Risiko- und Katastrophenmanagement sowie zur Information der Bürger gewinnen stark an Bedeutung. Deren Erstellung ist teilweise schon verpflichtendes Länder- bzw. Bundesgesetz. So müssen z. B. nach Sächsischem Wassergesetz (SächsWG) hochwassergefährdete Bereiche ausgewiesen werden. Eine EU-Hochwasserrichtlinie ist in Vorbereitung. Neben Hochwassergefahrenkarten etablieren sich zunehmend auch Karten der Strahlungsdichte in der Nähe von Funkanlagen. Derartige Gefahrenkarten weisen flächig die Gefahrenzonen aus. Durch Verschneidung der betroffenen Gefahrenflächen mit den

Programmergebnissen von SEMENTA lassen sich weiterführende Informationen für die Katastrophenplanung und die Gefahrenabwehr ableiten.

- Infrastrukturplanung: Die Daseinsvorsorge unter Schrumpfungsbedingungen verlangt in Zukunft eine sehr viel genauere und nachhaltigere Planung des Mitteleinsatzes für Erhaltung, Ausbau oder Rückbau der Infrastruktur. Dazu gehört alle Aufwendungen für die technische Infrastruktur mit den Teilbereichen Telekommunikation, Gas, Wasser, Strom und Abfall als auch die für die soziale Infrastruktur (Bildung, Gesundheit, Erholung, Einkauf). Für konkrete Planungen sind kleinteilige Informationen zur Einwohner-, Wohnungs- und Gebäudedichte unerlässlich. Die durch das Verfahren generierten kleinteiligen siedlungsstrukturellen Kennzahlen können eingesetzt werden in der Grundversorgungsplanung, der Schulnetzplanung oder der Kalkulation der Einzugsbereiche von Gesundheitseinrichtungen und Apotheken. Aber auch die ÖPNV-Planung kann das Verfahren zur Optimierung des Haltestellennetzes einsetzen. Kleinteilige Dichtekarten von Wohngebäuden, Wohnungen und Einwohnern sind aber auch für die Erarbeitung von Energiekonzepten zunehmend interessant.
- Landes- und Regional- und Stadtplanung: Hier ist der Verfahrenseinsatz besonders interessant, kann doch sehr einfach und schnell auch für sehr große Gebiete sehr kleinräumige planungsrelevante Grundlagendaten generiert werden. Auf Basis der ermittelten Kennzahlen könnte z. B. auch eine nachvollziehbare, vergleichbare und objektive räumliche Abgrenzung und Typisierung von Siedlungsgebieten erfolgen. Beispielhaft sei hier die räumliche Gliederung von Stadtregionen in städtisches Kerngebiet, Mittellage, Randlage und Außenbereich mit Hilfe von Dichtekennwerte genannt. Auch eine genaue räumliche Abgrenzung und Typisierung dörflicher Baustrukturen nach einer Dorftypologie wäre denkbar.
- Geomarketing: Längst hat die Geoinformatik auch Einzug gehalten in die Optimierung von Wirtschaft- und Verkaufskonzepten. Grundlage sind u. a. sehr kleinräumige Daten zu Einwohnern und Wohnungen verschiedener privater Datenanbieter (z. B. Microm, GFK Macon). Der hohe Preis für derartige Daten sind auch Ausdruck des hohen Erhebungsaufwandes, aber auch der hohen Wertschätzung dieser Daten für die Nutzer. Ein Teil dieser dort angebotenen Daten kann durch das entwickelte Verfahren wesentlich genauer und durch den hohen Automatisierungsgrad der Lösung auch zu wesentlich geringeren Kosten generiert werden.

Mit dem vorgestelltem Verfahren zur Generierung siedlungsstruktureller Kennwerte sind Grundlagen für vielfältige Anwendungen in der Planung eröffnet. Erstmals können durch vollautomatische Vermessung und Typisierung des Gebäudebestandes die Siedlungsstruktur bis auf Baublockebene mittels eines Systems quantitativer Kennzahlen sehr genau beschrieben werden. Dieses verbessert die Informationslage für Planungs- und Entscheidungsprozesse elementar. Bisher notwendige Annahmen und Pauschalisierungen mit geringer räumlicher oder inhaltlicher Schärfe oder aber aufwändige Vororterhebungen, die letztlich immer nur auf kleinen Gebietsflächen möglich sind, können durch das Verfahren ersetzt werden.

7 ZUSAMMENFASSUNG UND AUSBLICK

Infrastrukturplanung unter Schrumpfungsbedingungen benötigt sehr kleinteilige Informationen zur Siedlungsstruktur. Gemeinden bzw. die statistischen Bezirke der großen Städte als derzeit jeweils kleinste statistische Gebietseinheiten sind dafür nicht genügend räumlich auflösend. Da in Deutschland eine rasterbasierte Regionalstatistik noch in weiter Ferne liegt, wird ein Verfahren zur räumlichen Disaggregation durch Verknüpfung von Geobasis- mit Statistikdaten vorgestellt. Nach Selektion der Wohngebäude aus der digitalen Topographischen Karte 1 : 25 000 DTK25(-V) wird eine automatische Typisierung aller Wohngebäude durch Bestimmung geometrischer Kennzahlen vorgenommen. Anschließend erfolgt eine erste Zuordnung der Einwohner- und Wohnungszahl für jedes Gebäude durch Verknüpfung mit gebäudetypischen Referenzwerten, abschließend der Abgleich mit statistischen Kennzahlen der Gebietseinheit. Im Ergebnis stehen block- bzw. rasterbasiert hochauflösende siedlungsstrukturelle Kennzahlen zur Verfügung.

Das entwickelt Verfahren hat große Potenziale, da es allein auf allgemein verfügbaren und in ihrer Fortschreibung gesicherten Daten beruht. Durch die Anwendung von Geobasisdaten, die seitens der Landesvermessungsämter mit sehr hohem Aufwand erstellt und laufend gehalten werden, wird der Wert dieser Daten auch für Planungsprozesse nutzbar gemacht. In Zukunft sollten die einzelnen Fachplanungen

ohnehin einen stärkeren Einfluss auf die Weiterentwicklung der Geobasisdaten nehmen, denn diese sind in ihrer Anlage auf eine Ausdehnung auf relevante Fachdaten vorbereitet und offen. Eine zunehmende Verfügbarkeit von Kartenblättern in der neuen Kartengrafik (direkt aus ATKIS abgeleitete DTK25-Blätter) steigert die Genauigkeit der Ergebnisse bedeutend, sind doch hier die Gebäude noch genauer kartiert (digitale Erstellung in wesentlich größeren Maßstäben) und vor allem in einer separaten Ebene abgelegt, was die aufwändige und nicht völlig fehlerfreie Gebäudeextraktion erübrigt. Natürlich ist auch eine ausschließliche Verwendung des ATKIS Basis-DLM möglich, wenn dieses über den vollständigen Gebäudebestand verfügt. Allerdings ist der Preis für die notwendigen vektorbasierten ATKIS-Daten ca. sechs Mal höher, als für die rasterbasierten DTK25-Daten.

Das Verfahren könnte durch die Prozessierung verschiedener Kartenstände eines Gebietes auch eine quantitative Beschreibung der baulichen Veränderungen bis auf Gebäudeebene ermöglichen. Damit könnte letztlich auch die nationale Nachhaltigkeitsstrategie mit ihren flächenpolitischen Zielen verfahrenstechnisch unterstützt werden. So könnte beispielsweise erstmals die Nutzungseffizienz durch gebäudebezogene Auswertungen im Baubestand bestimmt werden.

Eine Verknüpfung der mittels SEMENTA gebäude- und blockbezogene Kennwerte mit anderen Datenquellen, wie Gebäudeadressen, Leerstandsinformationen, Straßendaten und Gewerbeinformationen, sind mittels GIS leicht realisierbar, überaus sinnvoll und erweitern den Anwendungsbereich des Programmes. Nachdem der Entwicklungsschwerpunkt bisher auf der Wohnbebauung gelegen hat, soll nun auch der Industrie- und Gewerbegebäudebestand mittels SEMENTA differenziert werden. Diese Gebäude sind nicht nur durch ihre Lage in der ATKIS-Objektklasse 2112, sondern auch durch ihre Gebäudegeometrie, insbesondere die häufig große Gebäudebreite (die so im Wohnungsbau durch die Anforderung einer natürlichen Beleuchtung nicht zu finden ist) eindeutig gekennzeichnet und können durch die Gebäudekennzahlen differenziert werden.

In näherer Zukunft soll das Programm auch für die Berechnung der Ökoeffizienz von Siedlungsstrukturen ausgebaut werden. Dazu soll auf Grundlage der berechneten Gebäude- und Blockkennwerte eine Abschätzung der Infrastrukturaufwendungen einschließlich der für die Verkehrsinfrastruktur erfolgen. Durch eine Anpassung des Gebäudeextraktionsteiles von SEMENTA auf älterer bzw. historische topographische Kartenwerke, wäre auch eine Auswertung früherer Siedlungsstruktur und damit eine retrospektive Siedlungsentwicklungsanalyse möglich. Auch eine Programmadaption an die verschiedenen nationalen Geobasisdaten in Europa wäre denkbar und würde eine Nutzung auch außerhalb Deutschlands ermöglichen.

8 LITERATUR

ESCHWEGE, A.V., HEIDRICH-RISKE, H. (2006): Nutzung des Raumbezuges in der amtlichen Statistik, Statistisches Bundesamt, Wirtschaft und Statistik, 2/2006, S. 118-135

GeoInfoDok (2006): Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland (www.adv-online.de)

GIFFINGER, R., KALASEK, R. WONKA, E. (2006): Ein neuer Ansatz zur Abgrenzung von Stadtregionen: methodische Grundlagen und Perspektiven zur Anwendung, In: CORP 2006-Tagungsband; Hrsg. Manfred Schrenk, S. 677-683

MEINEL, G., HEROLD, H., Hecht, R.: Automatische Ableitung siedlungsstruktureller Grundlagendaten auf Basis digitaler Bildverarbeitung, GIS und räumlicher Statistik. In: Strobl, J.; Blaschke, Th.; Griesebner, G. (Hrsg.) : Angewandte Geoinformatik 2006. Beiträge zum 18. AGIT-Symposium Salzburg. Heidelberg : Wichmann, 2006, S.423-429

STEINNOCHER, K., PETRINI, F., TÖTZER, T., WEICHSELBAUM, J. (2005): Räumliche Disaggregation von sozio-ökonomischen Daten: In Angewandte Geographische Informationsverarbeitung XVII- Beiträge zum AGIT-Symposium Salzburg 2005, S. 702-707

SZIBALSKI, M. (2006): Karten in der amtlichen Statistik. In: Statistisches Bundesamt, Wirtschaft und Statistik 3/2006, S. 205-211

WWW.INFOTERRA-GLOBAL.COM (2007): Infoterra Global: LaND25 Land Use/Land Cover Map

WWW.KOSTAT.DE (2007): Arbeitsgemeinschaft Kommunalstatistik KOSTAT

WWW.MVTEC.COM (2007): MVTec Software GmbH - Machine Vision Technologies

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Lifestyle Center – a new approach for designing "better cities"

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1 ERLEBNISWELTEN

Mit dem gesellschaftlichen Wandel zu Beginn der 1980er Jahre in Westdeutschland (Aufbrechen der klassischen Gesellschaftsstrukturen) und den Umbruch von der fordistischen zur postfordistischen Gesellschaft gewann der Freizeitsektor für eine erneute Gesellschaftsdefinition an Bedeutung. Diese neue Definition wurde von Gerhard Schulze unter dem Terminus der Erlebnisgesellschaft zu Beginn der 1990er Jahre beschrieben. Milieusegmentierungen treten an die Stelle der Klassen und Schichten (Schulze, 2005: 169f). Aufgrund des durchschnittlich hohen Lebensstandards[129] tritt anstelle der Existenzsicherung ein erhöhter Erlebnisbedarf. Der Beschaffungscharakter (Bedarfsfunktion) wandelt sich zum Erlebniskonsum als Lebensqualität (Opaschowski, 1998: 10f / Schulze, 2005: 33).

Erlebnisarchitektur ist jedoch keine Neuheit. Sie ist seit über hundert Jahren in Ausstellungen, Erlebnisparks oder Filmpalästen der 1930er Jahren anzutreffen (Beyard, et al., 2001: 4ff). Dieser zunehmende Erlebniskonsum veränderte aber nachhaltig den Einzelhandelsmarkt. Eine Folge war die Entstehung von Urban-Entertainment-Centern, entwickelt aus der amerikanischen Shopping Mall (basierend auf dem Konzept von Victor Gruen), die dem Kunden ein Komplettangebot an Unterhaltung und Einkauf bieten. Sie kombinieren verschiedene monofunktionale Bereiche wie Einzelhandel, Gastronomie und Unterhaltung (trinity of synergy)[130] miteinander (Falk, 1998: 44f) und enthalten somit innenstadtnahe Funktionen (Konkurrenzsituation).

Seit Ende der 1980er Jahre hat sich in den USA ein neuer Typus herausgebildet. Anstelle introvertierter Einkaufszentren treten Lifestyle-Center. Sie bestehen weiterhin aus den Bereichen Einzelhandel[131], Gastronomie und Unterhaltung, unterscheiden sich aber in ihrem typologischen Aufbau. Sie haben keine Ankermieter und basieren auf einem offenen Straßenraum. Aufgrund ihrer höheren Flexibilität, geringeren Kosten in der Unterhaltung der Gemeinschaftsflächen und einer besseren Selbstvermarktung kommen diese Center ohne Anker[132] aus (ICSC, 2003: 20f). Dieses Konzept scheint sich zu bewähren: Eine hohe Kundenbindung und eine gute Annahme der Spezialeinzelhandelsketten haben in den letzten fünf Jahren zu einer starken Expansion der Center geführt.

1.1 Die Bewegung des New Urbanism

Der New Urbanism ist die Bedeutendste der smart growth movements in den USA. Diese werden auch als Anti-Sprawl-Bewegungen bezeichnet und stellen „interdisziplinäre und heterogene Bewegungen verschiedenster Professionen und Interessensgruppen" (Bodenschatz, 2004: 63/72) dar.

Ziel ist eine Eindämmung des Sprawl, welcher sich hauptsächlich in den Wohngebieten außerhalb der amerikanischen Metropolregionen seit den 1960 Jahren entwickelt hat. Es werden alle Aspekte sowohl der Umwelt, Sozialpolitik und Ökonomie, wie auch Stadt- und Regionalplanung (Städtebau, Verkehrs- und Infrastruktur) berücksichtigt. New Urbanism versucht durch städtebauliche Interaktion eine neue soziale Bindungskraft für die postmoderne Gesellschaft zu entwickeln (Kegler, 1998: 335f). Nicht die Separierung von Stadt und Suburbia steht im Vordergrund, sondern beide sollen aufgewerten und revitalisiert werden. Der New Urbanism verkörpert somit eine zivilgesellschaftliche Bewegung zur Belebung der Innenstadt und Suburbia (Bodenschatz, 2004: 80ff). Mischnutzung, Fußgängerfreundlichkeit[133],, Aufwertung des öffentlichen Raumes und gute Quartiersvernetzung sind wichtige Gestaltungselemente dieser Erneuerung des amerikanischen Städtebaus, der auch dem Neotraditionalismus zugeordnet werden kann (Bodenschatz, 1998: 302).

1993 erfolgte die offizielle Gründung des Congress for the New Urbanism (CNU) und 1996 wurde die Charta des New Urbanism verabschiedet. Über jährliche Kongresse und verschiedenste

[129] vgl. hierzu Konsumgesellschaft nach König, 2000
[130] nach International Council of Shopping Centers (ICSC)
[131] Schwerpunkt liegt auf überregionalen Handelsketten mit hohen Bekanntheitsgrad und Kundenbindung
[132] im Gegensatz zu Shopping Centern
[133] im Englischen: walk ability

Publikationsmöglichkeiten wird eine große Anzahl an Akteuren[134] angesprochen (Bodenschatz, 1998: 308). Die Bewegung ist öffentlich präsent, und hat inzwischen ein weltweites Netzwerk in über 20 Ländern und 49 Staaten (Selbstdarstellung CNU) aufgebaut.

1.2 Greyfields – no more

Unter der Bewegung des New Urbanism entstehen seit Ende der 1990er Jahren Lifestyle Center in einem partizipativen Planungsprozess[135] mit einer Funktionsmischung aus Handel, Dienstleistung, Büro- und Wohnnutzung. Sie gleichen mit ihrer offenen Straßenstruktur und einer verdichteten Blockrandbebauung dem traditionellen „europäischen" Stadtbild.

Diese Lifestyle-Center haben in den USA eine weit reichende Fachdiskussion ausgelöst und der CNU hat erste Forschungsstudien zu diesem Thema begonnen. Seit 1998 läuft eine Studie über „dying malls" zusammen mit der Harvard Graduate Design School. Es folgten zwei Publikationen[136] über mehrere Fallstudien in den USA. In dieser Studie wurde bereits festgestellt, dass 19 Prozent der regionalen Shopping Center als zugrunde gehende oder als insolvent gewordene Einkaufszentren eingestuft werden können (CNU, 2005: 8). Gründe für dieses Mallsterben sind vor allem vom Standort und den Gestaltungsfaktoren abhängig. Es fehlt in den meisten Fällen an ausreichender Verkehrserreichbarkeit (Schwerpunkt MIV), Sichtbarkeit oder an einer Ansiedlung von direkter Konkurrenz (CNU, 2002: 18ff). In Abbildung 01 sind zwei wichtige Faktoren der Greyfields auszumachen: Die Werte der Umsätze pro Quadratmeter[137] und die Anzahl der Verkaufsläden stellen die stärksten Unterschiede zu funktionierenden Malls dar. Aus dem Verkaufsquotienten kann man den starken Rückgang der Besucher erkennen. Die Ladenanzahl gibt einen Rückschluss auf die Verkaufsfläche. Zusammenfassend kann festgehalten werden, dass überdurchschnittlich alte, unrenovierte und nicht vergrößerte Shopping Center brach fallen. Diese greyfields stellen für den Stadtraum monofunktionale und großflächige Strukturen ohne jede Anziehungsqualität oder Attraktion dar. Sie bilden in der Stadt so genannte „placeless" -Orte.

TABLE 1:
HOW GREYFIELDS COMPARE

	GREYFIELD	±	VULNERABLE	±	VIABLE	±	HEALTHY	±
Occupancy (%)	85	18	83	16	90	10	94	8
Sales ($/sf)	114	31	174	14	219	16	321	73
Year Open	1968	11	1971	10	1976	10	1973	11
Year of Last Expansion	1988	8	1990	6	1990	6	1999	6
Year of Last Renovation	1991	5	1992	4	1993	5	1999	4
Number of Stores	63	24	71	26	84	30	124	48

Abb. 01:How Greyfields compare - Vitalitätsfaktoren von Shopping Centern. Quelle: CNU 2002

1.3 Placemaking

In die Diskussion über New Urbanism wurde vor wenigen Jahren der Begriff des place making und des quality of place eingebracht. Ebenso wurde dieser Begriff im Reformdiskurs der britischen Planer von Patsy Healey verwendet (vgl. hierzu Fürst et al, 2004:39). Nach Fürst lassen sich folgende Definitionen unterscheiden:

Einerseits wird von einer Gestaltung des Raumes (urban design) gesprochen, um eine bessere Akzeptanz der Benutzer zu erreichen (quality of place). Dieser Richtung entspricht auch das Interessensverständnis des New Urbanism (ebd, 2004: 38). Ein anderer Ansatz definiert Placemaking als „die kollektive Gestaltung eines gemeinsamen räumlichen Umfeldes". Nach Healey ist eine Unterscheidung der Begriffe space als Raum in physischer Funktion und place in soziokultureller Funktion (ebd, 2004: 39).

Ihrer Definition, „spaces become places because they are acknowledged as such by those living there, doing business there or involved in Governance activities in some way. (…) Besides the idea of place has a key role in defining the identity of social groups, and this collective identity may contribute towards generating

[134] Vertreter aus Politik, Planung und Wirtschaft
[135] Charrette und Masterpläne als Satzungsmerkmal der Charta
[136] Greyfields into Goldfields, 2002; Malls into Mainstreet, 2005
[137] square foot (sf) wurden zum besseren Verständnis in Quadratmeter ausgedrückt

social cohesion. (Healey et al, 2002: 53), könnte man mit dem Begriff Heimat- oder Ortsgefühl (sense of locality) umschreiben. Gemeint ist die Wandlung eines Ortes (place), der von allen Beteiligten genutzt und positiv wahrgenommen wird. Die Definition von Fürst: „… einen kollektiven Prozess der Raumgestaltung, mit dem Ziel, die Raumnutzungs- und Lebensqualität zu verbessern und sich den Raum sozio-emotional ‚anzueignen'." hilft hier weiter (Fürst et al, 2004: 38).

Für diesen „kollektiven Prozess" ist eine hohe Anzahl beteiligter Akteure notwendig, die aus unterschiedlichen Motiven am Gestaltungsprozess teilnehmen. Wichtig dabei ist, dass „die Beteiligten gleichrangige Subjekte des Handelns sind" (ebd, 2004: 32). Diese Form der Partizipation kann mit dem Begriff governance oder local governance (Selbststeuerung) bezeichnet werden. Nach Fürst kann man hier sogar von einer „territorialen Handlungsorientierung" sprechen, es besteht keine reine funktionale Orientierung (Problembezug) sondern ein Raumbezug (ebd, 2004: 35). Dies fordert eine Partizipation von Akteuren aller betroffenen Gruppen. Für eine bessere Kommunikation dieser Akteursgruppen ist ein ausgeprägtes soziales Netzwerk notwendig. Diese Netzwerkkommunikation kann mit dem Begriff Sozialkapital umschrieben werden (vgl. Euler, 2006: 12). Dieser Begriff entwickelte sich im Laufe des 20. Jahrhunderts und ist bis heute nicht eindeutig definiert (ebd, 2006: 10ff). Nach Coleman wird durch Verstärkung der Beziehungen zwischen Individuen das soziale Kapital erhöht (ebd, 2006: 36 nach Coleman 1991: 407f).

„Soziales Kapital wird somit als Lösung des Kollektivgutproblems gesehen. Denn indem Normen wie die Reziprozitätsnorm und Netzwerke zivilen Engagements die Unsicherheit bei Handlungen minimieren und Vertrauen aufbauen, ermöglichen sie eine breite Basis freiwilliger Kooperation und so auch die Entstehung gesellschaftlicher Institutionen und Strukturen." (Euler, 2006: 52 nach Putnam, 1995: 664f)

Fürst vermutet unter dem Zusammenhang von Placemaking, Sozialkapital und local Governance eine Verbesserung der Beziehungen der Akteure und einen verstärkten Ortsbezug (Ortsgefühl). Dies kann er anhand seiner Fallstudien nachweisen (Fürst et al, 2004: 40f/226f).

Der Ansatz des Placemaking ist ebenso für Lifestyle Center von Bedeutung, um sowohl eine andauernde Nutzung und Belebung des Areals zu gewährleisten, als auch die Akzeptanz der Anwohner erhöhen zu können.

2 LIFESTYLE CENTER – EIN WACHSENDER MARKT?

Lifestyle Center bestehen aus Einzelhandelsketten, mit einem Sortiment auf hohem Preisniveau, die hauptsächlich Kunden der höheren Einkommensschichten ansprechen. Sie bieten eines dem Kundenkreis entsprechendes Ambiente, verfügen über einen hohen Verbreitungsgrad und sind über ihren Marktauftritt überregional bekannt. Eine Gruppenbildung verschiedener lebensstilorientierter Einzelhändler und der Verzicht auf übergeordnete Ankermieter lassen Wechselbeziehungen[138] unter den einzelnen Läden entstehen. Durch Nachahmung einer Fußgängerzone mit extrovertierten Ladenbereichen (Main Street) und ansprechender Gestaltung der Außenbereiche entstand eine Selbstvermarktung dieser Lifestyle Center (ICSC, 2003: 19). Einer Untersuchung des International Council of Shopping Centers (ICSC) über Lifestyle Center im Jahr 2002 hat folgende Unterschiede zu regionalen Shopping Centern ergeben:

Im Durchschnitt besuchten 74 Prozent der Kunden die Center um einen bestimmten Laden aufzusuchen, 30 Prozent kamen zum Stöbern und nur neun Prozent besuchten ein Restaurant. Während die letzten beiden Werte in etwa dem Durchschnitt von Einkaufszentren entsprechen, liegt die Zahl der gezielten Besuche um 14 Prozent höher. Die kürzere durchschnittliche Aufenthaltsdauer (21 Minuten Differenz) bestätigt die Vermutung, dass Lifestyle Center hauptsächlich gezielt besucht werden. Darüber hinaus ist die Aufenthaltsdauer in den einzelnen Läden wesentlich geringer, da in kürzerer Zeit mehrere besucht werden (vgl. Abb. 02). Dies lässt sich anhand der unterschiedlichen Ausrichtung der Verkaufskonzepte und unterschiedlichen Größe zwischen Shopping Centern und Lifestyle Centern erklären. Vergleicht man die Häufigkeit der Besuche, kann man feststellen, dass Lifestyle Center öfter besucht werden[139].. Jedoch ist festzustellen, dass es deutliche Schwankungen bei den Lagen der Center gab. Lifestyle Center im Kerneinzugsbereich werden zweimal öfter besucht als Center außerhalb des Einzuggebietes einer Stadt. Dies bedeutet einerseits, dass diese Center eine Versorgungsfunktion übernehmen (vgl. hierzu die Studie von

[138] z.B. Ansprechen des selben Kundenkreises
[139] 3,8 Besuche im Gegensatz zu 3,4 Besuchen innerhalb von 30 Tagen

Vogels; Will, 1999). Andererseits haben Lifestyle Center somit einen regionalen Einzugsbereich (ICSC, 2003: 48ff).

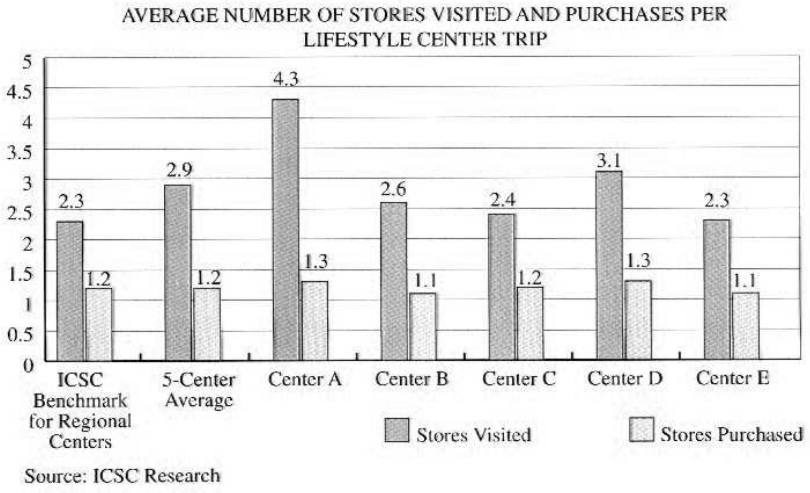

Abb. 02: Durchschnittliche Anzahl besuchter Läden. Quelle: ICSC 2003

Im Folgenden wird ein best practice Beispiel aus der Greyfield-Mall-Study vorgestellt, welches vom Autor während einer Forschungsreise in den USA näher untersucht wurde. Im Anschluss daran wird ein europäisches Beispiel vorgestellt (Bosch-Areal Stuttgart).

Anstatt einer Umnutzung oder Revitalisierung als „single-use development" wurden die Lifestyle Center in Mischnutzungskonzepte umgewandelt. Sowohl ökologische (geringerer Flächenverbrauch, Reduktion der Emissionen durch kürzerer Wege), wie auch ökonomische Aspekte sind hierfür vorteilhaft: Höhere Wirtschaftlichkeit durch vertikale Stapelung der Nutzungen, Wertsteigerung durch Kooperationseffekte[140] oder leichtere Umnutzungsmöglichkeiten durch Gebäudetrennungen sind in diesem Zusammenhang zu nennen (CNU, 2005: 11ff).

2.1 Santana Row

Das Projekt Santana Row liegt in den suburbanen Wohngebieten westlich des CBD von San Jose, Kalifornien, nahe an einem Kreuzungspunkt von zwei Highways. Bei der Stadt San Jose handelt es sich um eine Metropolregion (Silicon Valley), die von überdurchschnittlich hohen Einkommensschichten[141] geprägt ist (vgl. hierzu Florida, 2004). Ursprünglich stand an dieser Stelle die Town & Country Mall, welche Ende der 1990er Jahre sich nicht mehr am Markt behaupten konnte und abgerissen wurde. Das Projekt hat eine Gesamtgröße von 17,4ha und wurde auf Initiative des Investors (Federal Realty Investment Trust) entwickelt. Als Architekt war Sandy & Babcock International verantwortlich, die Straßengestaltung wurde von Street-Works übernommen (Abb. 03).

[140] Wechselbeziehungen unterschiedlicher Nutzungen
[141] Einkommen zwischen 96.000$ und 110,000$ im Umkreis von 5 Meilen (Angabe Federal Realty Investment Trust)

Abb. 03: Santana Row, Straßenansicht Santana Row. Quelle: eigene Aufn. 2006

Anstelle der Strip-Mall entstand ein Quartier mit einem großflächigen Einzelhandelsbereich (74.320m² VK) in den Erdgeschosszonen, einem Hotel[142],, Kinokomplex und über 1.000 Wohneinheiten[143] in den oberen Geschossen. Ein offenes, mit der Umgebung verknüpftes Straßenraster dient als Aufenthaltsbereich und Einkaufsstraße, welche qualitativ hochwertig gestaltet wurde und nach Aussage der Stadt mit städtischen Mitteln nicht finanzierbar gewesen wäre.

Entlang der Santana Row[144] sind sowohl Verkaufsflächen im Erdgeschoss mit exklusiven Marken besetzt, wie auch viele Gastronomieeinrichtungen angeordnet. Diese haben in den letzten Jahren einen immer größeren Anteil eingenommen[145] (Abb. 04). Entwickelt wurde das Projekt unter dem New Urbanism, jedoch fand keine Beteiligung des CNU statt. Es folgte ein Masterplan in Abstimmung mit der Stadt. Eine Charrette[146] in Verbindung mit einer langfristigen Partizipation der Anwohner war im Planungsprozess nicht vorgesehen und konnte auch nicht bestätigt werden. Die Akzeptanz der Bevölkerung für das Areal wird von der Stadt im Nachhinein als gut eingeschätzt. Das ganze Gelände (inkl. Strassen) ist Privatbesitz des Investors und somit kein öffentlicher Raum, ist jedoch jedem zugänglich[147] und wird aus Sicherheitsgründen von der örtlichen Polizei kontrolliert.

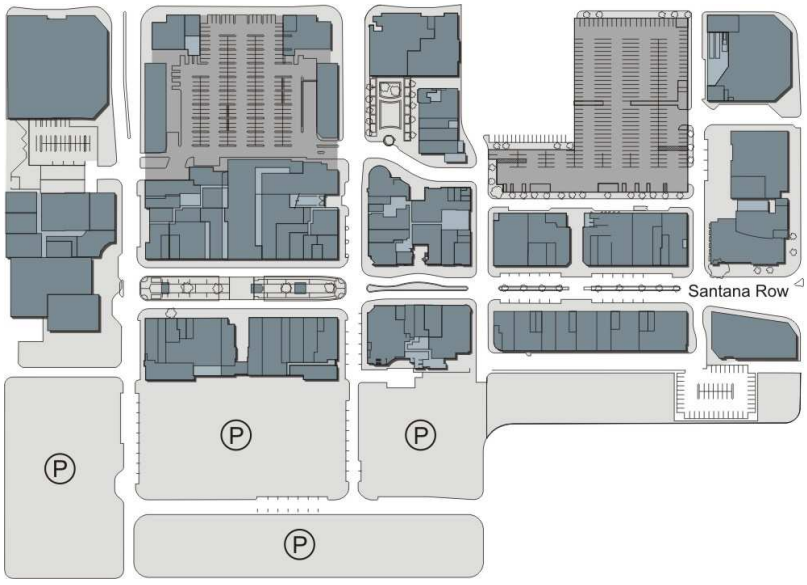

Abb. 04: Erdgeschoss Santana Row (eigene Darst.). Quelle: Federal Realty Investment Trust 2007

[142] mit ca. 200 Zimmern
[143] Geschosswohnungsbau, Stadthäuser, Lofts
[144] Hauptstraße des Quartiers
[145] Interview mit Erin Morris, Senior Planner, Local Government, San Jose, 20.09.2006
[146] Begriff in Anlehnung an Definition von NCI National Charrette Institute (www.charretteinstitute.org) ähnlich einem Planungsworkshop mit Bürgerbeteiligung
[147] solange die „Hausordnung“ eingehalten wird

Laut Aussage der Stadt besteht eine große Nachfrage nach den Wohneinheiten unterschiedlicher Größe (Großer Eigentumsanteil). Diese werden von unterschiedlichen Bevölkerungsgruppen genutzt (Seniors, Businessman, Dinks), was man auch an den Wohngrößen erkennen kann. Ärmere Bevölkerungsschichten sind wegen des hohen Mietpreises jedoch nicht vertreten[148] (Taylor; Anderson, 2007: 93).

Das Quartier selbst hat keinen Bezug zur Innenstadt von San Jose (suburbane Lage), fügt sich jedoch in die Umgebung städtebaulich ein, findet aber aufgrund der suburbanen Wohngebiete und introvertierter Malls in der Nachbarschaft keine städtebauliche Antwort. Eine Konkurrenz zur Innenstadt oder zu benachbarten Mall Valley Fair besteht nach Aussage der Stadt nicht[149] (cf. Sarkar, 2005). Die Handelsflächen sind alle vermietet, teilweise auch auf die umfassenden Strassen orientiert. Die Santana Row Promenade ist Hauptbereich des Projektes und besteht inzwischen zu Großteilen aus Restaurants.

Das Projekt, entwickelt von 1997 bis 2002, ist nach Aussage des Investors noch nicht endgültig abgeschlossen. An das Kino sollen noch zusätzliche Kinosäle angefügt werden, ein Gebäudeblock im Südwesten des Areals wurde noch nicht gebaut und einige Parkflächen (östlich) werden zu Wohnquartieren mit unterirdischer Parkierung umgewandelt. Haupterschließung erfolgt über den motorisierten Individualverkehr, eine fußläufige Anbindung oder ein öffentliches Verkehrsnetz sind nicht vorhanden (Suburbane Region). Die Belebung des Viertels in den Abendstunden ist durch die Entertainment- und Restaurant-Angebote gewährleistet, wird aber aus nachbarschaftsrechtlichen Gründen um 24:00 Uhr geschlossen. Insgesamt stellt dieses Lifestyle Center einen positiven Beitrag zur Integration von Handelsflächen in der Stadt dar. Es ist sehr belebt und hat sich zu einem Attraktionspunkt in Suburbia von San Jose entwickelt.

2.2 Das Bosch-Areal

Das Bosch-Areal stellt sich heute als ein revitalisierter Gebäudekomplex dar, der sowohl kulturell als auch wirtschaftlich einen positiven Beitrag zur Stadtgestalt der Innenstadt leistet (Abb. 05). Es liegt im Zentrum der Stadt Stuttgart, Landeshauptstadt von Baden-Württemberg (Deutschland), und bildet den Übergang der Geschäfts- und Einkaufsviertel mit den Wohnbebauungen des Stuttgarter Westens. Aber die geschichtliche Entwicklung des Areals begann schon im Jahr 1900 (Marquart, 1997: 553). Der Name des Areals geht auf den Industriellen Robert Bosch zurück, der sich dort zur Firmengründung von den Architekten Carl Heim und Jacob Früh Gebäude mit nutzungsneutralem Grundriss errichten lies (Krisch, 2002: 32). Schon 20 Jahre später wurde der Firmensitz zu klein und die Produktion ins Umland verlegt. Nach den Kriegsjahren, die der Gebäudekomplex fast unbeschadet überstanden hatte, wurde das Gelände unter staatlichen Besitz bis zum Anfang der 1990er Jahren teilweise als Hochschulstandort und als staatlicher Verwaltungssitz genutzt (Marquart, 1997: 553). Nach längerem Leerstand und mehreren erfolglosen Umnutzungsversuchen wurde in einem städtebaulichen Ideenwettbewerb 1992 vom Preisträger Architekt Roland Ostertag die Erhaltung und Entwicklung der bestehenden Bausubstanz vorgeschlagen (Krisch, 2002: 33). Einige Jahre später lobte die Stadt erneut ein Investoren-Auswahlverfahren aus.

Abb. 05: Bosch-Areal, Blick über den Berliner Platz. Quelle: Ostertag, 2004: 58

Schon im Jahre 1995 bildete sich eine Interessensgemeinschaft aus Bürgern um für den Erhalt des Areals zu kämpfen. Es gründete sich der Verein IG BoschAreal. Um an dem ausgeschriebenen Investoren-

[148] Aussage des Stadtplanungsamtes
[149] mit der gegenüber liegenden Mall Valley Fair wurden Branchenabstimmungen getroffen. Es ist von Synergieeffekten auszugehen.

Auswahlverfahren teilzunehmen, ging der Verein eine Partnerschaft mit dem Investor Müller-Altvatter ein. Aus dem Verfahren ging der Projektentwickler Deyhle & Veyhle & Fink mit einem abgeschlossenen Urban Entertainment Center hervor (Kox, 2001: 01). Das Areal wurde zwischen 1998 und 2001 unter Vorbehalt der Stadt als Kooperation aus Architekt (Roland Ostertag), der IG BoschAreal und den beiden Investoren zum neuen Zentrum für neue Medien, Kunst, Kultur, Einkauf und Entertainment umgebaut (Abb. 06). Aber seinen eigentlichen Erhalt verdankt der Gebäudekomplex nicht nur seinen nutzungsneutralen Grundrissen, sondern auch seiner hohen Dichte mit einer Geschossflächenzahl von 4,0. Diese hätte bei einem Neubau unter Beachtung der heutigen Bauvorschriften nicht erreicht werden können. Somit entstand auch ein wirtschaftlicher Grund für die Erhaltung des Bestandes (Krisch, 2002: 34).

Bei dem Bosch-Areal Stuttgart handelt es sich um ein Lifestyle Center, jedoch findet dieser Begriff keinen Gebrauch[150]. Es ist ein revitalisiertes Stadtareal zwischen der Fußgängerzone und den dicht besiedelten gründerzeitlichen Wohnquartieren von Stuttgart West. Das Projekt hat eine Gesamtgröße von 14.200m² und besteht aus einer öffentlich zugänglichen Fußgängerzone, an der im Erdgeschoss Handelsflächen und Gastronomie angegliedert sind. Im Untergeschoss liegen zwei Lebensmittel-Verbrauchermärkte und eine Diskothek. Hier besteht ein Zugang zu den Parkierungen, die mit der Kongress- und Liederhalle geteilt werden. In den Obergeschossen sind großteils Büronutzungen untergebracht. Ein Kinokomplex ist als zusätzliches Gebäude an das Areal angeschlossen. In den obersten zwei Dachgeschossen sind Wohnungen untergebracht. Seit Eröffnung 2001 ist sind die Flächen im Bosch-Areal durchgehend vermietet.

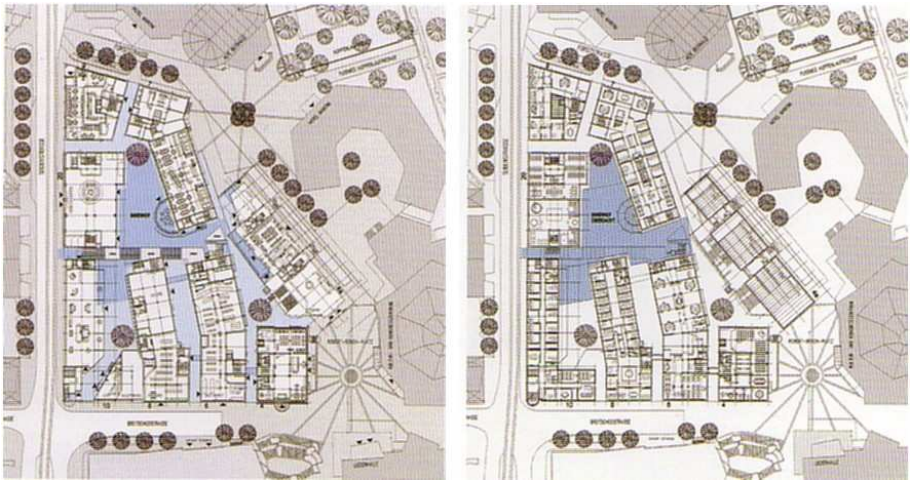

Abb. 05: Erdgeschoss / 1.Obergeschoss Bosch-Areal. Quelle: Ostertag, 2004: 60

Der Kontrast zwischen Alt und Neu schafft die nötige Atmosphäre, allein eine einheitliche Gestaltung und ein geschwungenes Glasdach zeigen die Zusammengehörigkeit des Areals. Es wurde nicht eine „künstliche Innenwelt“ geschaffen, sondern eine verwinkelte gassenartige Stadtstruktur, wodurch sich das Bosch Areal als eine Erweiterung der Fußgängerzone darstellt. Der Verein IG BoschAreal ist selbst von dem Endergebnis überzeugt und nimmt auch die Abstriche, wie z.B. der Reduzierung der Wohnungen oder der aufgegebenen Plane für ein Kinder- und Jugendtheater, in Kauf (Kox, 2001: 01).

3 AUSBLICK

Aufgrund ihrer Typologie scheinen Lifestyle Center, im Besonderen die Entwicklungen unter der Bewegung des New Urbanism oder unter einem partizipativen Planungsprozess, sich dem Stadtbild einer europäischen Stadt zu gleichen. Sie stellen offene und vernetzte Quartiere dar, die mit einer vielfältigen Nutzungsmischung, ökologischen und ökonomischen Vorteilen und hoher baulicher Dichte neue Wege in dem Bereich der Immobilienentwicklung beschreiten.

Es handelt sich um private Entwicklungsprojekte, denen grundsätzlich ein wirtschaftlicher Erfolg vorgeschrieben ist. Bei allen Lifestyle Centern nehmen die Handelsflächen den Großteil der Flächen ein. Büro- und Wohnnutzung dienen weitgehend nur zur Ertragsverbesserung. Ein Scheitern der Projekte ist wie bei ihren Vorgängern nicht auszuschließen. Jedoch sind Lifestyle Center leichter an Veränderungen des

[150] ebenso ist der Begriff in Deutschland nicht gebräuchlich

Marktes anpassbar und durch vielfältige Nutzungsmischung ein Ausgleichen wirtschaftlicher Einbußen in den einzelnen Segmenten besser möglich.

Aufgrund der demographischen Veränderungen[151] der Bevölkerung und einer verstärkten Individualisierung werden die Nettorealeinkünfte weiter sinken und der Anteil der im Konsum zurückhaltenden Bevölkerung weiter steigen. In Anbetracht des seit den 1990er Jahren stagnierenden Handelsumsatz und einer weiter ansteigenden Expansion der Handelsflächen wird der Wettbewerbsdruck sich erhöhen (Eggert: 25ff in Zentes, 2006). Diese Veränderungen werden auch zu einem veränderten Konsumverhalten führen. Die Märkte werden sich polarisieren und sich von der Mitte, die im Jahr 1990 noch 30 Prozent vom Handelsmarkt eingenommen hat, wegbewegen. Der Convenience- und Dienstleistungsmarkt ebenso wie der Erlebnismarkt werden weiter steigen (ebd.: 31ff). Der Handel ist jedoch bereits global orientiert, die einzigen Verlierer werden die Städte und Kommunen sein, in denen großflächige Einzelhandelsflächen leer stehen werden.

Für ein Entstehen von Placemaking ist eine hohe Anzahl von Akteuren notwendig (vgl. hierzu Kap 1.3). Neben dem Investor und der Stadt müssen eine Vielzahl von betroffenen Bürgern einbezogen werden. Eine rein partizipative Beteiligung (informelle Planung) kann aufgrund der einseitigen Einbeziehung kein soziales Netzwerk zur Raumgestaltung entstehen lassen. Eine ähnliche Beteiligung fand beim Projekt Santana Row statt, es bildeten sich sogar Gruppierungen (NIMBY´s), bei denen die Eigeninteressen deutlich über den Allgemeinwohl lagen[152].. Die Entstehung der IG BoschAreal (bottom up) beim Bosch-Areal lässt jedoch auf ein deutlich ausgeprägtes Netzwerk und Sozialkapital schließen, womit ein Entstehen von Placemaking vermutet werden kann. Dies muss allerdings noch in einer qualitativen Untersuchung nachgewiesen werden.

Vergleicht man die Sozialstrukturen, so stellt man fest, dass bei der privaten Immobilienentwicklung eine eingeschränkte Bevölkerungsgruppe als Kunden angestrebt wird. Dies entspricht nicht dem Sozialgefüge einer Stadt. Ebenfalls sind private Straßenzüge, wie im Projekt Santana Row vorgestellt, nicht vergleichbar mit dem öffentlichen Raum einer Stadt.

Jedoch sind diese Fakten sowohl im Hinblick auf die private Immobilienentwicklung als auch auf dem Themenfeld Shopping Center keine neuen Erkenntnisse. Vielmehr sollte in Anbetracht der aktuellen Entwicklungen des Einzelhandelsmarktes[153] und der demographischen Veränderungen diese neue Typologie sowohl näher untersucht, als auch von allen Beteiligten als neuer Stadtbaustein angewendet werden.

4 BIBLIOGRAPHIE

BEYARD, Michael D. (2001): Developing retail entertainment destinations. Washington DC: Urban Land Institute.

BODENSCHATZ, Harald (1998): Alte Stadt - neu gebaut. In: Die alte Stadt, Nr. 4, S. Ill., Kt.

BODENSCHATZ, Harald; Schönig, Barbara (2004): Smart growth - new urbanism - liveable communities. Programm und Praxis der Anti-Sprawl-Bewegung in den USA. Wuppertal.

CONGRESS FOR THE NEW URBANISM (Hg.) (2002): Greyfields into Goldfields. dead malls become living neighborhoods. San Francisco Calif.

CONGRESS FOR THE NEW URBANISM (Hg.) (2005): Malls into Mainstreets. an in-depth guide to transforming dead malls into communities. San Francisco Calif.

EULER, Mark (2006): Soziales Kapitel. Ein Brückenschlag zwischen Individuum und Gesellschaft. Oldenburg

FALK, Bernhard (1998): Das große Handbuch Shopping-Center. Landsberg/Lech.

FLORIDA, Richard (2004): The rise of the creative class. And how it's transforming work, leisure, community and everyday life. New York (1. paperback ed).

FÜRST, Dietrich; Lahner, Marion; Zimmermann, Karsten (2004): Neue Ansätze integrierter Stadtentwicklung. Placemaking und local governance. Erkner

HEALEY, Patsy (1997): Collaborative planning. Shaping places in fragmented societies. New York

HEALEY, Patsy et al. (2002): Urban Governance, Institutional Capacity and Social Milieux. Burlington

INTERNATIONAL COUNCIL OF SHOPPING CENTERS. (Hg.) (2003): Leisure and lifestyle retailing. New York.

KEGLER, Harald (1998): Mehr als Sehnsucht nach der alten Stadt: New Urbanism in den USA. In: Die alte Stadt, Nr. 4, S.335-346

KÖNIG, Wolfgang (2000): Geschichte der Konsumgesellschaft. Stuttgart.

KOX, Bettina (2001): Das Bosch-Areal. Einmischen lohnt sich! IG BoschAreal – eine Bilanz nach sieben Jahren. Stuttgart

KRISCH, Rüdiger (2002): Das Bosch-Areal: Umbau eines Quartiers in Stuttgart. In: Stadtbauwelt (Bauwelt), Nr. 156, S. 32-37

MARQUARDT, Christian (1997): Investorenclinch um das Bosch-Areal, Stuttgart. In: Stadtbauwelt (Bauwelt), Nr. 12, S. 553

NATIONAL CHARRETTE INSTITUTE (2006): www.charretteinstitute.org

OPASCHOWSKI, Horst Werner (1998): Kathedralen des 21. Jahrhunderts. die Zukunft von Freizeitparks und Erlebniswelten. Hamburg.

[151] Bevölkerungsverminderung und Überalterung

[152] Interview mit Erin Morris, Senior Planner, Local Government, San Jose, 20.09.2006

[153] Anstieg der Filialisierung und andauernder Boom neuer Shopping Center

OSTERTAG, Roland (2004): Das Bosch-Areal. Stuttgart
SARKAR, Pia (2005): The New Face of Retail Mimicked Main Streets, Mall Makeovers Seek to Lure Shoppers. In: San Francisco Chronicle, Ausgabe vom 03.05.2005
SCHULZE, Gerhard (2005): Die Erlebnisgesellschaft. Kultursoziologie der Gegenwart. Frankfurt/Main.
TAYLOR, Yann; ANDERSON, Rob (2007): A Moving Target. In: Urban Land Magazine, Januar 2007, S. 92-97
VOGELS, Paul-Heinz; WILL, Joachim (1999): Raumordnerische und städtebauliche Auswirkungen von Factory-Outlet-Center. Grundlagenuntersuchung im Rahmen des Forschungsfeldes „Zentren“ des experimentellen Wohnungs- und Städtebaus. Basel; Boston; Berlin.
ZENTES, Joachim [Ed.] (2006): Handbuch Handel: Strategien - Perspektiven - internationaler Wettbewerb. Wiesbaden

🏆 *reviewed paper*

Assessing the Spatial Dimension of Sustainability in Asian Megacities: An Indicator-Based Approach

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1 INTRODUCTION

This paper presents significant initial experiences of the urban sustainability assessment research of housing policies at the urban planning level in Ho Chi Minh City (HCMC). The objective is to develop an integrated approach to the sustainable development of housing and settlement structures to balance urban growth and redevelopment in HCMC. The aim of this paper is to discuss the importance of socio-environmental efficiency indicators for sustainability assessment (SA) in spatial development planning. Although environmentally inefficient settlement development structures are resulting in an ongoing unsustainable use of land-resources, planning instruments have their limitations to promote the necessary structural changes in spatial development planning. A special focus will be laid on methodological issues of urban sustainability indicators and their spatial representation by multi-layered urban typologies for the evaluation of housing and settlement strategies. Based on current urban growth research, this paper offers a overview of available indicators that can describe the efficiency of regional and urban spatial structures in relation to land use and land consumption. The relevance of these indicators in relation to contrasting urban development models is verified. This section closes with recommendations for the integration of spatial-enabled sustainability indicators to assess the efficiency of zoning of new developments for residential areas and traffic infrastructures in urban planning.

2 MEGACITY RESEARCH WITHIN THE METROPOLITAN AREA OF HCMC

Asia offers an appropriate setting for the analysis of many of the institutional forces and the urban dynamics that impact the interconnections between humans and their management of environmental resources in the megacities of today (Lo and Marcotullio 2001). Many countries have attempted to limit the growth of their largest cities and have responded to the dynamics of urban explosion with centrally planned institutional and administrative regulations and measures to reduce urban growth. Megacities of tomorrow like HCMC offer exceptional opportunities to analyse both the impacts of large-scale environmental resource problems and institutional responses to these impacts, as well as urban planning and management strategies to overcome the limits and failures in the management of environmental resources.

The transition of the economic system of Vietnamese cities (Boothroyd and Pham 2000) has brought about major transformations in the physical and functional urban structures over the last decades. The development of the future megacity of HCMC has two interrelated perspectives: firstly urban growth, the evolving urban forms in the context of urbanisation, and secondly urban redevelopment within the inner urban area. HCMC covers 2,000 sq km, divided into 24 districts hosting an official population of more than 6 million. The inner city has an average population density of around 10,000 people per sq km. HCMC is undergoing a rapid urbanisation such that by 2020 the 17 inner city districts are expected to have a population of approximately 6 million, while the suburban area will have roughly 4 million residents (table 1).

HCMC	*Area (km^2)*	*Population 2004*	*Population 2020*	*Greenspace per capita*	*Floorspace per capita*
Inner Districts	494	5.2 million	6 million	2 m^2	7-8 m^2
Suburban Districts	1,601	1.0 million	4 million	475 m^2	
Whole City	**2,095**	**6.2 million**	**10 million**	**14 m^2**	(14 m^2 2010) 10 m^2

Population density of 10.000 inhabitants/km^2 in inner city districts (20.000-80.000 in inner-city informal settlements)

Table 1: Population distribution within the urban area of HCMC

This rapid population and economic growth since the policy reform of Doi Moi has put a large and increasing stress on the water resources and environment in HCMC. The demand from industry and

households surpassed the current distribution capacities. The water quality in underground sources and river courses is highly degraded due to many sources of pollution (Van Duc and Gupta 2000).

HCMC's infrastructure is overloaded and is unable to meet the needs of people living in highly dense urban areas (Van Khoa 2001). In HCMC, the public transport infrastructure can attract only around 10% of travel demand. The transportation infrastructure is poor and almost 90% of commuters use private forms of transport (table 2).

HCMC	*Number*	*Mode share*
Motorbikes	~3 million	60%-70%
Public Transport		10%

Transport infrastructure 8% (urban area) (standard 20-25%)

Table 2: Transport mode shares in HCMC

The dominance of motorcycles and the weakness of public transport have resulted in increasing emissions from private urban transport activities. The current urban transformation process requires that the urban planning system be based on a sound understanding of the housing and settlement development processes.

2.1 Conflicting Requirements of Sustainable Urban Development

To enable sustainable livelihoods for all within the bounds of the environmentally possible, the spatial planning aspects of sustainable urban development require the development of settlement and housing structures that facilitate equitable access to public resources and service opportunities and the efficient sharing of finite natural resources and agriculturally productive space in the metropolitan region.

- The social aspects of sustainable settlement and housing development primarily require providing people with opportunities for an acceptable quality of life. Planning strategies to ensure an acceptable quality of life are focused on the reduction of environmental threats to human health that arise from insufficient urban sanitary infrastructure, inadequate provision of safe water, hazardous water and air pollution, and poor environment-related public services like the management of public transportation and of solid waste.
- The environmental aspects of sustainable urban development of future megacities require a balance between protecting the natural environment and using its resources in a way that will allow the sustainable supporting of an acceptable quality of life for all urban residents. Environmental planning strategies are primarily concentrated on the reduction of impacts on natural resources and environmental systems of urban-based production, consumption and waste generation.

'Quality of Life' - Liveable housing			**Quality of Natural Environment**	
Adequate and affordable housing	**Shelter**		**Resource use**	Freshwater use
Adequate sanitation	**Health**			Land use
Access to clean drinking water				Energy use
Air quality: indoor and ambient		<>		Waste produces
Absence of disease vectors			**Pollution and degradation**	Water quality
Access to health care				Air quality
Threat of natural or man-made disasters	**Safety**		**Protection of environment**	Conservation (land having formal protection status)
Indicator	*Issue*		*Issue*	*Indicator*

Table 3: Interrelationship between "liveable housing" and the natural environment described by core sustainability indicators

Because these different principles of sustainability obviously have conflicting requirements (Satterthwaite 1999) an integrated urban planning strategy will try to balance these different requirements (table 3). The resulting planning decisions need to be regularly monitored and assessed against agreed-upon urban

sustainability indicators. Because sustainable urban development holds these conflicting demands with different priorities in different regional contexts, it is not possible to define a general concept for sustainable human settlements. But urban-related sustainability indicator frameworks, like the Human Settlement Indicators of the Habitat Agenda, are creating an accepted normative framework based on human settlement-related indicators, defining urban sprawl and densification, and standards for basic needs, such as access to water and sanitation.

3 SPATIAL INDICATORS TO ASSESS THE EFFICIENCY OF URBAN LAND-USE

Settlement structure and its form of the built environment determine both the efficiency of resource uses and the quality of life of the inhabitants. Urban development planning of the last decades and the current discussion on sustainable spatial planning are characterised by contrasting and conflicting discussions about urban planning models that can combine high density in a sustainable urban form (Ewing et al. 2002). Spatial development in metropolitan areas worldwide is characterised by the continuing use of mainly agricultural land, a finite resource, for settlement and traffic purposes. These irreversible land use changes constitute an important issue for sustainability. In contrast to similar problems in Europe, urbanised areas in Asia are affected primarily by growth in employment and population. Other driving forces of land-use changes are mainly changing patterns of lifestyle, production and retail structures and transportation patterns.

Land consumption in metropolitan regions is characterised by a continuous and high rate mainly caused by the construction of new housing projects and transportation infrastructure. Therefore, land consumption is, because of its persistence, one of the main unsolved environmental problem areas. Consequently it is important to analyse the possible strategies, instruments and measures of an indicator-based policy instrument to optimise the policies and instruments in urban and regional planning and traffic management to reduce and manage the demand for land use in a more sustainable way.

The sustainable use of land resources is an important indicator for the evaluation of settlement structures and transport infrastructures from the point of view of an efficient spatial development. In contrast, the ongoing urbanization shows that the available instruments, spatial planning assessment methods, and many measures on regional and urban planning levels used to establish a more efficient land-use management are highly ineffective in the final evaluation. This is observed in the increasing rates of land consumption for residential areas and the resulting urban sprawl into surrounding areas.

3.1 Efficiency Indicators for Urban Land Use and their Impacts

In the spatial planning debate regarding sustainability impacts and spatial consequences of poorly managed expansion of residential areas in the outskirts of urban agglomerations, there is a need to have an agreed upon method to measure and evaluate the dominant structural changes in the urban landscape on a regional level. Beyond that, it is important for environmental and spatial planners to be able to demonstrate how the monitored sprawl of residential areas has real implications for an efficient land-use management and real impacts on the environment.

In the field of spatial and urban planning research, the main impacts of an inefficient use of land for settlement development are described as a spatial development in which the spread of residential development across the rural landscape far outpaces population growth (Nechyba and Walsh 2004). The efficiency of the resulting regional and urban spatial structure that this spatial development process creates can be measured and analysed (Apel et al. 2000, Ewing et al. 2002, Flacke 2003) by the use of the following spatial and structural indicators:

- Residential density and density of use,
- Variety of uses and mixed urban land use: Neighbourhood mix of homes, jobs, and services,
- Strength of agglomeration centres: Concentration and of polycentric structure settlements,
- Accessibility of public transportation infrastructures: Non car-based transport systems compatible with the city network.

In the following parts, these core indicators are explained with their relevance for and impacts on efficiency of use of land resources.

3.2 Linking indicators to Urban Development Models

Urban development planning of the last decades and the current discussion on regional planning are characterised by two contrasting and conflicting urban planning models (Apel et al. 2000):

- Network city - this widespread city is signified by the gradual dissolution of the traditional compact European urban structures. The network city represents a car-based urban planning model and is in line with the previously described trends in urban development: less residential density, fewer mixed land uses, decentralisation, dispersed structures, growth of private car-based transport.
- Compact city - this urban model is based on European urban culture and can be adapted to urban districts in polycentric, public transport-based regions. The compact city as an urban model represents an efficient use of resources such as land, energy, materials and time, and at the same time enables, through the concentration of human activities, the preservation of large greenfield areas in the countryside.

Indicator	Network City	Compact City
Residential density	The population is dispersed in low density development	High density of use, high residential density
Neighbourhood mix of uses	Rigidly separated uses (homes, shops, and workplaces)	Variety and mix of uses
Centeredness	Lack of well-defined activity centres (business, shopping)	Concentration of settlements, well-defined activity centres
Transportation choices	Poor access to public transportation choices: higher commuting rates and car ownership	Environmental-friendly public transportation choices, areas suitable for walking and cycling
Recycling of land	New developments mainly on greenfield sites	Redevelopment of brownfield sites and already built-up areas

(compiled from: Apel et al. 2000, Ewing et al. 2002)

Table 4. Efficiency of land-use for urban development strategies

Because efficiency indicators for residential land-use can be easily used to contrast and separate the two competing urban development models of the current spatial planning discussion (table 4), the efficiency of regional and urban development structures is a real, measurable phenomenon with real implications for indicator-based Sustainablity Assessment (SA) procedures in urban planning.

3.3 Recommendations for Spatial Planning Indicators

In general, spatial planning involves the setting of frameworks and principles to guide the location of residential development and physical infrastructure. Therefore spatial planning coordinates land-use related public and private investment decisions across space. As mentioned above, the trend of land-use changes and the resulting land consumption can be monitored in terms of spatial structural distribution, a system of activity centres and use densities and the patterns of interaction (commuting).

In HCMC, major deficits in the current regional planning framework to limit the environmental pressures associated with sprawl are a lack of spatially detailed data required to create indicators related to sprawl and land consumption and the resulting inappropriate zoning. Strengthening the regional planning competence requires an appropriate use of available data and a more precise and transparent zoning of future settlement areas (Runkel 1999). The current lack of usage and availability of socio-environmental efficiency indicators (Steinocher and Tötzer 2001) is limiting an appropriate zoning of land uses and the spatial assessment of environmental impacts of land-use changes resulting from spatial planning policies at the urban and regional levels in HCMC.

3.3.1 Indicators and Information Requirements for Urban Planning Systems

The control of the territorial setting of new residential areas must be acknowledged as the key task of spatial development plans. Therefore any assessment procedures against urban sprawl require detailed demographic information and land-use data to evaluate the spatial patterns of urbanisation and residential areas (Siedentop and Kausch 2004). The core data required are focused on the spatial concentration of land consumption as well as the distribution of newly created settlement areas. This information characterises driving forces and pressures related to demographic developments in agglomeration areas, their manifestation in the resulting land consumption and impacts on the compactness of urban structures. Special attention must be paid to the

importance of understanding the spatial structure of regions, agglomeration centres and cities in order to develop standards and thresholds for indicators which are compatible with the observed spatial structures of the assessed planning region.

The question of what type of residential development can be regarded as efficient in the use of land resources, and therefore limiting land consumption and protecting the countryside, must be more precisely defined by reference values on regional-level. A pragmatic approach to the assessment of settlement developments involving core indicators should be used (Apel et al. 2000, Wrbka et al. 2001, Flacke 2003), because they can largely be derived from the above-mentioned available land-use und socio-demographic base data. In order to provide improved control of the efficiency of land-use at the regional planning level, requires the primary definition of the basic parameters of urban development based on efficiency indicators (Flacke 2003, Wrbka et al. 2001). This means that definitions on the proposed type and scale of residential areas should be more specific and detailed than at present. This includes, for example, residential density and area size and basic information about the development potential in already build up areas or brownfields (Preuß and Ferber 2005). These indicators form the basis for spatial typologies that are based on intersections of land-use related environmental data and statistical socio-demographic information.

4 SPATIALISATION OF URBAN SUSTAINABILITY INDICATORS

Densification is the most important efficiency indicator for urban land-use patterns, because it reduces sprawl. Further, the dense structure of the compact city provides the necessary economies of scale for an efficient infrastructure, and provisions for certain types of public urban services and an efficient use of finite natural resources. Urban planning strategies based on the compact city model, with its efficient urban-related infrastructure and service provision and protection of the natural environment, promise to reduce the urban environmental footprint of megacities.

Yet in heavily under-serviced urban areas in developing counties, densification can be detrimental. In HCMC informal settlements are examples of areas of extremely high density living, but inadequate levels of service and infrastructure provision creating serious health problems and increased environmental impacts in these urban districts. In these under-serviced urban areas poverty reduction is the primary issue and the necessary establishment of acceptable living conditions induces an increase in resource consumption and energy production. Higher density is therefore not the only indicator for sustainable urban structures.

4.1 Common Spatial Framework based on Urban Typologies

Sustainable urban development requires different strategies for different settlement types, because spatial planning concepts are very dependent on the particular local urban context. Different settlement types will have different implications for achieving sustainability of settlement and housing structures. Different discipline-specific methodological approaches to the ‘urban environment’ require a commonly accepted spatial working basis, which can ensure that the resulting heterogeneous investigations can be trans-disciplinarily integrated by using an adequate spatially explicit classification. The housing-related ‘urban typology’ provides a uniform methodological and spatial framework for the different tasks within the interdisciplinary network of the research project. Housing-related urban development decisions require a rational characterisation of urban structural landscapes according to structural efficieny indicators leflecting the degree of compactness of housing areas in HCMC. The typology approach ensures that data integration of different sources (remotely sensed, field-based, survey-based and map-based) with their original specific spatial/temporal resolutions and thematic contents can be operationally integrated in the GIS environment of the research project.

Settlement and housing types in HCMC are not uniform. Understanding these different types in HCMC therefore becomes crucial to the urban planning debate in this metropolitan region. Building HCMC-specific urban typologies should be centred on the definition of settlement types according their compactness. To distinguish different settlement types it is important to define, based on urban form specific indicators, the core information layers that can help to differentiate one settlement from another.

Because of the difficulties of separating settlement and housing typologies in HCMC they are used in an integrated manner, to accept the complex nature and continued transformation of urban typologies in HCMC.

It is therefore not the primary goal to develop a general definition of settlement and housing typologies in HCMC. Rather, an analysis of the sustainability of urban typologies in a relatively representative model of different settlement and housing types is needed to assess the problems of different urban settlement and housing structures. Urban typologies can provide a tool for the structured and representative analysis of settlements in HCMC with its different components, of which housing is an important one.

Housing Typology	Description	Height (Storeys)	Block Size (Shape)	Street-Network	Built-up Ratio	Location	Housing Mix (Types)	Mixture of Usage (Res/So/Com)
Shophouse								
Type A	Shophouses on the border (street-orientated) of a slum area	1-3	large	irregular	medium	Inner-City	medium	medium (shops in the outside borders)
Type B	Medium-sized blocks with a small inner connection only for pedestrians	2-4	medium	regular	high	Inner-City	low	high
Type C	Small-sized blocks, every plot is connected to a street	2-3	small	regular	medium	Inner-City	low	medium (basically residential use)
Type D	High-density tourist area with hotels, restaurants, agencies in shophouses	2-8	small	regular	very high	Inner-City	medium	high (basically commercial use, only some residential use)
Type E	Redevelopment site with shophouse typology for middle- to high income groups	5	small	regular	high	Inner-City, Redevelopment Area	low	medium (sometimes residential use only)
Type F	Orthogonal shophouse pattern in the periphery	1-2	medium	regular	medium	Outer Districts	low	medium
Type G	Linear street-orientated sprawl	1-2	no blocks	irregular	low	Outer Districts	medium	medium
Villas Structure								
Type A	Mainly original villa structure from the French influence	1-3	medium	regular	medium	Inner-City	medium	medium-high
Type B	Villa structure with an intense mix of other typologies	1-3	medium	regular	medium-high	Inner-City	rich	medium-high
Condominium								
Type A	High-density linear apartment blocks	5-6	small	regular	high	Inner-City	Low (plug-in in shophouse area)	medium (shops, services on ground floor)
Type B	Medium-density apartment blocks with designed public space and partly occupied by slum buildings	5-6	large, (linear row-structure)	irregular	medium	Outer Districts	medium	medium (shops, services on ground floor)
High-rise								
Type A	High-rise apartment buildings as plug-in in existing settlement structure	ca. 20	small	irregular	high	Inner-City	low	low
Type B	High-rise apartment buildings in the new development area Saigon-South	20-24	medium	regular	medium-high	New Development Area	low	medium (shops, supermarkets on ground floor)

(Source: Storch and Eckert 2007 Tab.1)

Table 5. Study Sites, Housing Typologies

4.2 Methodology - Data collection based on Housing Typologies

In general, data on the housing typologies will be gathered by examining actual study sites within the metropolitan area of HCMC. Prior to the selection of these study sites, the kinds of housing development inherent to each typology were identified.

Four representative types, so called archetypes, of residential development were generally identified (table 5):

- Shophouse (tubehouse with small lot wide) patterns,
- villas structures,
- condominium (mid-rise multiple family apartment buildings) and
- high-rise apartment blocks (up to 20 storeys high).

Based on these four housing archetypes, each of these types was conceptually divided into two subtypes to generate the housing typologies, with the exception of the shophouse structure, which was divided into seven subtypes to reflect the broad variety of these predominant settlement structures occurring in the inner-districts of HCMC. The shophouse is a building typology found throughout much of Southeast Asia. They are mostly two to three storeys high and serve both shops on the ground floor and living quarters above. In HCMC, shophouses are located predominantly in the inner-city districts. Following building-specific indicators were used to define the final housing typologies (table 5):

- Height (storeys),
- block size and shape,
- structure of the street-network,
- built-up ratio,
- location in the metropolitan area,
- housing mix and mixture of usage (multi-functionality).

These housing typologies are used to define the study sites for the data collection procedures.

4.2.1 Housing Typologies – Selection of Study Sites

Each study site represents one housing typology found within the settlement pattern of HCMC. First, these study sites were spatially defined through examination of satellite images and later verified by ground recognizance. Study Sites were selected following three primary criteria:

- archetypical representation of the housing typology;
- conformance of the shape and size of the street block arrangement to the overarching archetype; and
- correlation to pre-existing statistical and spatial data sources.

The final criterion was included to simplify the data collection process during the initial phase of the research programme, where all available data required for the multi-layered approach should only be aggregated to reflect the typology-driven accepted common spatial framework. Out of this process, a first requirement for thirteen study sites was realized (table 5).

Up to four study sites are selected for each of the housing typologies. Each study site is selected to represent one housing typology found within the neighbourhood pattern on district level. The physical boundaries of the housing typologies are defined by street blocks. The study site is embedded within the surrounding urban fabric of the neighbourhood pattern. Data collected from the Study Sites for the representing housing typology will be used to formulate scores for sustainability based on the multi-layered approach. The neighbourhood pattern is represented as a puzzle, in which the separate housing typology pieces fit together to form the complete picture of settlement developments in HCMC.

5 TYPOLOGY BUILDING BASED ON SUSTAINABILITY INDICATORS

The proposed concept represents an interpretative method to integrate the physical aspect of housing developments with the socio-economic and environmental-related information of built-up areas (table 6), based on the concept of urban typologies. The typology-based approach allows a (scientific) trans-disciplinary identification of core indicators for the spatial information system. Because indicators used should reflect the housing-related sustainability issues that the urban typology is seeking to address, a layering of indicators is the most useful approach. It appears to be consensus that a useful urban typology must combine a range of different indicators.

The indicators used to formulate the urban typology are predominantly focused on housing structures and settlement pattern (Flood 1997), with environmental capacity/sensitivity and socio-demographic and economic characteristics also being included. This has led to a multi-layered typological approach (table 6) in which urban typologies to highlighting the major aspects of sustainable urban development can be identified. The framing of these factors was based on a set of requirements drawn from international descriptions of the characteristics of a sustainable settlement as measured by the described indicator conceptions.

This multi-layered approach reflects that the livelihood of the neighbourhoods in general is dependent on the combined effect of a range of sustainability-related factors, rather than the presence or absence of single aspects of urban sustainability. To assess the sustainability of urban settlement developments, four different layers must be analysed (table 6):

- The physical structure – how the settlement with its form of the built environment is related with the different parts of the city, responds to the topographic situation and is integrated within the natural environment.
- The urban environmental land-use patterns – spatial environmental sensitivity indicators offer the capacity to assist the identification of areas where housing-related development impacts require careful consideration (Bouland and Hunhammar 1999).
- The use patterns – are described by the public provision of urban infrastructure and services, which defines the way the settlement uses its resources and the impacts on the urban and regional natural environment.
- The social system – how the settlement provides opportunities for an acceptable quality of life to their residents.

The data collection is based on two sources: a GIS survey of pre-existing statistical data aggregated on street block level and ground reconnaissance. The indicator-related data collection was chosen on the basis of the four layers establishing the multi-dimensional housing typologies: housing structure, urban land-use pattern, housing-related infrastructure services and socio-demographic characteristics.

The main task of the multi-layered typology approach is to illuminate the connection between patterns of housing development and the sustainability of the metropolitan region of HCMC. The data collection for the housing typologies has to be distilled into four factors. These four layers were selected to reflect sustainable spatial planning research that has evolved in response to an increased concern about the environmental, social and economic costs of continued unsustainable urban development. Urban sustainability goals generally state that all residents have the right to clean air, safe water and affordable housing. This means communities should be designed to reduce dependence on private modes of transport; to protect the functioning of streams, sensitive natural areas and resources; and to foster an acceptable quality of life for residents.

These features are jointly influencing sustainability factors such as: commuting behaviour, housing affordability, the formation of social ties and job opportunities, and the efficiency of the use of land and natural environmental resources in general. The layered approach of housing typologies helps to indicate how successful each typology is in achieving these goals.

Clearly, the structure and arrangement of housing areas are factors influencing urban sustainability. Recognition of this connection makes it possible to re-evaluate the housing development pattern as a fundamental determinant in the formation of urban sustainability, because, if replicated on multiple sites, the housing development pattern becomes an integral part of the urban fabric of HCMC. The sustainability of each housing development helps to determine the ultimate sustainability of the urban region. Urban sustainability is strongly influenced by the choices that are made about the housing types to build.

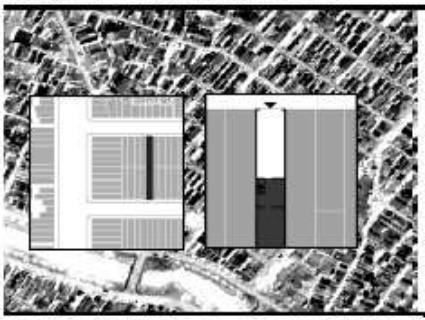
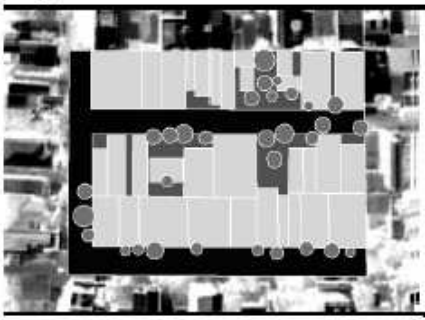
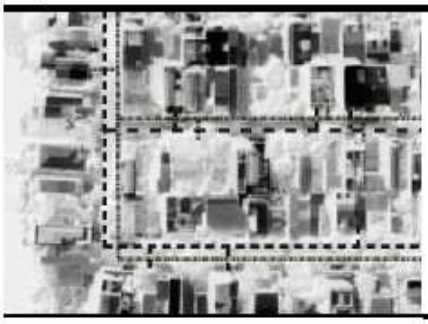
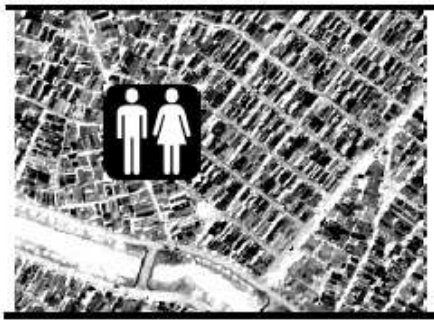
Layer 1 – Physical Structure	*Housing Structure*	
	Compactness (Density + Structure)	**Floor area, Height (storeys)**
		Built-up ratio,
		Block size and shape
		Structure of the street-network
		Location in the metropolitan area
		Multi-functionality / mixture of usage
	Informality	**Informal Settlement rate**
	Accessibility	**Low income people accessibility to housing**
Layer 2 Urban Land Use	*Urban/Environmental Land-use Pattern*	
	Land resource	**Land use structure**
	Green area	**Green area (trees, grass, waters)**
	Community space	**Community space**
	Green areas	**Distribution of green areas**
	Underground water	**Quality of underground water**
		Intensity of exploitation
	Surface water	**Quality of surface water**
Layer 3 – Use Pattern	*Public Infrastructure Services*	
	Sanitation (Accessibility)	**Clean water supply**
		Sewage system
		Waste collection system
	Water pollution	**Volume/ Treatment of wastewater**
	Disposal/Collection	**Domestic waste generation/collection**
	Treatment	**Volume of treated waste**
	Transportation modes	**Density/ Ratio/ Efficiency of public transportation**
	Energy	**Consumption of energy**
Layer 4 – Social System	*Social Sciences and Human Geograph*	
	Density	**Population density**
	Population change	**Migration/ Natural growth rate**
	Economic structure	**Income**
	Poverty	**Population living below poverty line**
	Unemployment	**Unemployment rate**

Table 6. Multi-layered Urban Typologies based on Sustainability Indicators.

6 DISCUSSION AND CONCLUSIONS

The concept of multi-layered urban typology looks at the housing development as a regional building block. Rather than examining the effects of housing developments on single aspects of sustainability independently, possible combinations of these aspects are explored. The goal of the data collection is to determine the relative sustainability of each housing typology. Although all of the defined housing typologies are preexisting in HCMC, the purpose of the multi-layered approach is to describe how each would function as new developments in the metropolitan area of HCMC. The results of the investigation of multi-layered housing typologies will be applied in the Sustainability Assessment of new housing developments, where urban planning administrations may combine different housing typologies to explore the implications of the resulting settlement pattern on the creation of a sustainable urban development region.

The strong spatial focus on urban typology facilitates the analyses of different housing-related environmental resource management strategies. It is important to reflect on the role of urban typologies in bringing clarity to urban planning policy and implementation. This suggests that a limited number of core indicators, based on the key planning policy issues, will be more appropriate than a broader range of detailed descriptions which results in an overly fine-grained geographical classification. This could mean that the application of urban planning policies would become fragmented, thereby negating the principle aim of typologies of defining shared opportunities and providing more consistent and transparent planning approaches.

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8 REFERENCES

Apel D, Böhme C, Meyer U, Preisler-Holl L (2000) Szenarien und Potenziale einer nachhaltig flächensparenden und landschaftsschonenden Siedlungsentwicklung. UBA-Berichte 1/00, Erich Schmidt Verlag, Berlin.

Boothroyd, P. and Pham, X.N. (eds) (2000): Socio-economic Renovation in Viet Nam. The Origin, Evaluation, and Impact of Doi Moi, Institute of Southeast Asian Studies, Singapore.

Bouland P. and Hunhammar S. (1999): Ecosystem services in urban areas. Ecological Economics 29 (2), pp. 293-301.

BTU (Brandenburgische Technische Universität Cottbus) (2007): Megacities of Tomorrow Ho Chi Minh City/Vietnam. Sustainable Housing Policies for Megacities of Tomorrow. The Balance of Urban Growth and Redevelopment in Ho Chi Minh City. BMBF-Research Programme. Website: www.megacity-hcmc.org.

Ewing R, Pendall R, Chen D (2002) Measuring Sprawl and Its Impact. Smart Growth America. Available online: www.smartgrowthamerica.org/sprawlindex/MeasuringSprawl.pdf

Flacke J (2003) Nachhaltigkeit und GIS. Räumlich differenzierende Nachhaltigskeitsindikatoren in kommunalen Informationsinstrumenten zur Förderung einer nachhaltigen Siedlungsentwicklung. In: Raumforschung und Raumordnung 3/2003 (61), pp 150-159.

Flood, J. (1997): Urban and Housing Indicators. Urban Studies 34 (10), pp. 1635-1665.

Janssen-Jansen L B (2005) Beyond Sprawl: Principles for achieving more Qualitative Spatial Development. In: DISP 41, pp 36-41.

Lo, F-C. and Marcotullio P. J.(eds) (2001): Globalization and the Sustainability of Cities in the Asia Pacific Region. New York: United Nations University Press.

Satterthwaite, D. (1997): Sustainable cities or cities that contribute towards sustainable development? Urban Studies 34(10), pp. 1667-1691.

Satterthwaite, D. (1999):The Links between Poverty and the Environment in Urban Areas of Africa, Asia and Latin America, United Nations Development Programme (UNDP) and the European Commission (EC), New York.

Steinnocher K, Tötzer T (2001) Analyse von Siedlungsdynamik durch Verknüpfung von Fernerkundungs- und demographischen Daten. In Umweltbundesamt Wien (ed) Versiegelt Österreich? Der Flächenverbrauch und seine Eignung als Indikator für Umweltbeeinträchtigungen. UBA Conference Papers, CP-030, Wien, pp 39-47.

Storch, H. (2006) Nachhaltigkeitsindikatoren als Basis von Raumtypologien - ein GIS-gestütztes Planungssystem zur Steuerung der Siedlungs- und Wohnungsbauentwicklung in Ho Chi Minh City. In: Strobl, J.; Blaschke, T. und Griesebner, G. (Hrsg.): Angewandte Geoinformatik 2006. Beiträge zum 18. AGIT-Symposium Salzburg, 645-650, Heidelberg: Wichmann. ISBN 3-87907-437-2.

Storch, H. and Eckert, R. (2007) (in print) GIS-based Urban Sustainability Assessment. In: Proceedings GGRS 2006 (Göttingen GIS and Remote Sensing Days) – Global Change Issues in Developing and Emerging Countries, Göttingen.

Environment-Related Indicators. Internet Site: http://www.ceroi.net/ind/indicat.htm

Van Duc, L., and Gupta, A. D. (2000). Water resources planning and management for lower Dong Nai River basin, Vietnam: Application of an integrated water management model. International Journal of Water Resources Development, 16(4), pp. 589-614.

Van Khoa, L. (2001): Air Quality Management in HO Chi Minh City. Department of Science, Technology and Environment. (DOSTE) of HCMC - Viet Nam. Available online: http:/www.unescap.org/esd/environment/kitakyushu/urban_air/city_report/HoChiMinh2.pdf

Van Vliet, W. (2002): Cities in a globalizing world: from engines of growth to agents of change. Environment and Urbanization 14 (1), pp. 31-40.

Weiland, U. (2001): Planning Cycle for a Sustainable Development of Urban Regions. Raumforschung und Raumordnung Vol. 59,pp. 392-401.

Wrbka T, Peterseil J, Szerencsits E (2001) Versiegelung, Zersiedelung, Zerschneidung und Fragmentierung – „Neue“ Indikatoren für die Belastung Österreichischer Landschaften? In: Umweltbundesamt Wien (ed) Versiegelt Österreich? Der Flächenverbrauch und seine Eignung als Indikator für Umweltbeeinträchtigungen. UBA Conference Papers, CP-030, Wien, pp 79-96.

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Where are the poor? A disaggregation approach of mapping urban poverty

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ABSTRACT

In this paper, we highlight an approach for mapping indicators of poverty. The main drive for developing such an approach is to address the neglected aspect of the spatial dimension of poverty since in most cases the indicators chosen for poverty rely on household data. Such data if spatially analyzed are usually aggregated to administrative units such as neighbourhoods or wards. Therefore the spatial heterogeneity within the administrative unit is hidden. For target interventions, detailed spatial information is needed on poverty as a multidimensional phenomenon at a disaggregated level.

The study shows an approach to address the neglected aspect of the spatial dimension of poverty, based on a case study of the city of Cebu in the Philippines. It is integrating locally available datasets on poverty relevant issues from several municipal departments with information extracted from a recent very-high resolution satellite image. The indicators identified and mapped are dwelling size, building density, lack of proper road network, poor structural quality of buildings and access to water and sanitation. Analysis is done at both disaggregated and aggregated levels (using data from the census) to demonstrate how data aggregation can hide spatial variation of poverty but also to examine the robustness of the selected spatial indicators.

The results at the disaggregated level clearly locate poverty areas and show that the nature of poverty varies among those areas. For some areas, the main issue is e.g. structural quality of buildings, while for others it is either access to proper sanitation and/or access to water supply. This approach has potential by using locally available datasets in combination with satellite image data to provide spatially detailed information usable for both planning and monitoring poverty intervention.

1 INTRODUCTION

To eradicate extreme poverty is one of the Millennium Development Goals (MDG's), the target is to halve the proportion of people whose income is less than one dollar a day, by 2015 (UN/DESA, 2006). Presently, more than a billion people in the developing world live on less than one dollar a day, with an increasing number and proportion of poor people living in urban areas. Even though efforts are made to localise urban poverty in many developing cities, the scarcity of relevant data, coupled with lack of both human and financial resource for data collection and analysis is a significant constraint to target interventions.

Traditionally approaches of measuring poverty have been focusing on income and consumption (monetary dimension of poverty), while recently poverty is understood as a multidimensional phenomenon focusing on multiple sources of deprivation in poverty areas (Martinez-Martin, 2005). Those areas are characterized by overcrowding, insufficient water supply, sanitation and infrastructure, problems of health and nutrition, limited access to education, as well as insecurity, exposure to hazard, deficient social relations, etc (Turkstra and Raithelhuber, 2004). As a multidimensional phenomenon urban poverty is also spatially heterogeneous since poor people tend to be clustered in specific places. Therefore it is important to capture the spatial heterogeneity and the substantial variation of poverty areas to know better where the poor are and how they are distributed throughout the city. Targeting of the poor depends significantly on how poverty is conceptualized, measured and analyzed within a specific local context. To be able to locate the urban poor and adequately profile them for target intervention requires defining, identifying and understanding areas of poverty not only on their commonalities but also on their diverse characteristics in terms of social, economic and physical conditions in a local context.

In principle, there are three main approaches of analysing poverty depending on the availability of data (Zeller et al., 2006), namely the construction of a poverty line, rapid appraisal and participatory appraisal methods or construction of a weighted poverty index (combining qualitative and quantitative indicators).

In most countries if spatial analysis of poverty is done it is at national, city or district level. This aggregation of data hides the stark contrast of income and living conditions between better-off urban citizens and the urban poor and overlooks pockets of poverty areas within the city (Hall et al., 2001). In recent years, poverty mapping, which is a powerful new information analysis and communication tool, has come into prominence and is bridging this gap in provision of the required spatial information. A variety of methods to spatially locate poverty has been developed e.g. small-area estimation (combining census and survey data for disaggregated geographic units such as municipalities), multivariate weighted basic-need index (disaggregating poverty using statistical techniques such as principal components), combination of qualitative information and secondary data (e.g. mapping poverty based on livelihood strategies), extrapolation of participatory approaches (incorporating local perception of poverty), direct measurement using household-survey data or census data (Davis, 2003).

One recent study presented by Baud et al. (2006), shows the relevance of a mapping urban poverty on sub-city level in Delhi (India), comparing the different wards by conceptualizing poverty by an index of multiple deprivation. The potential of recent very-high resolution satellite images (providing spatial resolutions of less than one meter) to disaggregate poverty further than to administrative levels of neighbourhood or wards has been explored by Lemma et al. (2006). Very-high-resolution satellite images supported by local knowledge, field observations and available local data can provide information on the location of poverty areas. The integration of these datasets in a GIS can generate a wealth of information on urban poverty. The advantage of such an approach is that it is locally generated, and thus easier for institutional embedding. Further, the use of very-high resolution images as backdrop images for 'putting the poor on the map', is an important aspect for gaining political support and communicating results to non-technical audiences at the local level (Turkstra and Raithelhuber, 2004).

2 BACKGROUND

Cebu City is located on the central eastern part of Cebu Province, an island at the centre of the Visayas in Southern Philippines and is the capital of the province as well as of the Central Visayas region. Based on the last population census conducted in 2000, the city had a total population of approximately 700,000. As Figure 1 shows, Cebu City is subdivided into 80 barangays (smallest administrative unit, similar to wards), 49 urban barangays where the majority of the population lives and 31 rural barangays (the later study focuses on 12 centrally located urban barangays).

High development pressure as a consequence of economic growth during the last decade has dislocated the urban poor into overcrowded and hazardous areas. It is pertinent to note that the concept of poverty in Cebu is viewed differently by the urban poor and the policy and decision makers. According to the study conducted by Etemadi (2001), the urban poor view poverty as deficiency in income, living conditions, access to basic services and resources, and working conditions. While policy and decision makers view the urban poor as the 'homeless and landless' even if they have earnings. As a consequence the main thrust of the policy and decision makers, is providing services and assistance whenever there is an incidence of demolition (Etemadi, 2001).

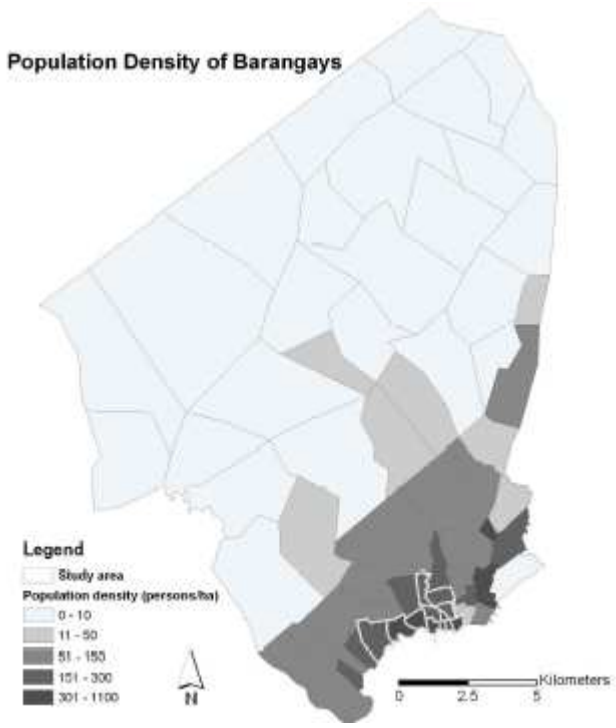

Figure 1: Population Density in Cebu

The Division for the Welfare for the Urban Poor (DWUP) has the mandate to provide adequate housing facilities, such as the socialized housing facility to the urban poor and ultimately relocate them from hazard zones of the cities. The poor however are required to organize themselves into cooperatives associations known as the Homeowners Associations (HOA). There are about 600 of these Homeowners Associations in Cebu City. The DWUP usually stimulates the formation of these associations in order to provide them with assistance in the form of:

- Assisting the HOA in case of eviction actions taken by landowners.
- Buying land for the HOA, for onsite settlement or land resettlement (mostly into fringe areas). In these cases the households are required to pay for the land in installments.
- Playing a leading role in providing basic services to the sites acquired.

Most of the poverty areas in Cebu are located on low-lying pieces of land squeezed between subdivisions and factories in highly polluted industrial areas. In some cases the areas are so crowded that some dwellings have been extended unto the water surface along the coastline. In most of the areas basic services like potable water supply, sanitary facilities and proper road network are almost non–existent. The structural quality of most dwelling units is poor and can be deemed shanties.

In general there is tremendous lack of public

spaces. Poverty areas have very high population and building densities. The density is usually greater than 60 households per hectare. Plot and dwelling size is usually below the minimum requirement of 36 and 25 square meters respectively. Detached buildings do not comply with the legal set back requirements of 1.5m set back side distance and 3m set back front distance. However, recognizing that urban poverty is a major problem facing the city, the Cebu city government has become one of the most active local government units in the Philippines dealing with this phenomenon.

Characteristics of poverty areas (pockets of poverty) in Cebu:

- Located on low-lying land (unto water surface) and near industrial areas.
- Overcrowded areas with high densities with lack of public space.
- Plot and dwelling size below the minimum requirement.
- Insufficient basic services - potable water supply, sanitary facilities, roads.
- Shanties makeshift structures (‘barong-barong’) with non compliance to building regulations.

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Figure 2: Characteristics of poverty areas in Cebu

3 METHODOLOGY

Acquiring comprehensive information on the spatial location of pockets of poverty, reflecting their heterogeneity requires the integration of multiple data sources. We employed group discussions with local experts and stakeholders to develop a list of indicators of locating pockets of poverty, as well as obtaining a good overview of locally available data to support their implementation. The group discussions were held with the Chief Planning Officer and other senior personnel of the Planning Department, the coordinator of Division of Welfare for the Urban Poor, a senior official of the National Statistical Office and the community leader of the Basak San Nicholas Sitio Pandayen Homeowner Association. Based on the group discussions the following list of indicators for identifying pockets of poverty has been developed (see table 1).

Role	Domain	Indicator	Measure	Data Source
Identifying pockets of poverty	Urban morphology	• Lack of proper road network	• Irregular patterns/ absence of accessible roads to vehicle traffic (e.g. 5m access roads)	Visible image interpretation (QuickBird 2005)[1]
		• Building densities	• Crowding of buildings – more than 90% of roof coverage	
		• Small dwelling size	• Roof area of building (less than 25m^2)[2]	
		• Poor structural quality of buildings	• Building material of roof (mostly corrugated iron sheets)	
	Location	• Natural hazard zones	• Location of flood prone areas • Location of dry hydrants	Records of HOA[3] (2003), dry hydrants and past flooding events (2005)
		• Location in poverty area	• Location of Homeowner Association (HOA)	
Analysing diversity	Living Conditions	• Access to water & sanitation	• Water point connections • Availability and type of toilet facility	Watsan Dataset (last update 1998)

Table 1: Disaggregated indicators of poverty pockets

The first group of indicators is the basis for identifying pockets of poverty and the second group (living conditions) is reflecting the diverse characteristics poverty. Optimally more indicators could have been developed for reflecting the diversity of poverty (using e.g. social dimension) but the employed indicators are understood as examples to combine spatial disaggregation with an analysis of poverty as a multidimensional phenomenon. For identifying the visible-morphological characteristics the main data sources was a very-high resolution satellite image (QuickBird 2005). However, since not all the characteristics of these areas are visible from space, data have been collected from other sources, namely flood records, location of HOA and dry hydrants. Field observation was also an important source since it could validate the data collected from the other sources. Data used for analysing differences in living conditions of the identified pockets of poverty was a dataset containing information regarding water connection and the availability of toilet facility of households (Watsan[4]).

The indicators were compared and analyzed with two indicators (namely dwelling size and structural quality of dwellings) derived from the census database (2000) on aggregated data at barangay level to determine whether there is any correlation. The statistical data were used to determine whether the barangays with a larger coverage of poverty pockets (at disaggregated level) have also a higher number of small buildings (below the minimum requirement) or higher number poor structural quality of buildings.

[1] Pan-sharped multispectral image of 0.7m spatial resolution.

[2] The 25m^2 threshold was defined based on information from the Planning Department regarding the non-compliance of most dwellings in poverty areas satisfying the minimum standard of 25m^2.

[3] Database of the Division for the Welfare for the Urban Poor of registered members of HOA. Dataset is so far not used to analyse poverty within the City. During the group discussion the potential of utilizing this dataset was identified as the majority of urban poor are organised into HOA. Besides the location of these areas, the dataset give information on socio-economic characteristics.

[4] Main drawback of this data is the temporal difference as well as it is not covering the entire study area (2 barangays are not covered).

3.1 Identifying pockets of poverty

Interpretation of indicators based on scale

Scale	Interpret. element	Indicator	Nature of indicator
1:8,000	colour	Appearance of roof materials	Very visible
	texture	Extreme clustering of buildings	Very visible
	size	Small dwelling size	Not clearly visible
1:1,200	pattern	Irregular layout	Very visible
	size	Small dwelling size	Visible but most areas are heterogeneous

Table 2: Image interpretation elements

Pockets of poverty can be located on a QuickBird image by describing typical characteristics based on colour, texture, size and pattern (Lemma et al. 2006). Based on these interpretation elements the characteristics of the poverty pockets visible on the image, are:

- Irregular layout pattern – inability to observe formal road network within settlements and non – visibility of access roads or footpaths,
- Extreme clustering and continuous roof coverage of buildings (texture), greater than 90% roof coverage,
- Small size of buildings – of less than
- the stipulated required 25 m²,
- Tabl e 2: Image interpretation elements
- Bluish-grey appearance of roof materials of the clustered buildings (colour).

These visible characteristics were used as criteria in identifying the poverty pockets. They are easily observable on a satellite image depending on the display scale. At different scales, the indicators have their strengths and weaknesses. For instance, the characteristics of colour and texture – the bluish-grey appearance of roof materials and the extreme clustering of buildings are good indicators at a scale of 1:8,000. On the other hand, the characteristic of pattern – irregular layout and non–visibility of access roads or footpaths are better indicators at a large scale such as 1:1,200.

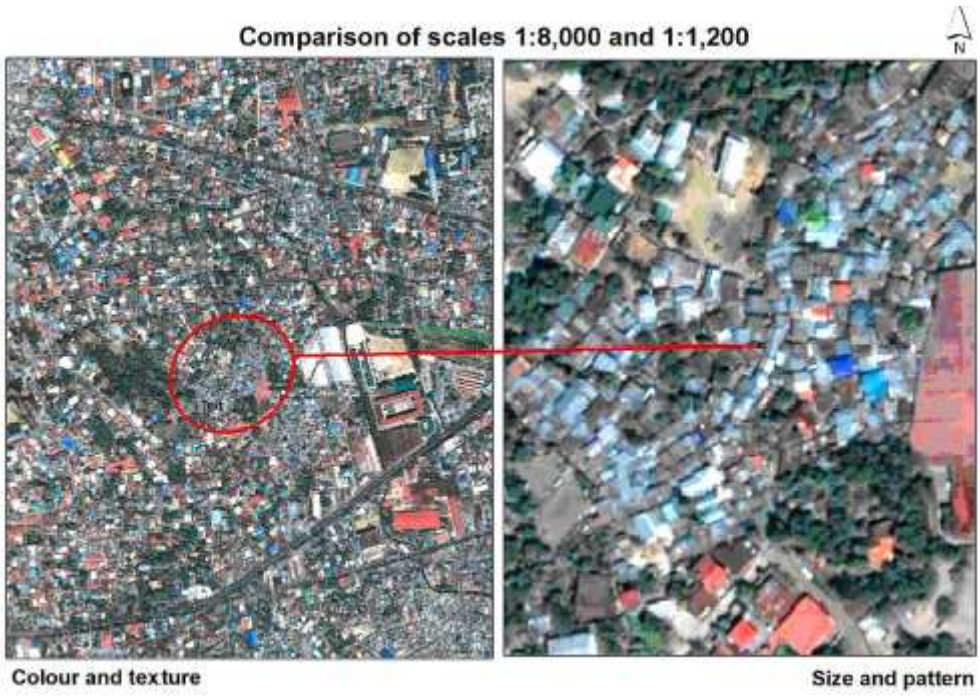

Figure 3: Comparison of indicators at different scales for a poverty pockets in Cebu (QuickBird 2005)

The small size of buildings tends to be a fuzzy indicator at both scales. At the smaller scale small buildings are not clearly visible on the satellite image. At the larger scale it is somewhat difficult to clearly distinguish pockets of poverty pockets based on small size of buildings since no areas can be classified as totally homogeneous. Any particular block or area within the city contains buildings with different sizes. Considering these strengths and weaknesses, visual interpretation was therefore be done at two levels of visibility, one at a scale of 1:8,000 and then at a larger scale of 1:1,200.

The delineation of the poverty pockets was done by on-screen digitizing. To facilitate digitizing, specific interpretation guidelines were employed. Firstly, the minimum size of a poverty pockets had to be established. In exploring the Homeowner Association (HOA) records, it was found that they have none less than 7 structures for one specific location. Using this as reference in combination with the average dwelling size of 14 m², a minimum of approximately 100 m² was established as minimum mapping area. Secondly, in order to assist with the interpretation, available data layers of the major roads, rivers and barangay boundary were overlaid on the satellite image.

Not all spatial indicators are visible on the image, thus further supporting indicators have been used on e.g. the location of hazards zones. For the indicators not visible from the satellite image, data on these indicators is extracted from the following datasets:

- Flood prone areas: Point locations of previous flooding events, such areas are mostly occupied by the poor, since they tend to occupy land that is prone to environmental hazards such as floods.
- Dry hydrants: all records of outlet points. These outlets are located in very high density areas inaccessible to emergency vehicles such as the fire engines. Such areas are mostly areas with poor living conditions.
- Location of HOA: The HOA capture the poor that organised them in Homeowner Association.

3.2 Analysing diversity of poverty pockets based on living conditions

In order to analyse differences between the identified pockets of poverty two measures that indicate differences in living conditions were selected, namely access to water and sanitation. The data were retrieved from the Watsan dataset. The records enable to identify households with no toilet facility and records with water source far from house, e.g. open wells whereby households must get water by container, this type of water source has also possible contamination. They are classified as households without piped water. Notwithstanding the possible geometric inaccuracy5 of the point data selected, the clustering of the points at

previously defined pocket of poverty (on the QuickBird image) give evidence of two aspect of the diversity of living conditions between the pocket of poverty.

3.3 Census data to indicate poverty levels on aggregated units

In order to analyse the robustness of the selected indicators for identifying pockets of poverty, there was need to compare the results with available data from the census that provide information on poverty. Since dwelling size and structural quality of buildings were selected previously as indicators, data on these indicators were accordingly extracted from the census. The census data is aggregated at the level of the barangays. The data on dwelling size was available in interval range and not by absolute numbers. Therefore all records of dwelling size were selected for the barangays under study within the interval ranges of 0-9 m² and 10-19 m². Records of dwelling size within the interval range of 20-29 m² were not selected since these will include dwellings above the minimum requirement of 25 m², which is not defined as a characteristic of poverty pockets.

When overlaying the data on the QuickBird image the points did not accurately overlap with the buildings visible on the image.

4 DISCUSSION OF RESULTS

For implementing the set of indicators, 12 centrally located urban barangays were selected (see figure 1). Based on the interpretation guidelines suspected areas of poverty were delineated. But, visual image interpretation could not determine ultimately whether these areas are occupied by poor households. Further evidence was needed to verify this classification, using locally available data sources. The location points of HOA, dry hydrants, flood prone areas greatly facilitated data extraction of the pocket of poverty. Figure 4 illustrates the clustering of the locations of the Homeowners Associations, the dry hydrants and the flood prone areas and locations identified from the image interpretation using the morphological indicators.

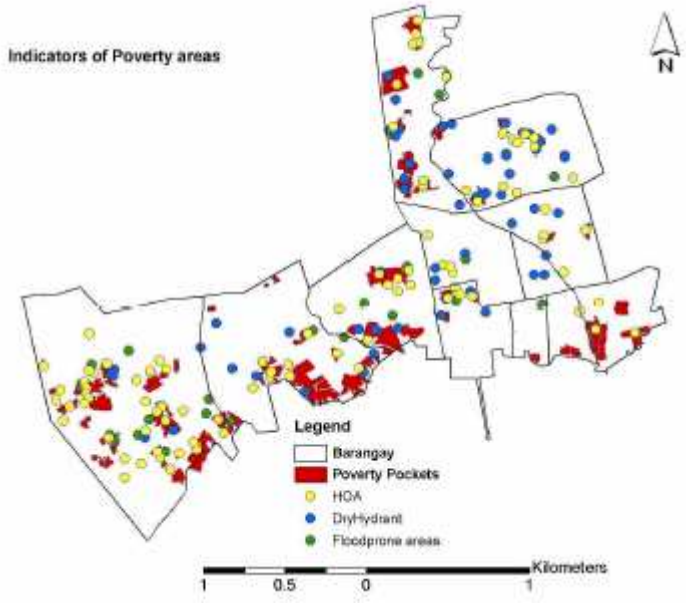

Figure 4: Pockets of poverty combining results of the visual interpretation with locally available data sources

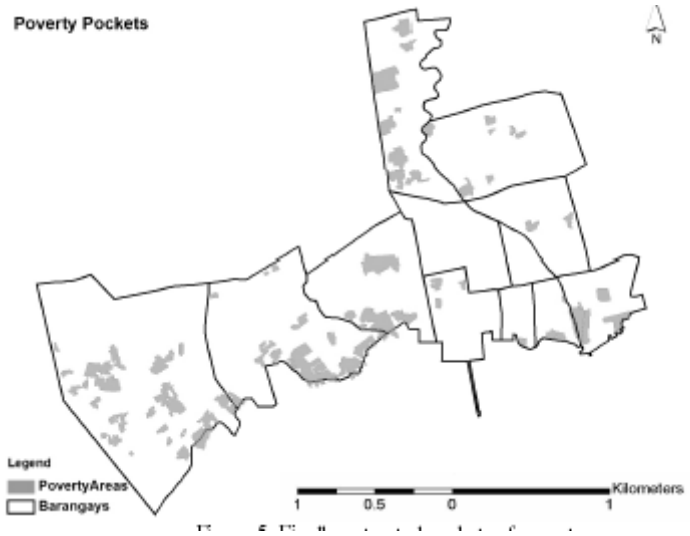

Figure 5: Finally extracted pockets of poverty

The selected data (figure 4) represent characteristics of the poverty pockets in terms of their location, density and vulnerability to environmental hazard. The data was then filtered to select only those areas equal or greater than 100m². As a consequence some areas on the map (see figure 5) where there are no poverty pockets, but there are some clustering of data, are those polygons of less than 100m². The total number of poverty pockets is 84 and accounted for 52.5 ha (12%) of the total land area of the barangays under focus. The smallest area is 0.01 ha while the largest is 3.3 ha.

For further analysis at a disaggregated level, the data were integrated with the Watsan data since this data is at the level of households and is able to provide both spatial and aspatial information on households' characteristics. The major limitation of using the Watsan data was the time difference and incompleteness of the dataset (two barangays were not covered by the dataset). In analysing the issue of water and sanitation the Watsan data was extracted according to households:

- Households (HH) without piped water.
- Households (HH) without toilet.

This distinction had to be made to give a better overview of the living conditions in the identified poverty pockets, using the important aspect of water and sanitation. Analysing the first category, the percentage of households without piped water located within the poverty pockets is 16%. The poverty pockets with the most households without piped water were found in the barangays of Basak San Nicholas and Mambaling with 88% and 38% respectively (see table 2).

Pocket ID	Barangay	Area in ha	% HH without piped water	% HH without toilet	% HH without water & toilet	Remarks
38	Basak San Nicholas	0.38	87.5	25.0	42.9	Most HH without piped water
62	Pasil	0.28	2.3	74.4	0.0	Most HH without toilet
63	Pasil	0.29	1.6	66.4	0.0	Most HH without toilet
72	Mambaling	0.35	19.8	98.0	39.6	Most HH without toilet
77	Mambaling	1.44	38.0	30.5	42.4	Most HH without piped water

Table 3: Poverty pockets with most problematic living standard

Figure 6: a) Households without piped water b) Households without toilets in poverty pockets

In analysing the second category which is based on proper sanitation, the percentage of households without toilet located within the poverty pockets is 25%. Comparing with the results of the first category the problem of sanitation is more widespread. The poverty pockets in Mambaling and Pasil have the highest percentages with 98%, 74% and 66% respectively (see table 2).

At an aggregated level of the barangay comparison with the census data for some indicators used at disaggregated level is possible. The poverty polygons were summarized according to barangays and the % coverage of poverty pockets was then calculated for each barangay to determine which barangay has the highest coverage of poverty pockets.

Barangay Name	Census Data		Disaggregated Analysis
	% of small buildings	% of makeshift materials	% poverty pocket
Pahina San Nicholas	33.7	3.6	0
San Nicholas Proper	7.1	1.5	0
Pahina Central	33.0	0.2	2.8
Suba Pasil	36.9	1.4	2.9
Sawang Calero	36.9	2.4	3.7
Sambag I	16.3	0.8	3.8
Basak San Nicholas	29.5	1.2	12
Calamba	24.8	3.6	17.2
Mambaling	47.3	0.7	18.7
Duljo	27.0	1.5	19.2
Pasil	35.7	0.1	19.7
Ermita	52.8	15.2	27.3

Table 4: Comparing aggregated with disaggregated data

The comparison of poverty levels in table 3 based on the census data and the located pockets of poverty show a moderate correlation of 0.5 in both cases (‘% of small buildings’ and ‘% of makeshift materials’ compared with the ‘% of poverty pockets’). The moderate correlation of the data can be explained by several reasons, from the census data only dwelling of less than 20m² were derived while using for the visual interpretation 25 m². Another reason can be attributed to the time difference of 5 years (between the census and the satellite image). For the barangays of San Nicholas Proper and Pahina San Nicholas no poverty pockets have been delineated, while the indicators derived from the census point to poverty which is not spatially clustered. Poverty is most pronounced in Ermita, having 27% of the area delineated as pockets of poverty as well 53% of substandard housing size and 15% substandard housing quality.

The census data provide a general indication which barangays are on average more effected by poverty relevant issues, while spatial variation within them is hidden. Using the employed set of indicators pockets of poverty could be detected leaving out poverty which is not spatially clustered.

5 CONCLUSIONS

The main thrust of this study was to develop an approach for mapping spatial indicators of poverty at a disaggregated level to make spatial heterogeneity within administrative unit visible. To support such an analysis, detailed spatial information is needed on poverty. A set of indicators was developed with the assistance of local experts and stakeholders reflecting poverty aspects of morphology, location and living conditions. Indicators related to morphology and location were used to find pockets of poverty while indicators on living conditions gave insights into the diversity of these areas.

The analysis of morphology was operationalised by indicators on size of dwellings, density characterised by the extreme clustering of roof coverage, lack of proper road network characterised by irregular layout of settlements and non-visibility of access roads, poor structural quality of buildings regarding roof material. These indicators were analysed using a very-high resolution satellite image. The criteria used on the image were based on the interpretation elements of colour, texture, pattern, shape and size. The other relevant datasets to assist in the identification were the point locations of the Homeowners Associations, dry hydrants and flood prone areas. The integrated datasets could provide detailed spatial data for identifying poverty pockets.

The results of data analysis at such a disaggregated level have shown where the critical poverty areas are located and identified critical issues of sanitation and access to water supply affecting these areas. The critical issues identified showed clearly that poverty is multidimensional in nature. The analysis could indicate the barangays with the highest percentage of poverty pockets (e.g. Ermita with 27% of poverty pockets) but also localise specific pockets of poverty with very critical living conditions. Such critical living condition could be e.g. localised in two areas within Basak San Nicholas and Mambaling which had the highest percentages of 43% and 42% respectively for households without water and toilet, were the main issue is water supply and to a lesser extent sanitation.

Analysis based on the data integration and correlation of the results at the disaggregated and aggregated levels gave credence to the fact that spatial variation can be hidden when data is aggregated. The results of the data analysis at the aggregated level have proven the robustness of the selected indicators in analysing poverty at the disaggregated level when comparing the percentages at the two levels. However, from the analysis it was apparent how aggregation can mask variation of poverty within the barangays since, poverty can be not localised and is averaged within one barangay. The specific areas (pockets of poverty) and their spatial extent were clearly visible at the disaggregated level. The combination of both, analysing poverty relevant indicators on administrative sub-city units in combination with localising the specific pockets of poverty has good potential to assist in better targeting interventions.

6 REFERENCES

Baud, I.S.A., Sridharan, N. & K. Pfeffer: Mapping urban poverty for local governance in an Indian mega-city; the case of Delhi. Working Paper 1 for IDPAD project New Forms of Urban Governance, presented at the New Delhi Conference of the Project of New Forms of Urban Governance, June 2006. Davis, B.: Choosing a Method for Poverty mapping. Food and Agriculture Organization of the United Nations. Rome, 2003. Etemadi, F.: Towards Inclusive Urban Governance in Cebu. Working paper 25 on Urban Governance, Partnership and Poverty. University of Birmingham, UK, 2001. Hall, G. B., Malcolm, N. W., & J. Pinowar: Integrating Remote Sensing and GIS to detect Pockets of Urban Poverty: The case of Rosario, Argentina. Transaction in GIS, Vol. 5, No. 3, pp. 235 – 253, 2001. Henniger, N. & M. Snel: Where are the Poor? Experiences with the Development and use of Poverty maps. World resources Institute, Washington, D.C., USA and UNEP/GRID. Arendal, Norway, 2002. Lemma, T., Sliuzas, R. & M. Kuffer: A participatory approach to monitoring slum conditions: an example from Ethiopia. IIED: Mapping for change: practice, technologies and communications. Participatory learning and action, No. 54, pp. 58-66. London, UK, 2006. Martinez-Martin, J.: Monitoring intra – urban inequalities with GIS-based indicators: with a case study in Rosario, Argentina. Utrecht University, Utrecht, ITC, Enschede, Netherlands, 2005. Moser, C. O.: The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies. World Development, Vol. 26, No. 1, pp l-19, 1998. Turkstra, J. and Raithelhuber, M.: Urban Slum monitoring. ESRI Conference Paper No. 1667, available online: http://gis.esri.com/library/userconf/proc04/docs/pap1667.pdf, 2004. United Nations Department of Economic and Social Affairs (UN/DESA): The Millennium Development Goals Report, available

online: http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2006/MDGReport2006.pdf. New York, 2006. Zeller, M., Sharma, M, Henry, C. & C. Lapenu: An Operational Method for assessing the poverty Outreach Performance of Development Policies and Projects: Results of Case Studies in Africa, Asia and Latin America. World Development Vol. 34, No.3; pp. 446-464, 2006.

Digital Platform for Collaborative Urban Landscape Design using Google Earth

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1 INTRODUCTION

Japanese local authorities have become focus on urban design issues than before along with the enforcement of Landscape Law of Japan in 2005. At the same time, people became aware of the lack of regionality in individual cities and their desire for creating beautiful country.

Urban design is not only the work of assembling design elements for making up aesthetic quality but also the process for creating the livable and sustainable community. Further, design process involves a lot of bodies and citizens, therefore, the common platform is needed to share the urban forms and environmental impacts.

Information technology is expected to encourage visualizing imaginary urban space and invisible environment issues which appear in the design process. Google Earth could be a useful platform for those purposes. It is free, downloadable and easy to navigate virtual urban space. This paper shows an implementation process of Virtual Fukuoka in Google Earth, a seamless digital platform for urban landscape design.

2 SPATIAL DATA COLLECTION

2.1 Case Study Area

A case study is done in Fukuoka City Japan, the eighth largest city, situated in the island of Kyushu, Japan, where the authors' parent research unit has been collecting huge stocks of 2D/3D spatial data for landscape research. They consist of digital maps, digital terrain models, aerial photos, landuse data, ecological maps and others which cover the entire area of the city approximately 329 sq. kms. Fukuoka city faces Genkai Sea to the north and is surrounded on three sides by mountains. Those natural geographic factors contribute to bring city diversified scenic as well as the modern urban landscape of downtown, waterfront and other new development sites in the inner area of the city.

2.2 Maps, Models and Database

2.2.1 2D maps and database

Digital maps from 1/2,500 to 1/25,000 are stored, mostly ESRI shape file format, in GIS system. Large scale base map is originally surveyed by 1/2,500 and layered into boundary line, building footprint, building plot, road and railway line. The existing landuse data which has 15 categories such as residential area, commercial area and others defined by the legal guideline is linked to each building site shown in Fig.1. In addition, other thematic maps such as ecological map, vegetation map, geologic map are drawn as results of specific analysis and field survey, and then stored into GIS.

2.2.2 3D models

Google Earth can show 3D buildings by original setting in Fukuoka City. But those shapes are simply expanding building footprint to the vertical direction with the height of the number of building stories multiplied by uniform floor height. But the building forms are more complicated and the floor heights vary by each building and floor, thus, we use the MAPCUBE data, developed by Pasco, Increment P and CAD Center, Japan.

Mapcube is a set of three dimensional models of the buildings and other structures based on the DSM (Digital Surface Model) derived from LiDAR (Laser imaging detection and ranging) data. Object data of the buildings are stored in the Wavefront OBJ format files and some buildings known as the landmarks in the city have their surface texture stored in the MTL format files. Figure 2 left shows the DSM data of the central Fukuoka city and the right figure shows the 3D buildings on the DTM data.

2.2.3 Other data

MAPCUBE also provides DTM (Digital Terrain Models) in the Wavefront OBJ format. The resolution of DTM data is 2.5m whilst Google Earth has 30m resolution DTM data collected by NASA's STRM (Shuttle

Radar Topographic Mission). The orthographic photo images are scanned by 1/2,500 color and stored in 1,000m x 50m quadrangle unit Tiff format files. Each pixel represents 10cm on the ground. In our field survey, various snapshots of urban landscape are collected and stored in the database. Some snapshots are linked to the GPS location data and the location data is filled in Exif format file.

Fig. 1: 2D map colored by landuse category

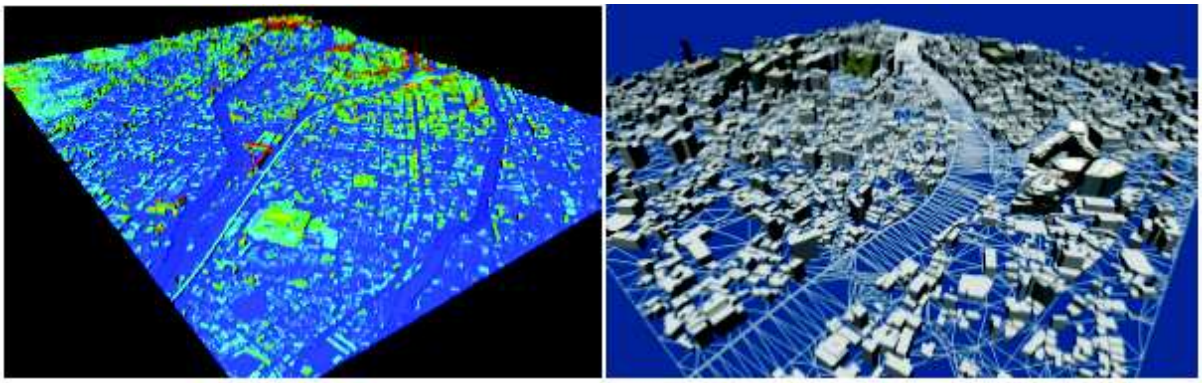

Fig. 2: 3D Models (left: DSM, right: 3D Buildings and terrain model)

3 DATA IMPLEMENTATION PROCESS

3.1 Google Earth

Google Earth is a virtual globe on which the satellite image is mapped provided by Google Inc. It is very easy to navigate the imaginary earth all over the world and its download is counted over a couple hundred million for use in the broad area of interest. It supports KML (Keyhole Markup Language) and COLLADA (Collaborative Data Asset) format, both of which are XML-based languages whose specs are fully disclosed. Therefore, we can make the program to import/export from CG and GIS to Google Earth to. Some of those scripts are already downloadable on the Internet. The performance has been rapidly improving since its first release on May 2005. On June 2006, texture mapping model import is supported and on September 2006, 3D building models are added to major US and Japanese cities.

The reasons that Google Earth is suitable for a platform of collaborative landscape design are:

- It is able to visualize the imaginary of urban space and simulate urban environment on one platform integrating the basic functions of computer graphics, virtual reality and geographic information system.
- It has already millions of users. And that means it is a familiar platform to them
- The performance is rapidly improving and it has wide range of applications.

3.2 Data Conversion

Google Earth is using geodetic coordination system which expresses the location by latitude, longitude and altitude with WGS84 datum. The spatial data of Fukuoka city is mostly using planner cartesian coordinate system mixed with Tokyo datum and WGS84 datum. Therefore, the reprojection and the transform works are

expected to overlay those spatial data in Google Earth. After the reprojection and datum shifts, spatial data are converted to KML and COLLADA format files.

KML is an XML-based language for modeling and managing geospatial data such as point, image and polygon in Google Earth. KML file has a .kml extension and KMZ file is a zipped KML files with a .kmz extension. COLLADA is also an XML-based language to make it easy to exchange the data among 3D applications. It is originally developed for making the gaming software by Sony Computer Entertainment Inc., and available for the 3D modeling in Google Earth.

Each landmark building has a dataset of object, UV and texture in OBJ, MTL and BMP format respectively, and other building data is stored by 250m x 250m quadrangle unit in OBJ format file. Self-made Perl scripts are used for converting OBJ/MTL format files to COLLADA format files. GIS data is stored in ESRI Shape file formats with a .shp extension. Export to KML 2.3.4, downloadable program from ESRI Web site, is used for converting SHP files to KML files. Figure 3 shows the diagram of data conversion process to Google Earth.

Fig. 3: Diagram of Data Implementation

3.3 Import and Overlay

3.3.1 Overlay 3D objects

Two images are shown in Figure 4. The Left one is a city wide view and the right one is the image of Tenjin downtown place. Those images are rendering the 3D building models placed in the center with the mountains surrounding the city. Those wide spread land surface and long distant landscape with topographic data can enhance the reality of virtual urban .

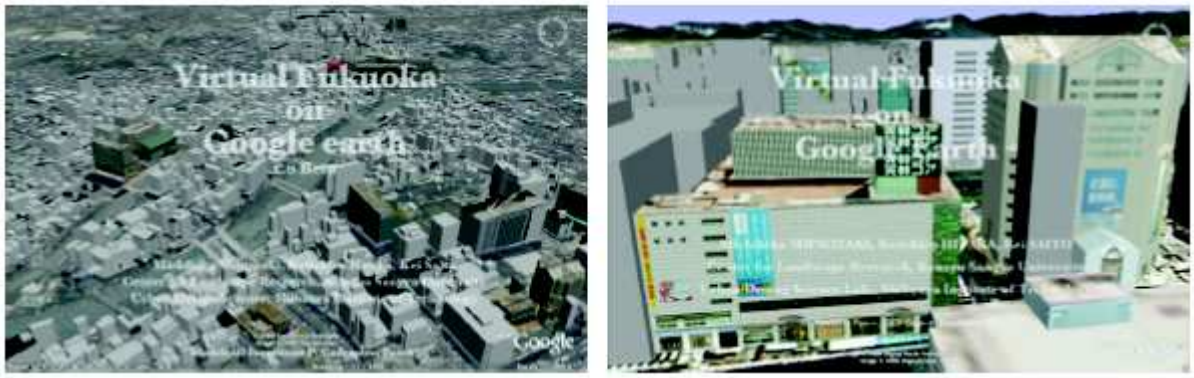

Fig. 4: 3D Textured models in Google Earth

3.3.2 Overlay GIS data

Figure 5 (left) is a superimposed image of the landuse data converted from the GIS shown in Fig. 1. Google It is not easy for GIS to display the result extensively in 3D but it can cover the broad area and show imported spatial environmental data easily. Though Google Earth itself does not have the spatial analysis function, these usages help people to understand the physical environment in urban space.

3.3.3 Overlays for landscape design and survey

Figure 5 (right) shows the landscape study on a trial basis to check the key views and vistas to be retained. Three gray fan-shaped polygons are visualizing visible and invisible area from each view point to each observation point respectively. This overlay can be effective for the check of height control of the buildings when used with landuse overlay such as Fig. 5 (left).

GPS locator can trace the route of the field survey and log the location and time in GPX format by certain interval of time according to the moving speed. The time stamp information in the digital photo data is synchronized to GPS log data and the location data is filled into Exif (Exchangeable image file format). Exif file with the location data can be imported on the Google Earth as shown in Fig. 6. Some free software on the Internet is used in this process for linking and importing data.

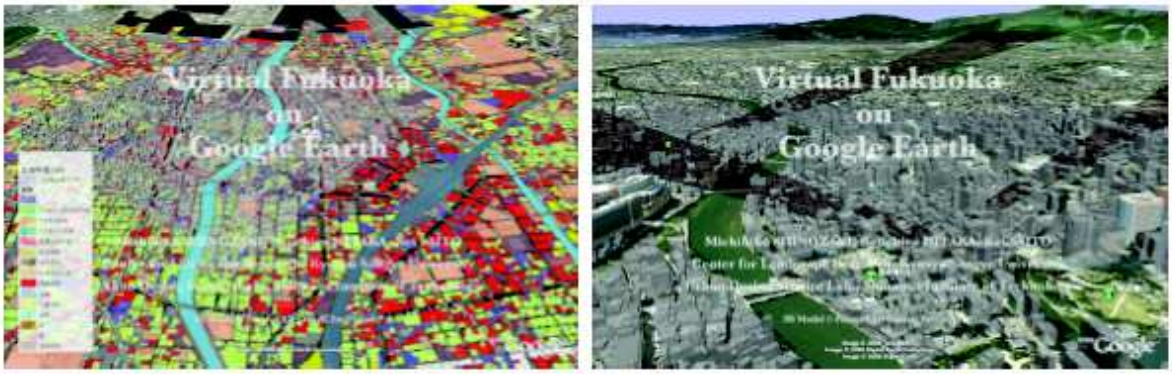

Fig. 5: Overlay for design survey (left: landuse, right: key views and vista)

Fig. 6: Route of field survey (left) and Snapshot linked to its location (right)

4 TECNICAL AND FUNCTIONAL FEATURES

The following features are confirmed in the data implementation process.

- The total operationality is superior to other 3D systems that the user is often required the operational skill. The navigation in virtual urban space is very easy. User can move, rotate the viewpoint and manage layers and time scale on one window without special skill. This user friendliness is one of the major criteria for the common platform in collaborative urban landscape design.
- The spatial data can be controlled by each object and group in KML scripting. Time management is possible as well. Further, hyperlinks in KML can dynamically connect to the files in remote or local network locations for updating or adding new spatial objects. Those features are effective for the analysis of the change and the comparative study of urban landscape.
- The resolution of the satellite is higher enough but the horidontal accuracy is not enouth. Therefore, we have to lose the accuracy to fit the Google Earth image though we have accurate 3d models scale with the the survey map. Further, the accuracy of the altitude data is not enough for the close up view. More accurate altitude data such as 5m mesh DEM provided by Geographical Survey Institute is worthy of consideration.

- KML or KMZ file should be disclosed for every user if we want to make it usable for them in the collaborative design. But there are several restrictions to deliver spatial data which is protected by copyright.
- The hardware performance is slowing down when the large size high resolution image is overlayed. The hierarchical grouping and adequate nesting is needed in KML programming.

5 CONCLUSION

It is confirmed that Virtual Fukuoka has a sufficient possibility to be a powerful and easy to use platform for urban landscape design. User can overlay, switch and animate various spatial features along with the navigation in virtual urban space. Another case study is going on in Tokyo with some improvement of this methodology along with Urban Renaissance model research supported by the Cabinet.

6 ACKNOWLEDGMENTS

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7 REFERENCE

Banes, M. and Sony Computer Entertainment Inc. Ed., COLLADA – Digital Asset Schema 1.4.1 Specification, Khronos Group, 2006.

Arnaud, R. and Barnes, C. M., COLLADA: Sailing the Gulf of 3d Digital Content Creation, A K Peters Ltd, 2006.

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Lisbon: towards a suprametropolitan configuration?

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1 FROM THE UNOCCUPIED. AN INTERPRETATION OF THE METROPOLITAN FORMATION OF LISBON

Absence is the contemporary protagonist in the metropolis. Nevertheless, no author has attempted to interpret a concrete metropolis from this point of view, examining the circumstances in which unoccupied spaces occur, even when such spaces have been latent in conventional urban planning readings based on occupied space.

This then was the challenge: how to interpret a concrete metropolitan formation starting from its unoccupied space. On the one hand, it would be necessary to show that unoccupied spaces really determine the various stages of urban development that lead to an effectively metropolitan status. On the other, it would be necessary to choose a metropolis where this premise is unquestionable. Such a premise is true of Lisbon, which is formed around a large unoccupied central space: the Tagus Estuary. The progress of the research determined a simply and extraordinarily flexibly structured approach.

Analysis of the metropolitan formation of Lisbon around the unoccupied is based on five significant moments in which three principles – water, land, and artificial creation – are used to identify morphologies of unoccupied spaces, using the same conceptual criteria, expressed according to identical cartographic criteria. Considering the motives and forms of occupation, as well as how they inter-relate with each other, the metropolis of Lisbon is not only described, but trends for future development are also outlined (Morgado, 2005).

This reading matrix made it possible to establish an analytic criterion which was coherent at all stages of metropolitan development discussed here. In addition, it was possible to see how the three elements related to each other, characterising the territory as a whole, as well as how each element over time has adapted to the circumstances of the metropolitan formation itself:

- 1860 | the founding of the metropolis: the shapes of water and land were the main factors determining formation, resulting directly in the artificial creation which definitively marked later development of the ways of occupying territory;
- 1940 | the infrastructural base of the territory: the territory where the lines of development of the future metropolis of Lisbon were taking shape was transformed by large-scale infrastructures, particularly the railways and the port of Lisbon;
- 1965 | the machine-space: a pre-metropolitan conurbation began to be formed, and territory began to be more intensively exploited, involving functionalisation of space expressed in maximum-productivity forms;
- 1992 | a metropolis of opportunities: this was when Lisbon first achieved real metropolitan status, with renewal of land-use opportunities in comparison with the foregoing period;
- 2001 | a supra-metropolitan transformation: insertion into larger networks has led to an apparently homogeneous reduction of unoccupied space, which contributes to an undifferentiated landscape and few urban reference-points.

Analysis of each period showed a territorial structure under construction, from its foundation to its current status as part of a supra-metropolitan formation. Each stage has been dealt with in a completely autonomous reading but the time-sequence explains the present configuration of the Lisbon metropolis around unoccupied spaces, and allows us to draw some conclusions concerning the trend of future development. Progressive knowledge of the formation of the metropolis has made it possible to describe and classify it at every stage, showing that unoccupied space is the essential determining factor in the territory of Lisbon.

This study proposes an innovative interpretation of a concrete territory starting from a discussion of a space which remains unoccupied, based on a specific methodology. The use of some GIS techniques applied to a

specific territory, in which the importance and role of the various types of unoccupied territory are systematically assessed at each of the five stages of metropolitan formation, also led to the production of new cartography on this theme, with potential future use, together with a new detailed cartographic archive on the territory under analysis. Furthermore, the methodology and conclusions may be used to interpret other metropolitan realities and comparisons have already been established with identical urban research, both applied to metropolises of Southern Europe (Font, Indovina, Portas, 2004, The Explosion of the City, International Research Project, 13 Metropolises in Spain, Italy, Portugal and France) and specifically to Lisbon (George, Morgado, 2004, previously mentioned research project).

1.1 1860 | the founding of the metropolis: inland sea

The shapes of water and land were the main factors determining formation, resulting directly in the artificial creation which definitively marked later development of the ways of occupying territory. In territorial terms, the existence of estuaries is always a major factor. Yet here, the truly extraordinary facts are that there are two estuaries, and that the relationship established between them offered a major urban opportunity by creating special dynamics between the two main cities in the area: Lisbon and Setúbal. The urbanisation of this territory was incipient, merely comprising structures that were adapted to the water and the land. On the one hand, this demonstrates the structure of the rustic space; on the other, it enables the identification of artificially created features that interpret the territory and point towards an embryonic concept of territorial identity.

In the middle of the 19th century, the territory under analysis was at a very early stage of development in terms of urbanisation, since the start of industrialisation only truly came about for political and economic reasons at the end of the century. This conjuncture is of exceptional relevance for this study, as it reveals the real foundations of the future Lisbon metropolis.

At that time, the layout of the water and the land were the most decisive factors in determining the structure of urbanisation, directly resulting in the artificial creation that would definitively shape the future evolution of the forms of land use.

In fact, prior to industrialisation, the urbanisation of what is now the Lisbon metropolitan area was organised around an open and central heart of water. All the infrastructural lines that would define the later shape of the metropolis converged on this expanse of water (Morgado, 2005).

Graph 1: 1860 | the founding of the metropolis: inland sea (Sofia Morgado, 2005, Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado, ETSAB-UPC Barcelona, FCT fellowship)

1.2 1940 | the infrastructural base of the territory: a new hierarchy

The territory where the lines of development of the future metropolis of Lisbon were taking shape was transformed by large-scale infrastructures, particularly the railways and the port of Lisbon. These spaces were large specialist areas that established radial expansion along the lines of communication (national roads and railways). These highly specialised and artificial spaces included port areas shaped by the natural conditions of the water and large agricultural areas whose direct connection to the railway and ports imposed investment in land redistribution, mechanisation and colonisation. These productive areas were overlapped by the axial spaces of greatest infrastructural intensity that began to establish the skeleton of the metropolis

Between the middle of the 19th century and the 1940s, there was a major transformation as the effects of technological change inextricably associated to industrialisation began to be felt. The political conjuncture and the effective development of a country that was investing in creating new infrastructures, combined with various urban plans, also contributed to this phenomenon. Their impact on the territory had a defining influence on the growth that led to the current metropolis of Lisbon.

These highly specialised and artificial spaces included port areas shaped by the natural conditions of the water and large agricultural areas whose direct connection to the railway and ports imposed investment in land redistribution, mechanisation and colonisation. These productive areas were overlapped by the axial spaces of greatest infrastructural intensity that began to establish the skeleton of the metropolis.

This was the dawn of a new form of territorial control and organisation: artificial creation. It would overwhelm natural spaces, beginning a profound restructuring process and creating the infrastructural base for the territory in terms of specialisation and the intensive and productive use of the unoccupied space (Morgado, 2005).

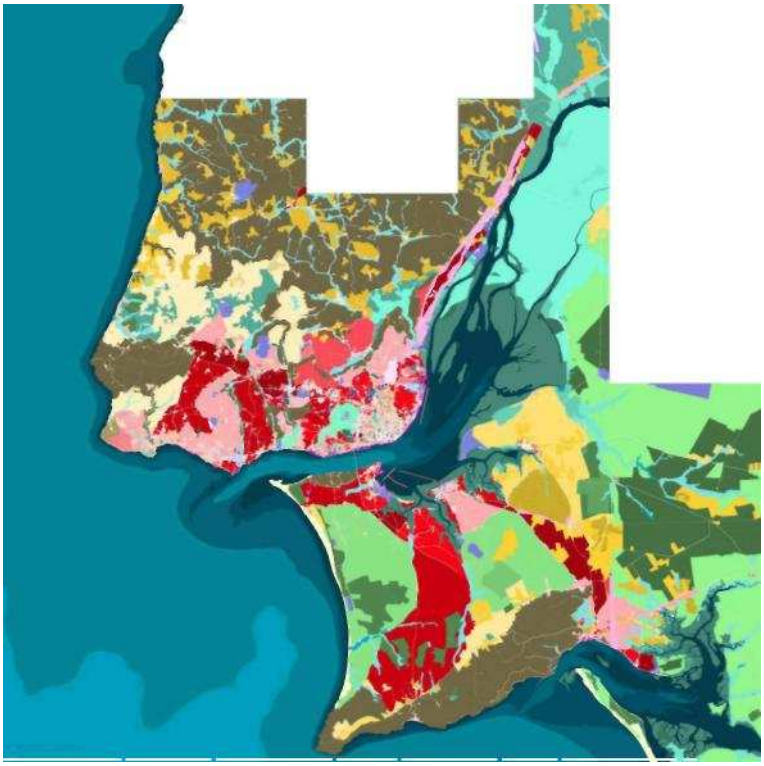
Graph 2: 1940 | the infrastructural base of the territory: a new hierarchy (Sofia Morgado, 2005, Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado, ETSAB-UPC Barcelona, FCT fellowship)

1.3 1965 | the machine-space: selective exploitation

A pre-metropolitan conurbation began to be formed, and territory began to be more intensively exploited, involving functionalisation of space expressed in maximum-productivity forms. This situation created a territory that was organised according to the efficiency of its infrastructures and that characterised the land according to activities in specific zones, particularly in terms of the artificial creation of urban occupation. The main axes of opportunity drove urban growth, both through specific uses (industrial and/or residential occupational) and through proximity to infrastructures whereby they were directly dependent on routes, fundamentally around railway stations.

The guidelines for introducing the infrastructures into the territory generated a series of dynamics that in turn resulted in important modifications to the forms and structures of Lisbon's incipiently metropolitan space in the middle of the 20th century. A pre-metropolitan conurbation began to emerge both from the efficiency of the infrastructure lines and the opportunities that they created. This also involved intensive exploitation of the territory that implied functionalising the space, which took the form of maximising production.

In brief, artificial creation defined the extent and specialisation of the unoccupied space when could be directly accessed from the mobility networks. Applying both to agricultural land (large-scale holdings) and to spaces of opportunity, this definitively segregated these spaces from the others whose peripheral nature and inherent fragmentation (smallholdings on steep and frequent slopes) mean they are not able to compete with intensive production, either urban or agricultural (Morgado, 2005).



Graph 3: 1965 | the machine-space: selective exploitation (Sofia Morgado, 2005, Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado, ETSAB-UPC Barcelona, FCT fellowship)

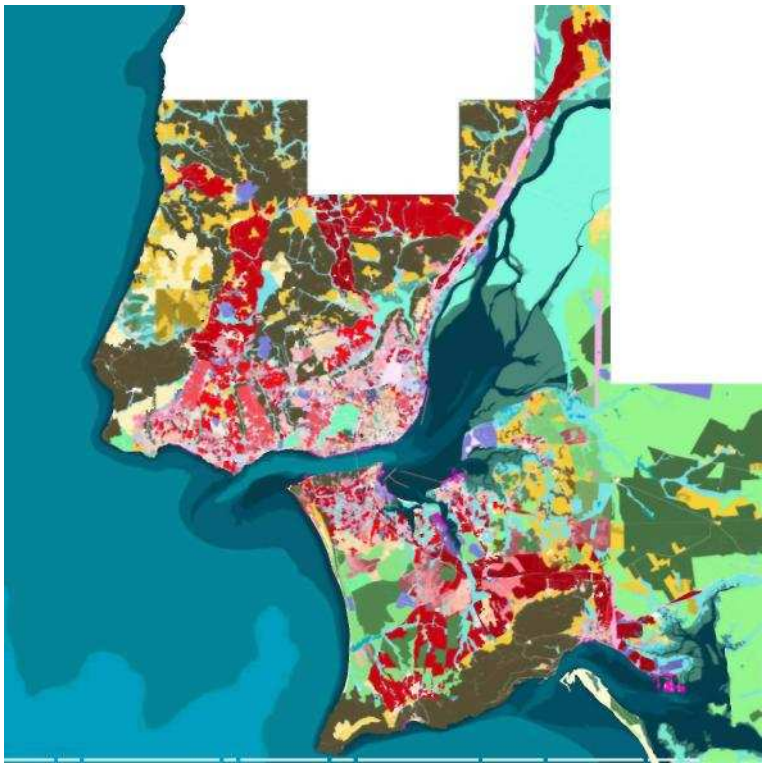
1.4 1992 | a metropolis of opportunities: a topology of connectivity

This was when Lisbon first achieved real metropolitan status, with renewal of land-use opportunities in comparison with the foregoing period. The land is also increasingly facing a splintered form of occupation, in this case due to the development of previously identified areas, establishing specific forms of occupation that have different connections to the metropolitan network. Through a process of redistribution, infrastructure development and individual constructions, the characteristic areas that make up the core of the territory examined here define incipient urban perimeters: the basis of low density unoccupied space that immediately becomes widespread.

In 1992, Lisbon reached the first truly metropolitan status as it renewed its land opportunities in comparison to the preceding period. Democracy in 1975 and membership of the European Union in 1986 established a new political and economic conjuncture that went hand-in-hand with major transformations in the productive systems, which started focusing on the service sector, making the industrial and port areas obsolete. The evolution of radial axes of opportunity for an effective mobility network defines multiple central points because of their extraordinary connectivity. These central points stand out in the territory as emerging metropolitan centres set against a backdrop of unoccupied spaces, some of which have a passive function as recipients of occupation, while others act as tensors and organisers of the metropolitan space. It is irrelevant that their previous structures were rural. Above all, what matters is that this space is unoccupied and extraordinarily accessible from any point within the metropolis and even beyond, or that – at the very least – it will become accessible, integrating into the global networks.

Therefore, the spaces that already have urban occupation and intermediate unoccupied spaces that are experiencing occupation out of inertia are actually far more passive vis-à-vis the dynamics and developmental trends in the metropolis of opportunity that Lisbon is progressively becoming. In closely connected unoccupied spaces, expectations are high, and production is far more flexible and mainly based on information or on assembling and storing of products in transit. This only requires a space that is available, mono-specialist and communicable (Morgado, 2005).

Unexpectedly, the true centres are the inhospitable and unoccupied spaces located around motorway exits.



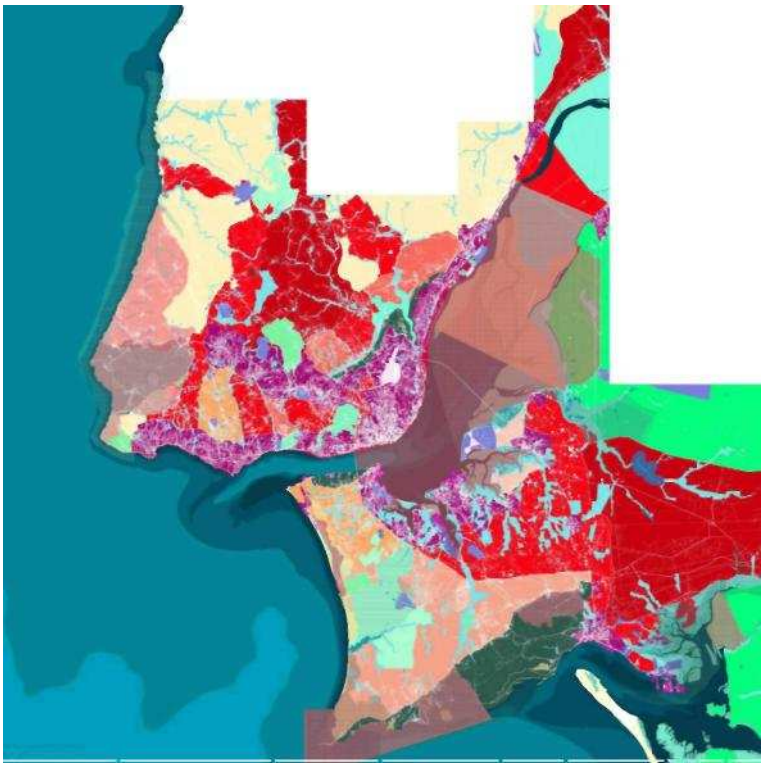
Graph 4: 1992 | a metropolis of opportunities: a topology of connectivity (Sofia Morgado, 2005, Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado, ETSAB-UPC Barcelona, FCT fellowship)

1.5 2001 | a supra-metropolitan transformation: indifferent landscapes?

Insertion into larger networks has led to an apparently homogeneous reduction of unoccupied space, which contributes to an undifferentiated landscape and few urban reference-points. In fact, the Lisbon metropolis is faced by a supra-metropolitan transformation that places it within a sub-global category, integrating it into networks that have international – and particularly European – dynamics in terms of the mobility of people and products, and of the productive transformation that is increasingly focused not merely on services but on a broad range of activities associated with a knowledge-based economy. The Lisbon metropolis emerges as an organism with apparently more homogenous forms of occupation that, due to artificial creation, are converted into areas that are large and poorly structured in terms of density and that lack diversity in terms of the formation of these metropolitan lands.

Integrating the Lisbon metropolitan area into larger scale networks brought an apparently identical reduction of the unoccupied space, leading to a uniform landscape and few urban points of reference. However, identifiable forms correspond to this apparent uniformity, reconstructing Lisbon's metropolitan identity according to the aforementioned unoccupied spaces (Morgado, 2005).

From 2001 to 2005, the Lisbon metropolis definitively acquired its form, while simultaneously clarifying its role within an Iberian conurbation stretching between Lisbon and Galicia which (in national terms) covers the northern half of the Atlantic coastline (Gaspar, PNPOT, Portuguese National Urban and Territorial Master plan, 2005). Hence, the Lisbon metropolis suggests a still more complex transformation that incorporates the various metropolitan structures of Oporto, Coimbra and Aveiro.



Graph 5: 2001 | a supra-metropolitan transformation: indifferent landscapes? (Sofia Morgado, 2005, Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado, ETSAB-UPC Barcelona, FCT fellowship)

2 TOWARDS A SUPRAMETROPOLIS CONFIGURATION?

Initially, progressive knowledge of the metropolitan formation of Lisbon has made it possible to describe and classify unoccupied space at every stage. Analysis of each period showed a territorial structure under construction, from its foundation to its current status as part of a supra-metropolitan formation. Insertion into larger networks has led to an apparently homogeneous reduction of unoccupied space, which contributes to an undifferentiated landscape and few urban reference-points.

As part of an ongoing research (ETSAB-UPC, Barcelona/ FA-UTL, Lisboa), two additional important premises have been defined:

- The potential of unoccupied spaces as instruments for urban control;
- A case study which revealed a certain degree of future impact or an emerging transformation. For this, the following natural and urban areas that are still unoccupied but which will house major infrastructures in the near future were selected: the New International Airport of Lisbon, the International high speed train, and a new local skeleton network formed by a metropolitan tramway.

As a result, it is possible to imply that the Lisbon metropolis is faced by a supra-metropolitan transformation that places it within a sub-global category.

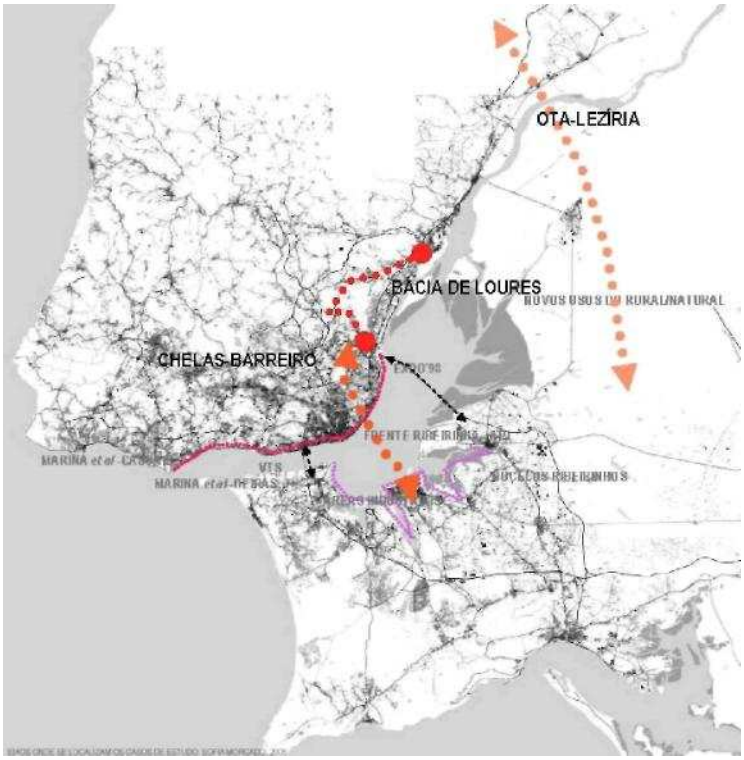
Given the increase in environmental concerns, which impose the definition of protected areas, and the sudden appearance of polarised centres in deserted or rural areas with excellent connections, there is frequent artificial and hyper-real recreation of the metropolis. It is believed that the unoccupied space will continue to acquire new meanings due to future transformations, artificially recreating itself in new forms that are associated to leisure and production, as well as defining new means of urban formation (McHarg, 1992; Dematteis, 1995).

In the current context and given new approaches to the creation of the urban space, which reveal the potential of the unoccupied space, this is an opportune moment to examine innovative ways of urbanistic interpretation and intervention. The work in question is appropriate as the theme has already been studied by highly regarded specialists as a potential instrument for metropolitan organisation and urban intervention (Secchi, 2005, Viganó1999; Pavia, 2002).

Given metropolitan Lisbon's current urbanistic panorama, a concept for the urban project whose main instrument in characterising identity and structuring growth is the unoccupied space is seen as relevant. This also acts as the agent that articulates the territorial and urban scales.

The current projects for major infrastructures (high speed train and new bridge over the Tagus, new international airport, surface lines of the Lisbon Underground) suggests the creation of a new supra-metropolitan hierarchy and a new cluster of centres superimposed on the current ones and transversal to its infrastructural and urban order. This will naturally lead to urban phenomena that must be anticipated with a vision that looks to the future of the territory and of urban development (Graham, Marvin, 2001).

Using a chronological approach and further developing the previous model, the aim is to create a guide that will truly explain the relations between the occupied and unoccupied space in the current metropolitan area.



Graph 6: An approach to a new form of structuring the Lisbon Metropolis (Sofia Morgado, 2007, Designing Absence. The unoccupied space as morphological and urban project fundament at the metropolitan formation of Lisbon, FA-TU Lisbon, ETSAB-UPC Barcelona, FCT fellowship)

The basis for selecting the case studies is a territorial interpretation based on the unoccupied space that has become established. The areas that articulate with the Tagus Estuary, previously considered a metropolitan plaza, are of particular relevance:

- Infrastructured lines on the north bank: Loures-Lisbon-Cascais. This is the main area for urbanisation, and also where the richest models of unoccupied spaces can be identified. Moreover, this is where the most significant projects are concentrated, including the only metropolitan project to adopt the proposed form – the Costa do Sol Plan – and more recent projects such as the Port of Lisbon Master Plan and Expo'98.
- Natural borders that are being urbanised on the south bank: Alcochete-Moita-Montijo. This area is enclosed by axes for opportunity where the ongoing division of the land, influenced by major infrastructure projects, has created a type of landscape characterised by dispersion and the obsolescence of rural practices.
- Protected spaces: Lezíria Grande-Rio Frio. This is an area of intensive farming where technological progress and new uses linked to an ecological vision are introducing alterations that must be examined in terms of the demand for space and its usage.

The unoccupied space is finally beginning to be understood as essential in structuring the metropolitan area, not only in terms of environmental protection, but mainly though innovative action on urbanistic tools themselves, which should establish the open space as a high quality place that is accessible to the people.

Thus, territorial definition of the urban project (scale of the integration and spatial structuring projects with urban architectural content) can be particularly relevant as the main instrument for strategies and tendencies.

In this process, it is fundamental to regenerate forms of occupation and uses within the context of a metropolitan structure.

In the meantime, some recent phenomena associated to unoccupied spaces have been identified, and are already considered as of potential value in this formulation.

3 REFERENCES

AAVV (coord Ramon Folch), 2003, El Territorio como sistema. Conceptos y herramientas de ordenación, Territorios y Gobiernos (Visiones/3), Diputación de Barcelona, Barcelona AAVV (coord. José António Tenedório), 2003, Atlas da Área Metropolitana de Lisboa, Área Metropolitana de Lisboa, Lisboa AAVV (dir João Ferrão), 2002, As Regiões Metropolitanas Portuguesas no Contexto Ibérico, coordenação geral João Ferrão (Instituto de Ciências Sociais – Universidade de Lisboa), (Estudos/5) DGOTDU – Direcção Geral do Ordenamento do Território e Desenvolvimento Urbano, Lisboa. AAVV (ed. Ángel Martín Ramos), 2004, Lo urbano en 20 autores contemporáneos, Escuela Técnica Superior de Arquitectura de Barcelona, Edicions UPC, Barcelona AAVV (ed. Antonio Font; coord. científica Francesco Indovina, Nuno Portas, Antonio Font), 2004, L'explosió de la ciutat. Morfologies, mirades i mocions sobre les trasnformacion territorials recents en les regions urbanes de l'Europa Meridional, Collegi d'Arquitectes de Catalunya-COAC/Forum Universal de les Cultures Barcelona 2004, Barcelona. BANZO M., MORGADO S., 2006, «Les espaces non construits des périphéries métropolitaines. L'Aire Métropolitaine de Lisbonne». In Crozat D., Viala L. et Volle J.-P. (coord.), Villes méditerranéennes d'Europe et leurs périphéries. Mutations territoriales, innovations sociales, Montpellier, Publications MTE, coll. Recherches. CABRAL, João; MORGADO, Sofia; CRESPO, José Luís; COELHO, Carine, 2007, «Urbanisation trends and urban planning in the Lisbon Metropolitan Area» in AAVV (Oom de Seabra Pereira, coord), A Portrait of State-of-the-Art Research at the Technical University of Lisbon , Springer, the Netherlands. DEMATTEIS, Giuseppe, 1995, Progetto implicito. Il contributo della geografia umana alle scienze del territorio, Franco Angeli, Milano. GASPAR, Jorge, 1993, As Regiões Portuguesas, Direcção-Geral do Desenvolvimento Regional, Ministério do Planeamento e da Administração do Teritório, Secretaria de Estado do Planeamento e Desenvolvimento Regional, Lisboa. GEORGE, Pedro; MORGADO, Sofia; et al, 2004, «Àrea Metropolitana de Lisboa 1975-2001. De la monopolaritat a la matricialitat emergent/ Metropolitan Area of Lisbon 1970-2001. From monopolarity to an emerging matrix pattern» in AAVV (ed. Antonio Font; coord. científica Francesco Indovina, Nuno Portas, Antonio Font), L'explosió de la ciutat. Morfologies, mirades i mocions sobre les transformacion territorials recents en les regions urbanes de l'Europa Meridional, Collegi d'Arquitectes de Catalunya-COAC/Forum Universal de les Cultures Barcelona 2004, Barcelona. GEORGE, Pedro; MORGADO, Sofia, 2005, «Dinâmicas do Uso e Ocupação do Solo da Área Metropolitana de Lisboa 1940-2001», Pós-Revista do Programa de Pós-graduação em Arquitetura e Urbanismo da FAUUSP, Faculdade de Arquitetura e Urbanismo da Universidade de São Paulo, Nº 18, Dezembro 2005.
GRAHAM, Stephen.; MARVIN, Simon, 2001, Splintering Urbanism. Networked infrastructures, technological mobilities and the urban condition, Routledge, London/New York GUST, The Ghent Urban Studies Team (dir Dirk de Meyer, Kristiaan Versluys), 1999, The Urban Condition: Space, Community and Self in the Comtemporary Metropolis, 010 Publishers, Rotterdam. HALL, Peter, 2002, Urban and Regional Planning, Routledge, London and New York.
LANG, Robert E.., 2003, Edgless Cities. Exploring the elusive metropolis, Brookings Institution Press, Washington D.C. MCHARG, Ian L., 1992, Design with Nature, John Wiley & Sons, Inc, New York. MORGADO, Sofia, 2005, Protagonismo de la ausencia. Interpretación urbanística de la formación metropolitana de Lisboa desde lo desocupado, (Protagonism of Absence. Interpretation of the metropolitan formation of Lisbon from the unoccupied) doctoral thesis, Departament d'Urbanisme i Ordenació del Territori-Universidade Politécnica da Cataluña, Barcelona. MORGADO, Sofia, 2006, «Assenza. Formazione e progetto di Lisbona metropolitana» in Urbanistica & Architettura. Il ruolo del progetto Urbano nella riqualificazione della città contemporanea, Dossier Urbanistica, INU- Istituto Nazionale di Urbanistica, Roma. PAVIA, Rosario, 2002, Babele. La città della dispersione, (Babele/7), Meltemi editore, Roma.
PORTAS, Nuno; DOMINGUES, Álvaro; CABRAL, João, 2004, Políticas Urbanas, Fundação Calouste Gulbenkian, Lisboa. SECCHI, Bernardo, 2005, La città nel ventesimo secolo, Editori Laterza, Roma-Bari. SIEVERTS, Thomas, 1997, Cities without cities. An interpretacion of the Zwischenstadt, Spon Press/ Routledge, 2003, London/ New York SOJA, Edward W, 2000, Postmetropolis. Critical Studies of Cities and Regions, Blackwell Publishing,Oxford. VIGANÓ, Paola, 1999, La città elementare (Biblioteca di Architettura Skira/7), Skira Editore, Milão.

SISAL21: Cross-Frontier Sustainability indicators System for Local Agenda 21s

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Keywords: SISAL21, Local Agenda 21, Sustainability Indicators, Sustainable Development, Citizen Participation, Navarra, France

1 BACKGROUND

At an international level, the Local Agenda 21 is a plan promoted by the United Nations for sustainable development in the 21st century, approved by 173 governments at the Earth Summit held in Río de Janeiro in 1992.

Since then, the Local Agenda 21s have become a planning benchmark for achieving the sustainable development objectives stated at Río and Aalborg. The aim of the LA 21s is to promote measures directed at achieving a clean, just, habitable, fertile and humane world.

The Local Agendas 21 in Europe that are traditionally included as tools of Sustainable Local Administration, -in the Thematic Strategies of Urban Environment-, have come into existence to comply with the principles and agreements signed in the Danish town of Aalborg in 1994 in the European Conference of Cities and Sustainable Towns (this declaration was updated in 2004 and is known as Aalborg +10).

In this document, the local entities commit themselves to preparing and implementing Local Agenda 21s, in order to promote sustainability at a local level. These agreements will be reached by means of cooperation amongst different local stakeholders and different regions.

2 INTRODUCTION

The project SISAL 21 is included within the framework of European program INTERREG III A France/Spain 2000-2006 subsidised by the FEDER and in which are participating the following

Regions: Navarra, Gironde, The Bidasoa-Txingudi Consortium and the Council of Hendaya. The public company Trabajos Catastrales S.A., also ranks among participants, as a technological partner.

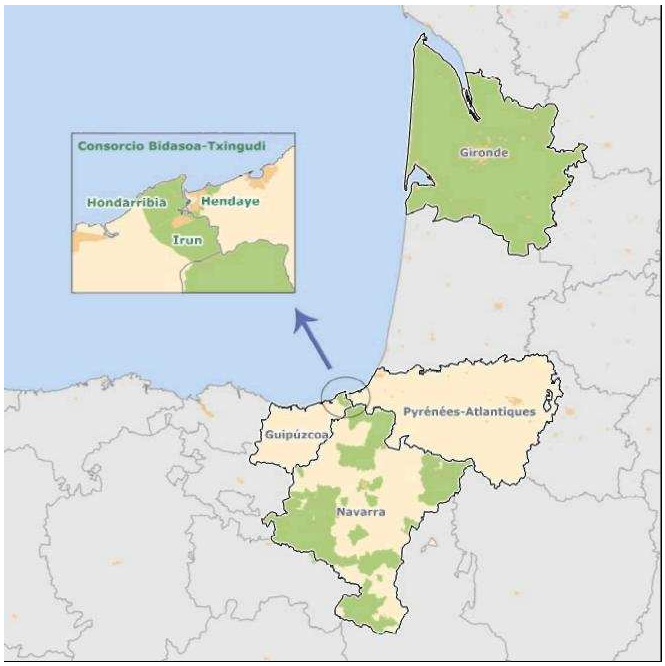

Figure 1: Regions participating

SISAL 21 is a project aim at the compilation of information from the different Local Agenda 21s of the French and Spanish regions participating in the initiative. These regions have displayed a real commitment to

achieving their respective Local Agenda 21 goals. However, thus far, the implementation of these schemes has had a highly variable impact on both sides of the Pyrenees.

The general objective is to promote cooperation amongst local entities at cross-border level, in favour of sustainable development. Other goals are:

- Provide support to implement Local Agenda 21, not only at municipal level but also over-municipal (group of local administrations), fomenting environmental monitoring in its development.
- Collect and disseminate good practice and satisfactory experience related to Local Agenda 21 on both sides of the Pyrenees, learning and obtaining added value from them.
- Contribute to training and involvement from local stakeholders, public authorities and their technical staff, environmental, social and economical agents, not only publics but also privates, and citizens in general to achieve AL21 objectives.

These objectives will be reached by means of providing municipalities and local stakeholders with a set of tools, friendly and accessible through Internet, to support Local Agenda 21 developments.

In addition to this Inter-regional comparability, the common tool will also enable common policies and initiatives to be adopted. The aim is to achieve the sustainability of cities and regions through joint co-operation, by allowing the participation of all local stakeholders, including the general public.

The main objective, therefore, consists on the creation of a common system of Sustainability Indicators that allows their collection and management, as well as their diffusion, promoting the co-operation of local entities at a cross-frontier level in favour of sustainable development.

3 PROCESS

The first task was the analysis of current situation regarding sustainability indicators in every region. The comparison and standardization of indicators collected in Local Agenda 21s of the different partners, started from the approval and upgrade of LA21 indicators from Navarra, (Sustainability Indicators System of Navarra SISNA 2003-2006), which previous experience served as reference for the other partners and gave place to a proposal of indicators that were comparable in all the participant regions.

The common operable tool created to be used by the municipalities of these border regions enable updating and managing these indicators, is also based on common calculation criteria and directed at providing uniform data that can be compared between regions. The interest in the use of Internet lies in that related Local Agenda 21 managers were geographically scattered and the System should allow them updating and effective maintaining of its data.

The different stages are presented in the next figure:

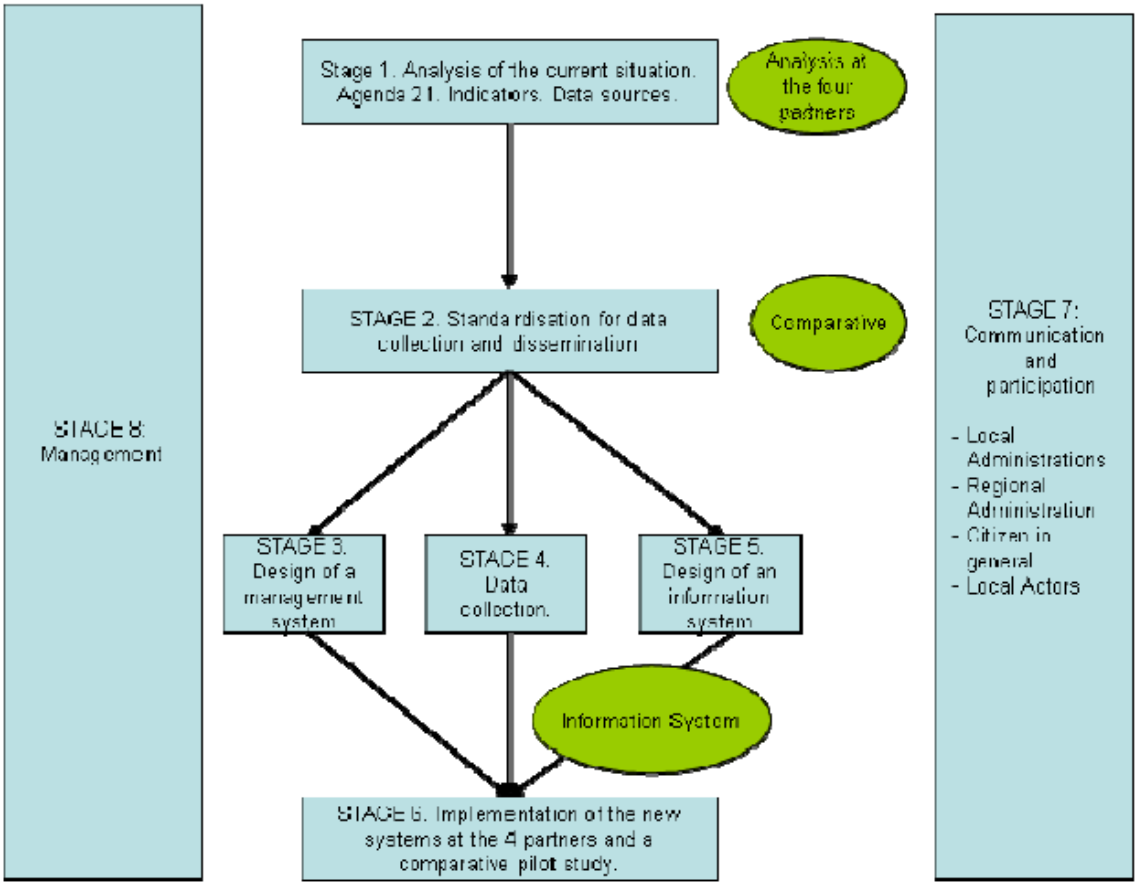

Figure 2: Project Stages

The project includes 32 indicators which, in turn, are divided into sub-indicators which either help or allow the indicators to be calculated. The sustainability indicators provide information on the sustainability status and dynamics of a municipality, and also allow comparisons to be established between different municipalities or regions.

The list of indicators is structured in three topics:

1. Structural aspects – 19 Indicators
2. Environmental vectors – 10 Indicators
3. Participation of the general public – 3 Indicators

The indicators serve a double purpose:

- Provide information on the municipality sustainability status and trend or, to put it another way, they serve as an instrument to facilitate the analysis or diagnosis of the structural aspects of the municipality and those environmental vectors whose management directly affects the local sustainability status.
- Act as a tool to monitor the implementation and impact of the action plans in progress to improve the sustainability status and trend.

Starting from this indicators, design and development of a management system was carried out to promote decentralized updating from every region. Also quality control tool was prepared to ensure data integrity.

The next step was to design and develop a thematic web to disseminate Territorial Sustainability Information, providing the next functionalities:

- Viewing geospatial sustainability indicators
- Cartographic representation
- Viewing graphical and table data indicators

- Realizing advanced queries
- Downloading table data indicators

4 RESULTS

The results obtained are presented in the portal SISAL21 (http://sisal21.tracasa.es) that has been designed as an integrated and transferable tool among the different authorities.

The portal is available in four languages: Spanish, French, Euskera and English.

- Provides Information relating to the project, to the partners and also to the antecedents.
- Supply a decentralized friendly system of data collection based on Sustainability Indicators, by means of a user (partner) and password validation.
- Allows the representation of the data by means of a thematic cartographic viewer.
- Includes a system of searches and advanced analysis that completes portal potential.

Figure 3: SISAL 21 Main Page

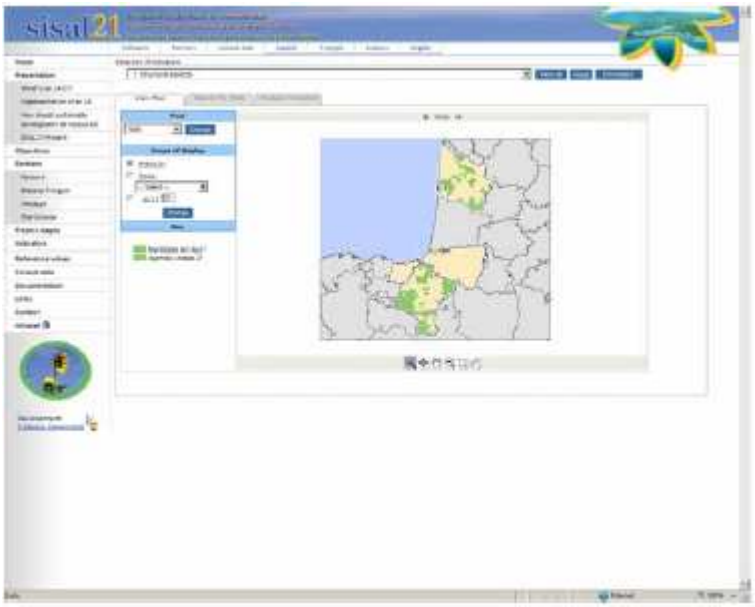

Figure 4: Map Viewer

5 CONCLUSIONS

Impetus to change does not always come from the top, in this case Towns, Cities and other Local Entities are the most important stakeholders. To make important changes globally, it is necessary to act locally.

The SISAL 21 project has been working within this context. SISAL 21 is thus a European project focussed on promoting co-operation between local entities at a cross-frontier level in favour of sustainable development, using the Local Agenda 21s to achieve this.

"Sustainable Development meets the needs of the present without compromising the ability of future generations to meet their own needs"

It is, therefore, a cooperative and integrative project, in which the information, coming from diverse sources, will help us all work towards achieving increased sustainability in our cities and regions, based on the analysis of these Sustainability Indicators.

Considering the project results, we could conclude:

- The great potential of Sustainability Indicators evaluating and monitoring Local Agenda 21 development.
- Develop specific tools is the best way to guarantee the preparation and the up-dating process for the data to be both done decentralized by each partner region.
- Another major advantage of the specific tools is the easy-to-use approach for both beginners and experts
- Finally, Internet becomes the suitable way to release the knowledge about Sustainability Indicators promoting Social participation in Local Agenda 21.

6 REFERENCES

Antequera, J. (2005): “El potencial de sostenibilidad de los asentamientos humanos”. Complete text in electronically edition available at www.eumed.net/libros/2005/ja-sost/

Echamendi Lorente, P.; Fontano Ruiz, S. (2005): “Indicadores de Sostenibilidad y Agendas Locales 21: Difusión en sistemas de información corporativos”. Poster and Communication presented at ESRI Users meeting 2005. http://www.tracasa.es/html/es/posterAL21.pdf

Ministerio de Medio Ambiente (2001) “Sistema español de indicadores ambientales: área de medio urbano", Madrid, Serie Monografías.

Local Agenda 21 Navarra. http://agendalocal21.navarra.es/

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Sustainable Development of Greek Islands and European Policy

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1 INTRODUCTION

The present paper intends to investigate how much the policy of the EU contributes in the sustainable development of the Greek islands. In order to achieve the objective mentioned above, prior to anything else, the terms "island" and "sustainable" are clarified and then the basic development problems and the economic physiognomy of islands are described. After that, the basic directions, policies and actions regarding the policy of EU, which aim directly or indirectly at assisting the Greek island,s are determined. This way the contribution of the EU policy in the sustainable development of the Greek islands is pointed out .

By the term "island", a piece of land which is surrounded by sea, is smaller than a continent, is created without human interference and can support residential and economic activity, is described. The EU, aiming at a better implementation of its regional policy, does not always regard as islands those which include state capitals (for example, Great Britain, Ireland etc.). Also, islands that are found too close to the continental country and some without socio-economic interest, or smaller than 1 square Kilometer in surface and population smaller than 50 residents are often excluded.

Attempting the interpretation of term "Sustainable Development", it should be underlined that, the term "sustainable" describes the term "development" and is related to the life and more specifically to the survival of all beings and humans in the environment. A place is considered sustainable when it involves a healthy environment, secures a higher quality of life and better conditions of existence in such a way, that it corresponds with modern requirements, without endangering future generations. Based on what has been mentioned above, an island is considered sustainable when all the factors, environmental, economical, social, cultural, are combined harmonically perpetually, thus ensuring a higher quality of life and social- economic prosperity for its residents both currently and in the future.

Islands, not only in Europe but globally, face sustainability problems that are often due to their inherit island character. They are located in remote areas, relatively to the big economics centers and for this reason they are often called "regional". Because of the marine barrier which surrounds them, their relations with other regions are diminished, the role that they play in economical, technological, cultural and political developments is limited, which puts them on the margins of current developments. Moreover, they are also characterized as "disadvantageous" because of their inherit weaknesses resulting from their limited area which does not allow them to advance easily towards a sustainable development process. Finally, island regions are often some of the most significant, but at the same time the most fragile natural resources worldwide and this is because they are closed regions that lack the ability of regeneration.

The European Union long identified the natural weaknesses of islands and in its effort to develop even the most remote location in its territory, it exercises its policy and the islands are included in its objectives. Through this process, it is clear that the Greek islands are suffering from all of the above mentioned weaknesses. The are also, however, the subjects of the intensifying policy of the EU, and under this scope, the are being researched in the present work.

2 DEVELOPMENT PROBLEMS AND ECONOMIC PHYSIOGNOMY OF THE ISLANDS

As mentioned in the introduction, an inhibitive factor in the development of th islands is their 'Regionality' and Isolation due to the marine barrier that surround them. The natural isolation, creates an increased transport cost, the installation of production units is discouraged and this results in either underdevelopment, or one-sided and non-domestically controlled development. The isolation combined with 'regionality' lead to an increased cost regarding he following:

- Financial cost, due to the operational expenses which businesses have to sustain. The cost of living is increased, since transportation to and from the islands, requires the use of a costly means of transport, either by sea or by air, which in its own turn equals to increased transportation expenses. Thus, the transport cost to the islands is often 30 - 40% higher than on the continental regions.

- The cost of works and infrastructure services, due to the negative economics scales which are created. In each island, even if this is not justified by the number of its residents, it is essential that basic infrastructures, necessary for its economic and social growth (for example, energy, transport, telecommunication, health etc.),exist.
- Opportunities cost, mainly for the young who may be benefited less by business, financial, or other opportunities .
- Cost of information, since information reaches these remote regions at slow rates, while at the same time specialized information comes at a cost.

All of the facts mentioned above, often constitute disadvantages and inhibitive factors regarding the process of development of the islands. However, the islands have developed their economic physiognomy, according to their individual potential. As for the primary sector of production, it plays the most important role. Agriculture makes up an important sector of employment, wherever there are suitable conditions (fertile cultivable area). Livestock-farming plays a similar role in the economy of these islands. Furthermore, islands which may have exploitable mines, exploit them ensuring economic resources.

Fishery, as is expected, has traditionally played an important role in the economic growth of most islands. Progressively however, as the piscatorial industry becomes more intense, things become more complicated in this sector and the islands are often faced with problems and competition from big piscatorial harbors of the Continental country. It is pointed out that the threat to the resources of fishermen in small European islands are the ships of the fishing industry which is based in Continental Europe. Nevertheless, in some islands success is being made by shifting the epicenter of production to shellfish farming and the aquaculture.

Regarding the secondary sector of production, things are much harder because of the natural restrictions faced by the islands (transport charges, lack of specialized workforce etc.). Thus, only a few have developed large scale industries, while there are more possibilities for medium-sized enterprises and the EU over the past few years has shifted towards this direction through its regional policy.

The tertiary sector has been faced with more luck in certain islands through tourist development. Of course, some islands profited economically and developmentally, while some others did not capitalize this event. In the islands of the first category, the economy developed and the level of life of their inhabitants was improved. It is not always possible to measure the exact influence of tourism in the local economy, however, it is clear that the tourism yields big profits for many remote island regions.

Of course, there are also negative repercussions in the economy of the islands because of tourism. For example, unplanned tourist activity and its expansion or integration in rural and urban land can have negative effects in the environment and in the ecosystem of island. Also, the additional population that occurs seasonally, increases the problems of water supply, waste disposal etc.

This, is often translated in marine pollution, exhaustion of the already limited natural resources of the islands, such as water and energy etc. On some islands air-pollution and noise-pollution because of the traffic congestion are not negligible, either. . A great danger also lies in the housing pressures that result from tourist installations which are increasing. It is noticed of course, that many islands over the last few years have been presented with a growth in the areas of construction and public works. This is related to the tourist industry (hotel and rural residences) and to the public investment programs that have taken place over the last few the last years.

It is underlined that many of the Greek islands that were developed through tourism, did not always follow sustainable rates. Viability is based on the balanced growth of all three sector of production and tourism itself, is part of the tertiary sector. Nowadays, there are Greek islands which base most of their income exclusively on tourism and little or not at all on other sources of the primary or secondary sectors of production, which puts the viability of their economy in danger

3 THE POLICY OF THE EUROPEAN UNION AND THE GREEK ISLANDS

For many years now, the EU takes into consideration the fact that n its territory includes islands, which as is recorded in its documents, "constitute special geographic units". Their size varies, and if the islands which host member-state capitals are excluded, the important islands of Europe with populations of over 50.000 residents are Sicily, Sardinia, the Tenerife, the Majorca, Guadeloupe, the Martinique, the Corsica, the

Madeira, La Reunion, Isle of Wight, Gran Canaria, Lanzarotte, San Miguel, Tenceira, Grete, Rhodes, Hios, Minorca, La Palma.

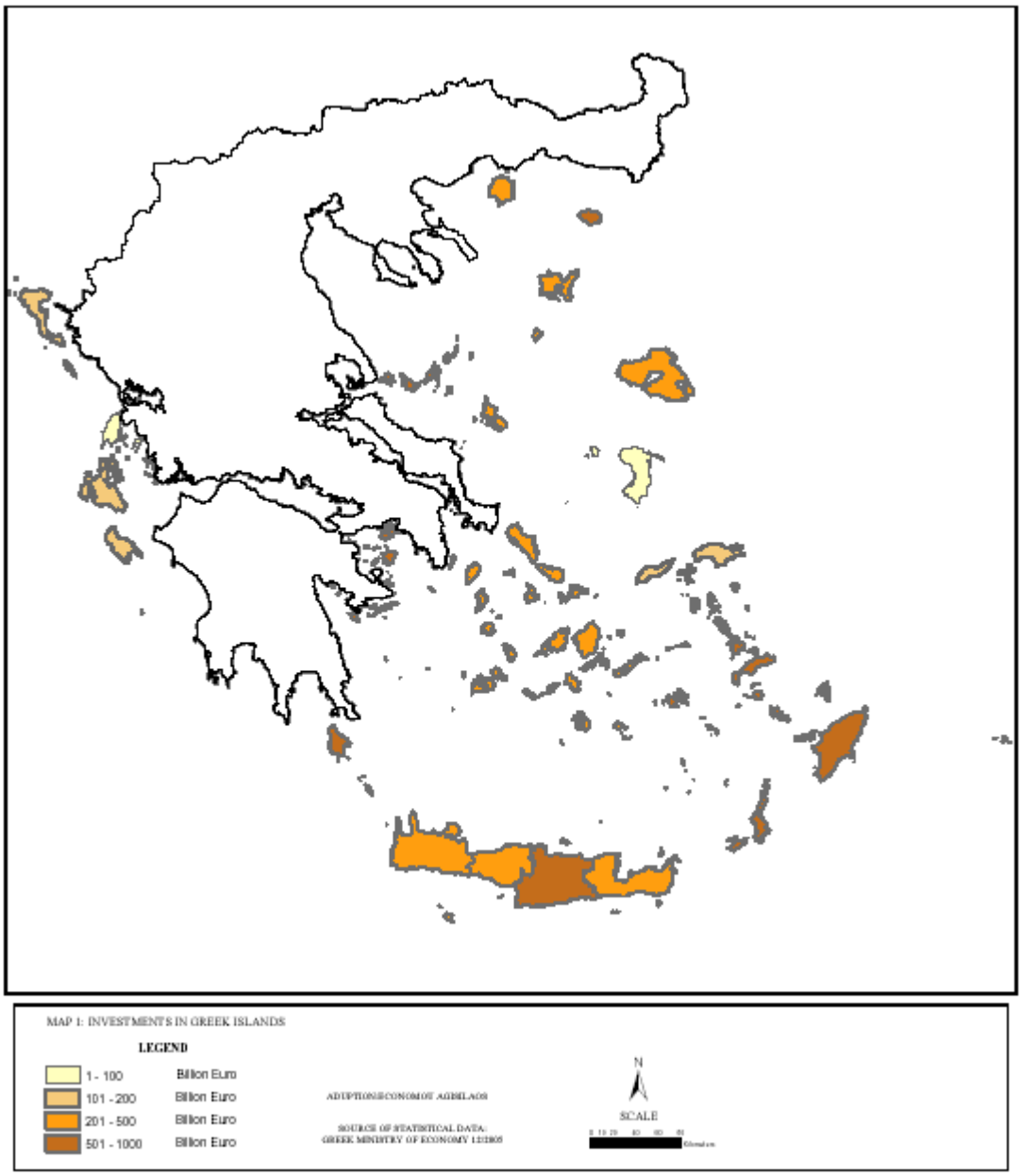
The usefulness of islands is great for the Union, provided that these give it the possibility to reach several seas and oceans, as the Baltic, the Mediterranean, the Indian Ocean, the Caribbean, the North Sea and the Atlantic Ocean. Some member states, because of their islands control marine areas holding significant fish and oil reserves. Also, the islands constitute an important source of tourism for Europe, produce a lot of goods of special interest, while they have rich natural beauty with appreciable geophysical and cultural elements. At the same time, islands are sensitive regions and are parts of the least developed regions of the EU. This emerges from the per capita crude product, demographic, level of education of residents, productivity, employment, invested chapter etc. indexes.

All the above reasons constituted important motives for the development of a European strategy aiming at the aid of island regions. For the last three decades, the Committee of Islands of the Forum of Coastal Peripheral Regions of the EEC (OKRM) deals with the subjects of islands. The OKRM was founded in 1973 by the regions of the then member-states, and had as its most basic demand the establishment of a common regional policy. It is a non-government organization, which tries to expose the problems of the regions found in the remote areas of the Community and are less developed. From 1978 it constitutes an official advisor of the EEC and has two main courses of action, the development of European regions and the sustainable development of coastal areas. The OKRM promotes the exploitation of the possibilities of information technology and telematics in order to create the suitable tool that will allow the European islands to manage the advantages and restrictions of their island nature efficiently.

Today, the EU, aiming at lifting the inequalities between its regions and the social–economic cohesion, exercises its regional policy and aims at a total developmental strategy. This includes the aid for the economic and social infrastructures, the rural growth, the improvement of competitiveness of enterprises, the improvement of the environment, the protection and the appointment of culture, the capitalization and growth of human resources, the rational tourist development, and more generally the improvement of life standards etc.

The above objectives are addressed to and concern the islands, provided that they constitutes disadvantageous regions in the Union. The ultimate goal is the sustainable development in all sectors: economy, society, culture, and environment. A basic action for the strengthening and the lifting of the isolation of islands is the creation of networks. The transport, energy and telecommunications networks, strengthen the remote and isolated regions such as islands, so that they link themselves with the continental country and with each other come out of their isolation.

Regarding Greece, since 1981 when it joined the European Economic Community, Greek regions received significant surges of resources and interventions and Directives, programs and finances were directed through Structural Funds, to the Greek regions. A significant financial support for the country was found in the Integrated Mediterranean Programs (IMP), which had an initial period of implementation from 1984-1989, but was extended until their completion. These programs aimed for the first time at the growth of the Greek regions including all four island regions, of Northern and Southern Aegean, Ionian Islands and Crete.



MAP 1: INVESTMENTS IN GREEK ISLANDS

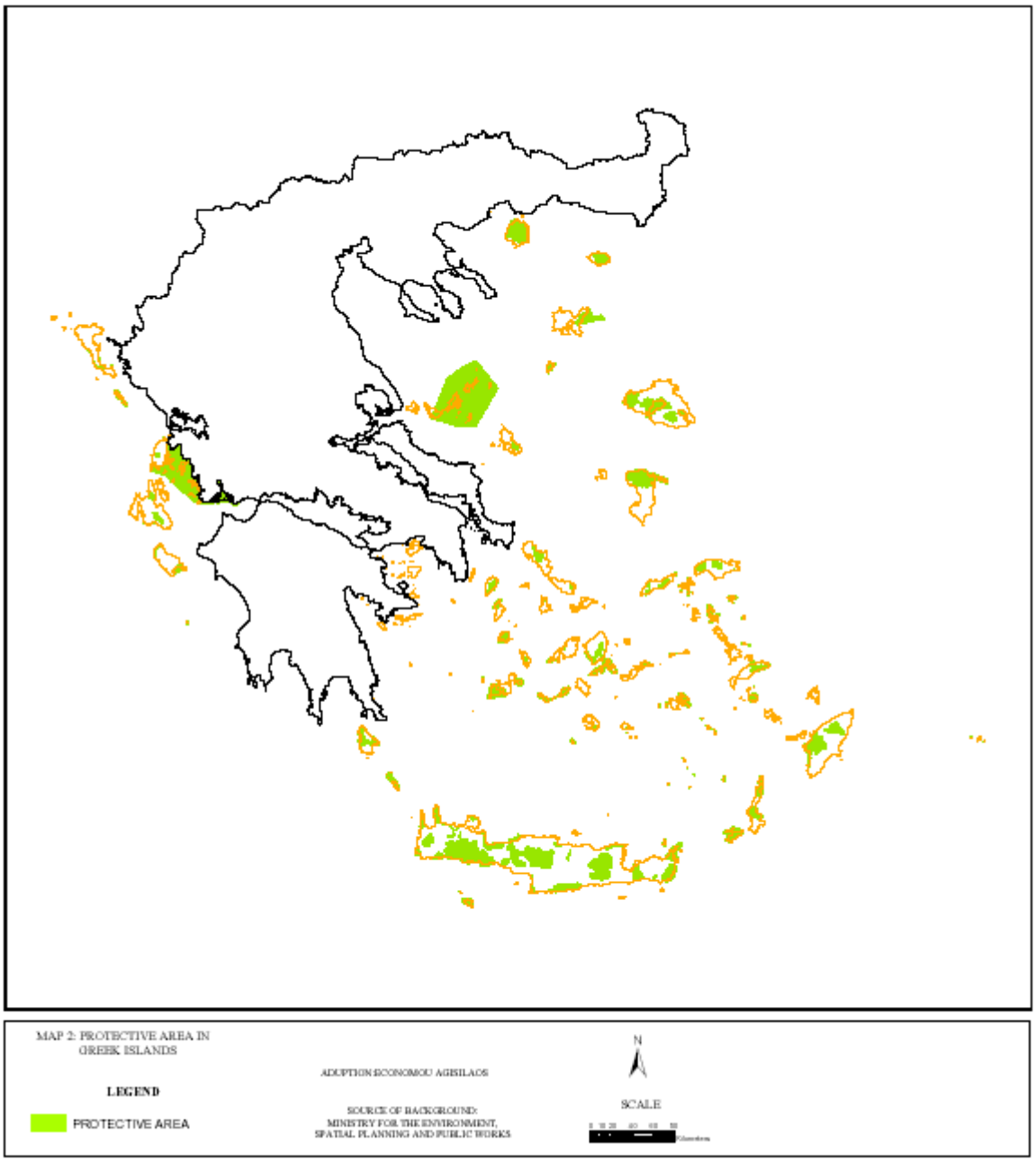
Six out of seven Programs of IMP corresponded with the six areas in which Greece was then administratively divided and the seventh was thematic (IMP of Information technology). they The 3 Community Support Frameworks (CSF) also constituted a decisive aid for the Greek regions. The A' CSF or First Parcel Delors (1986-1994), aimed to assist the move towards an internal market and help the weakest economies and regions to face the consequences of the suppression of the internal borders of the Community. The application of this program is distinguished byb the big dissemination in infrastructure works concerning the entire Hellenic space.

The B' CSF (1994-1999) was focused more in infrastructure works that contribute in diminishing the regional character of Greece and in the promotion of its internal completion. Its objectives concerned sectors as the environment, the improvement of the health system, urban development, the intensification of international competitiveness, modernization of agriculture and tourism, the reduction of regional developmental inequalities and the lifting of the isolation of Greek regions.

The C' CSF (2000-2006) aims at the completion all these works so that Greece can meet the future conditions of competition in the European and international environment. Its objectives concern the increase of productivity and the essential growth of the country via investments in anthropogenic, human and cognitive capital. A main feature of this period is the development of the country for its integration in the

Economic and Monetarity Union as well as the implementation of big infrastructure works in the entire country: Road axes (PATHE, Egnatia Road), harbor, the modernization of Greek railway network, Metro of Athens, energy works (aeolian parks, natural gas), telecommunications, hospitals etc.

Within the framework of the three CFSs two forms of interventions were planned , interventions by sector and regional interventions. Regional interventions concern exclusively the 13 Greek regions, among which are the 4 island regions. At the time of this paper, the C' CSF is in progress and the D' CSF for the period 2007-2013, which sets as its main objective the sustainable economic development through social cohesion via a competitive and dynamic economy in which knowledge and full employment will constitute essential elements, is being prepared.



MAP 2: PROTECTIVE AREA IN GREEK ISLANDS

Moreover as far as Greece is concerned, actual convergence towards the average European standards and cohesion remain two of its main development objectives. The resources that have been proposed for the Policy for the Cohesion during the 4th Programming Period 2007 -2013 (D' CSF) amount up to 336, 1 billion Euros, they correspond to 0, 41% of GNP of the EU of the then 25 member-states. To this resources one should add the funds for the aid of rural growth and fishery in the regions of the so-called "Objective of

Convergence", which have been proposed to be 31,3 billion Euros for agricultural growth and 3,7 billions Euro for fishery.

More generally, as basic contents of the Policy for the Cohesion during the period of 4th CSF, the following are being proposed in order of precedence:

- Innovation and Economy of Knowledge
- Environment and Prevention of Hazards
- Accessibility and services of general Economic of Interest
- European Strategy for the Employment
- Special needs of least developed Regions and Member states (infrastructure, institution development)

Over the last years, Greek islands have been subjected to the above mentioned regional policy of the EU and have been included in the integrated strategic program of growth for the entire country.

Specifically, the objective is focused on tourism, with the simultaneous maintenance and aid of existing remaining economic activities. Tourism constitutes an important source of income, but the encouragement of alternative forms of tourism is set as a parallel goal to mainstream tourist development. For the development of the rural sector, the effort focuses on rural infrastructures, fishery and the promotion of traditional islands products.

The main works that were constructed over the last years are barrages and water supply networks, irrigation works, construction of rural roads, the assistance of live-stock production with the use of programs of genetic improvement, the aid of agricultural production with the financing greenhouse building and the construction of piscatorial shelters. A thrust in the aid of medium-sized enterprises via various motives and the use of human potential through training of the unemployed, was achieved.

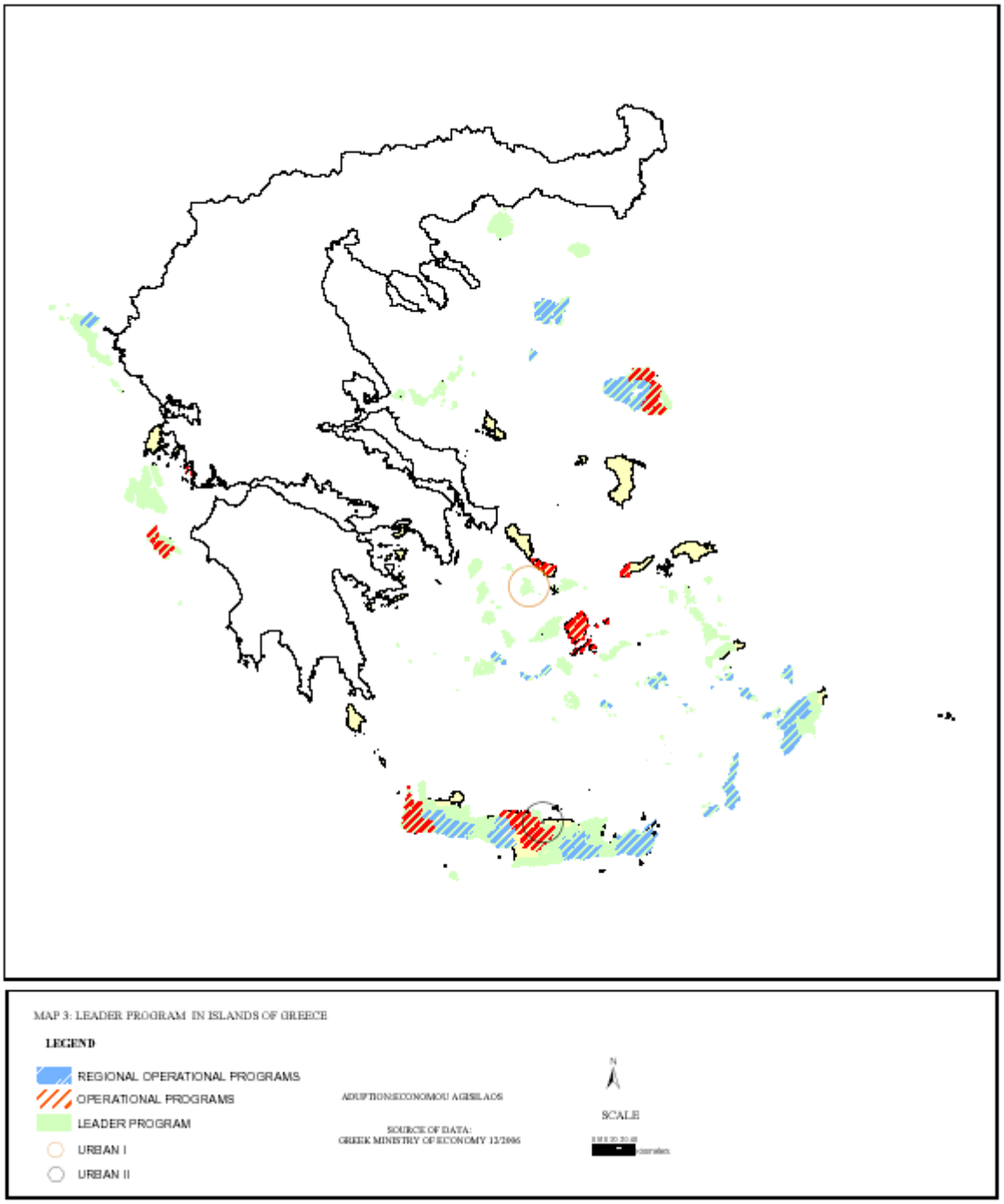
To support the primary sector the construction of shelters for fishing boats, interventions in natural forest regions, opening up or improvement of rural roads, construction of small dams, electrification of rural units, subsidies for the construction of flower-gardens, greenhouses are promoted. Also, the improvement and aid of infrastructures regarding transports (airports, harbors, and roads) as well as aiding mass media , are also goals.

An additional measure is the improvement of the productive environment with the aid of local high added value traditional cultivations and the promotion of such products. For the future, with the 4th programmatic period priorities for the islands are set. A fundamental objective is the creation of infrastructures for the economic growth. In the relative proposals it is reported that priority should be given to the sectors that concern the modernization of infrastructures of basic networks.

The environment, in its natural and also in its structured form, also constitutes a priority for the future. The protection, the safeguarding and the promotion of the natural environment is set as an objective. The structured environment also receives similar care. Thus, the protection of aquatic resources, the organization of land-planning, the completion of infrastructures in the structured environment, along with energy policy, constitute interventions that are programmed to be implemented within the framework of the 4th programmatic period.

Social infrastructures, services and education, are decisive factors for the sustainable development and the standard of life. The maintenance and the aid of infrastructures of services of social security and concern, the support and completion of infrastructures of education, the development of new systems of education as well as the support of infrastructures of health, constitute the most basic elements of priority.

Priority is also given to the human capital. The interventions for the next programmatic period have as an aim the training, upgrade and support of human potential, the support of institutions that deal with the work market, without of course ignoring the sensitive groups of the population. At the same time, the sector of public administration is important. The improvement of administrative capability in the public administration and institutions, is expected to be strengthened by suitable policies over the next period. Finally, inter-state collaboration is a goal for the future.



MAP 3: LEADER PROGRAM IN ISLANDS OF GREECE

Through these priorities the extrovert role of islands will be strengthened. The control of tourist activity, the qualitative upgrade of the tourist and cultural product are some of them. The objectives are the modernization of tourist infrastructure, emphasizing on a small number of alternative forms of tourism, the growth of international relations and cross-border programs, the promotion of culture through the form of experiences, and facing the problem of tourist education.

The improvement of approaching and the accessibility of region are also objective for the next period. The air and coastal links concern in the creation of qualitative land installations, routing of means, rearrangement of lines and political freight. The energy and the communications are a sector that will accept aid in the next programmatic period. Objective is the guarantee of networks capable they cover the current and future needs. The value of information technology has particular importance for regions more with difficulty accessible, as are the islands of South. Aegean, precisely because it offers new possibilities in the enterprises of region decreasing drastically the factor of isolation.

The production of high technology products is a sector that is investigated for the next period. The objective is to set specifications and arrangement studies for the suitable regions of installation for these investments (for example technological parks), to ensured the conditions of their operation (networks of energy, communications, transports, etc.), to promote and are publicize the expected positive effects, so ast to ensure the attraction of necessary human potential.

To emphasize on information technology, the involvement of local societies in the planning and their information regarding the designed policies in a simple and comprehensible way, to create motives both from the local government and the state so as to attract this type of enterprises and finally to transfer to these enterprises the academic technological experiences.

The configuration of a competitive enterprising environment is also a very important objective for the next period. A basic objective is the competitive planning and the economy of resources, the use of innovative tools in the financing, the planning in the attracting of capital and new enterprises, the emphasis on the quality and the reduction of work-cost, the priority of the economy of knowledge, the mapping of local business dexterity, the encouragement of feminine business dexterity.

For all of the above, efforts will be intensified even more for the support of low economic growth regions. This means, an engagement of resources intended exclusively for actions that will lead to the intraregional convocation and flexibility to the regulations of implementation.

4 CONCLUSIONS - THE CONTRIBUTION OF EU IN THE SUSTAINABLE DEVELOPMENT OF THE GREEK ISLANDS

Through the apposition of the above mentioned policies, actions and objectives related to the strategic development program for the whole country and islands, it is realized that the Greek islands face important problems that result from their island character and more generally from their geophysical location. A conclusive presentation of the existing development process, of the prospects and the potential of the islands, has been attempted. The basic objective was to investigate the degree up to which the whole policy of the EU can contribute to the sustainable development of Greek islands.

The modern development model that imposed big scale economies and external economies, is an important cause of the current disadvantageous position of many islands. Most of them, due to inaccessibility and the remoteness, did not succeed in living up to modern requirements, as a result of which they fell short of their goals regarding development, were left behind which became evident in all expressions of their socio-economic life. It appeared however, that over the last years, the escalation of the Regional Policy of the EU, aiming at sustainable development and being applied via the CSFs , constitutes an opportunity for the islands.

The first results already have already been seen from the completion of the works built, those in progress, but also those programmed. One of the basic issues regarding the island regions, is that of maintaining their population. The aid that is given via the CSFs in all the sectors can contribute to the increase of the GNP, thus creating motives so much for maintaining the existing population, as for attracting new, provided that employment opportunities for the residents are amplified.

More specifically with regard to the economy and more specifically the employment sectors, (primary, secondary, tertiary), strategic programs are applied and objectives are set. The objective of Sustainable Development requires balanced development of all three sectors of production, so that each place is self-sufficient and autonomous with a minimization of economic dependences on external factors. Nevertheless of course, a steadily decreasing tendency in the employment of the population in the primary sector is being observed, presenting however high levels of specialization. The secondary sector - where it exists - is aided mainly at the level of medium-sized manufacturing enterprises.

A significant percentage of the activities of the tertiary sector is related to tourist enterprises. This percentage varies from region in region, nevertheless it maintains a high percentage in all four Greek island regions. The dangers facing a place which bases its economy entirely on tourism, has been pointed out, from time to time, by many scientists and experts. At the same time however, tourism constitutes an undeniably valuable economic resource for a lot of islands in the Greek island regions, therefore it should under no conditions be neglected..

One of the basic concerns for the Greek islands is to set tourism education and hospitality as a priority. Education is necessary for regions where tourism constitutes a sector of high importance, and the meaning of sustainable tourism should be made known to everyone. At the same time, the independency of tourist activities from the strictly coastal zone and their expansion towards the mainland of the islands, should be set as an objective.

The same must be done with the seasonal tourist assembly during the summer months. Tourism viability means dissemination throughout space and time, for economic, environmental, social and quality reasons and the Policy of the EU contributes, at the highest degree, to this direction. The utilization and promotion of culture and its connection to tourism, is a good example proving that.

The historical value of monuments and their important contribution in sustainable development has been determined. It has become evident that maintaining cultural heritage is necessary, as it sketches out the characteristics of each nation, is necessary for the survival of the past, provides useful information on the built environment of each time period, constitutes an aesthetic value which can also be translated financially.

Thus, with the aid of EU via the financing and the parallel initiatives of Local governments for the protection and promotion of cultural heritage, the extension of tourism through space and time can be aides and as result the sustainable development of islands can be assisted.

Also, it is importance to point out the important role of transportation and communications, and consequently of their proper organization. The islands, possibly without any further delay, will have to pursue a reduction in government interference with the adjustment of every detail regarding transportation. Competition creates a level of prices that in some cases may be lower than current prices. Moreover, the free configuration prices works in favor of the regular customer, meaning mainly the islanders.

Finally, the upgrading of coasting does not involve only new ships but good harbor infrastructures as well. Take into account the new programmatic period, harbors with future prospects should be designed. Coasting companies, as users of these harbors, should take part in this design

At the same time, the environment has already been determined as a central priority for development programs. In the future, still greater effort is required, provided that this constitutes perhaps, the most precious capital of the Greek islands. A serious increase of resources is also required, in absolute terms and relative terms, as a percentage of the total expenses. The success of he new design lies on the promotion of the comparative advantages of the islands and on the promotion and protection of natural wealth, so as to achieve a leap in quality, which will lead to the accomplishment of the objective of sustainable development.

The current policy of the EU via the C' CSF, includes a lot of infrastructure works or actions of social solidarity at a regional level, while others are to be included in the D' CSF. Thus, the efforts of state and local governments to contribute in sustainable, local and regional development of islands regions are supported. The Cohesion Fund, which is an independent from the C' CSF financing source, finances works related to the environment.

At the same time, the Special Management Services that aim at the more efficient management and implementation of the Regional Operational Programs (ROP) are operating in these regions. With regard to the action programs aiming at the growth of regions in all levels (viable, local and regional), appreciable effort from the program LEADER +, which finances investment proposals for the creation of rural farms, with animals, cultivations or trees and which will be open to visitors and provide overnight accommodation, is observed. Some islands have already benefited from all these initiatives. At the same time, as was made clear from the planning of the next period 2007-2013 , which will concern the 4th CSF in the future they can benefit even more.

Also, international relations and cross-border programs may constitute a basic priority for the general development activity. This can increase the number of the tourists in Greece. Common tourist packages with neighboring countries such as Italy and Turkey can be created. Moreover, it is a fact that each island makes up an independent tourist destination and the islands' development policy should be coordinated with this event.. Besides, as it was underlines and above, this is the strongest point of many Greek islands, which is unique in Europe and perhaps and the whole world.

The object of the European programs is the improvement of the quality of life of the human potential. We saw that some of the actions that should be undertaken with the new P.E.P. are the development of new

sources of employment, the prevention and reduction of unemployment as well as actions of promotion of equal opportunities for people threatened with social exclusion, the improvement of employment dexterities in all productive sectors of the islands' economies, the growth of innovation aiming at the creation of suitable environment for the growth of productive activities. The positive steps are underway and in spite of the small size of some islands and their remote location from the capital and other big urban centers, these islands have made appreciable efforts to this direction.

It is repeated that all the programs and actions that already has been completed and those which are in progress now, undoubtedly have contributed in the growth of the islands. However, the problems that should be faced are of multiple categories and not one-dimensional. The action programs should aim at all kinds of problems: economical, environmental, social, development, cultural, giving to the islands a thrust for development in all sectors.

With the promotion of all kinds of networking by the EU (transports, energy, communication, and urban networks) a chance is given to the islands to come out of their isolation and to stop being characterized as remote and regional. Beside this, it must not get past us the fact that a lot of islands, in various phases of their history have developed important actions and demonstrated a big economic growth and occasionally constituted cradles of civilization. This constitutes a proof that the problems are not insuperable and that the small size of the islands and their remote nature cannot be considered as disadvantages and inhibitive reasons for their growth. On the contrary, with the suitable utilization of these facts, their current underdevelopment can be overturned.

For the promotion of the sustainable development of the islands, priority be given to the modernization - upgrading of tourist infrastructure the upgrading of dexterities of those employed in the secondary and tertiary sectors, the promotion of competitiveness in the rural sector, the improvement of infrastructure of rural regions aiming at the creation new job openings, the interconnection of rural regions with larger settlements etc should. Through all these, the local economy will be strengthened and developed, and the life standard of the population will improve. In all these, EU policy targeting at viable development, is particularly important.

5 BIBLIOGRAPHY

1. ZABELIS H., "The Greek island space and the problems of small islands", Proccedins of the Meeting Coastal and Island Space", Ministry of Environment and Public Works, Athens 1999
2. MITOULA R., "Sustainable Development in European Union and reconstruction of Greek Urban Environment", ed. Stamouli, Athens 2006
3. KONSOLAS N., "Regional Financial Policy. General Attestation», ed. PAPAZISI, Athens 1985
4. European Commission, " Europe 2000+, Cooperation for the xrapora^ia in Europe", Coastline regions and Islands, Brussels 1991
5. see 4
6. SPILANIS G., Research and documentation Texts N. 41, For the European Policy for the Islands, Greek Center of European Studies, Athens 1996
7. European Commission, "The Structural Funds and the coordination thereof with the Cohesion Fund - Plan of Directives for the programmes 2000-2006", Brussels 3.2.1999
8. MITOULA R., "The Financial Identity and the Progress of Development of 13th Greek Regions», Proccedins of the 1st Meeting Enterprising "Innovation - Undertaking", Harokopio University 17-18/3/2005
9. ANGELIDIS M., Economou A., "The contribution of Community Support Framework (CSF) in the development of coastal area in Greece", CORP 2006, 11th International Conference on Urban Planning and Regional Development in the Information Society, 13th-16th February 2006, Wien
10. General Regulations Plan 14.7.2004 – COM 2004 492 Final
11. www.kps.gr

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Virtual Communication and IT in the Reflection of Architecture and Urban Design. Experiences from international studio projects

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1 EUROPEAN ASPECTS AND PREMISES

Students are learning in the European Learning Space. They navigate themselves in it and select courses and programmes according to their needs, interests and their actual life conditions. They look for the best provisions in terms of quality and services universities provide.Universities are to be conceived as nodes in this Learning Space delivering knowledge resources and learning facilities, based on research. They build their reputation on the quality of their research, education and services to the students. Education is lifelong, open and flexible. By integrating e-learning to their systems, openness and flexibility can be improved essentially. New strategic goals of generation and contribution of universities partnerships, common programmes, flexible and reusable learning contents, virtual mobilities, internationaly accepted acreditation and author´s certification result from such visions. Virtual universities, which include the cooperation and common use of the electronic learning contents and /or virtual mobilities of students and professors, are still the great challenges.

Design and building of virtual environment in the field of architecture, urban design and international projects of sustainable growths, promotes of the multi-disciplinary, multicultural and multiligual processes. By utilization of ICT, multimedia and e-learning environment, it is possible to create communicational, creative and tutorial platform for international portfolio of works, professionals, lecturers and students. Usage of the virtual multimedial environment and videoconferencing supports favourable conditions for European higher education institution to work together for developing sustained public services and to compete worldwide with respect to an e-learning higher education market creation.

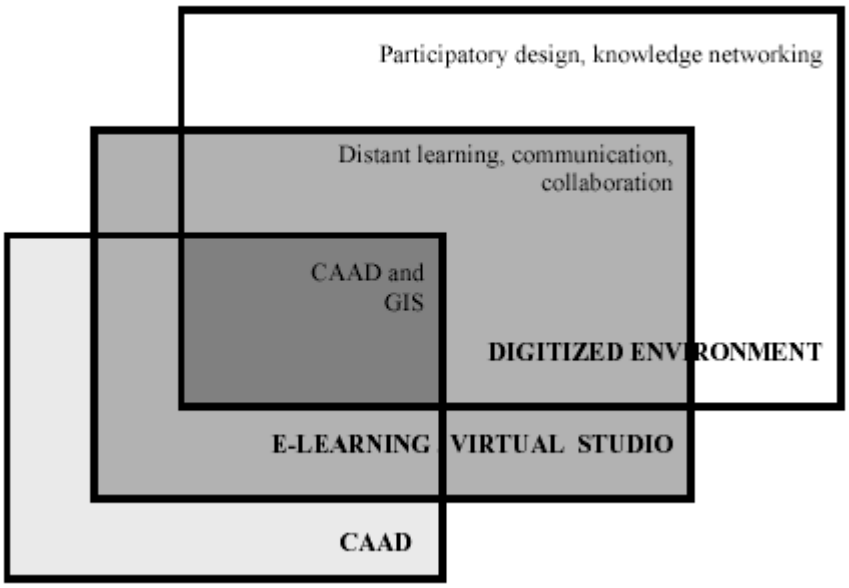
2 RESEARCH TOPIC

Research at the Department of Computer Aided Architectural Design at the Faculty of Architecture, Slovak University of Technology in Bratislava, ranges with the issue of benefits and limits in the utilization of modern information and communication technologies in the architectural, town planning and landscape designs education and practice. It is supported by the wide scale of teaching applications in students´ design projects and studios, with the various combinations of internal and abroad students and professors.

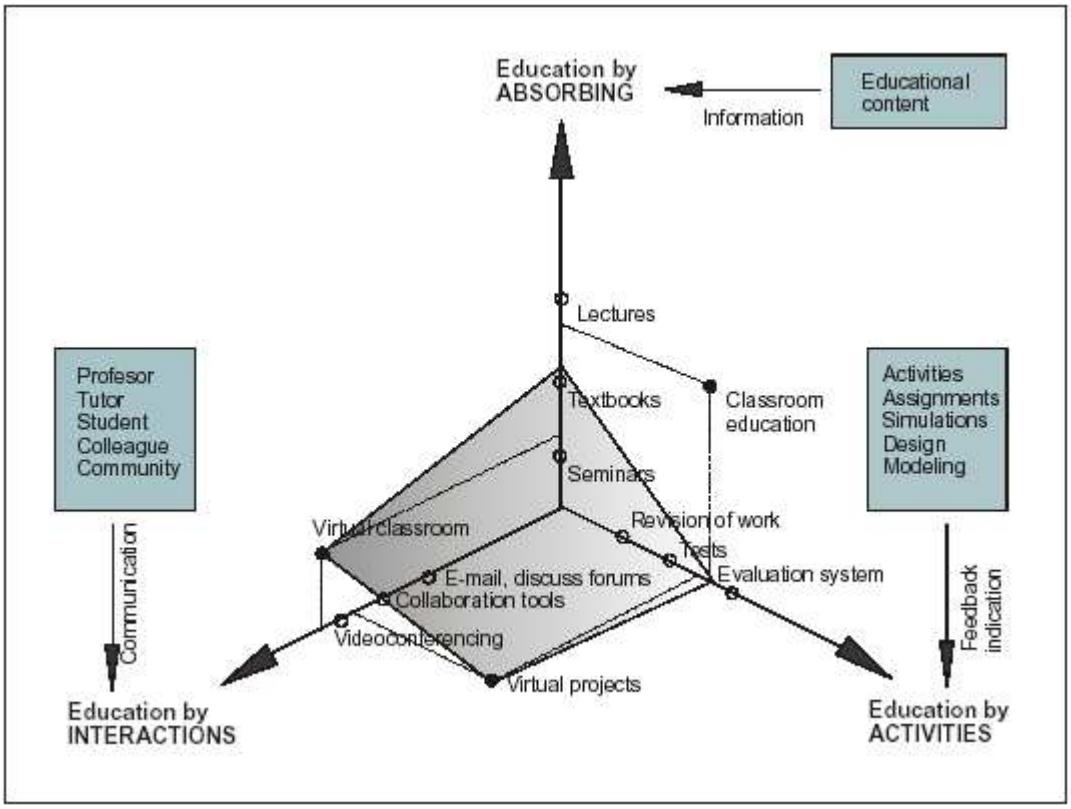
The creative design studios play the key role in architecture and urban design. They also dominate in the learning proces at our Faculty. Utilization of e-learning systems (with their standard understanding as electronic developed courses, seminars and tests) can be hardly conceived in the architectural studios. They need permanent interaction and communication during the design process and teaching assignments often varied, followed by actual issues and social acquisitions of architectural environment design. The aims follow the assessment of necessary extent of attendance forms of education and the acceptability of distant forms of education in architectural studios and the allocation of technological and pedagogical bases for them.

2.1 Analyses of utilization of ICT in architecture and urban design

The tools of ICT can provide much help to simulation of real, multiprofessional environment. New technologies and methods give the new tools and possibilities reflecting the new techniques of education, research and practice. Networks and Internet enables data and information exchange, but also the exchange of experiences and cultural property. Internet itself is not just a tool for surfing and enjoying, but preferably represents a tool for collaboration, workgroups, virtual studios or long distance education. Utilisation of ICT in architecture and urban design can be split into three main fields, following the complexity of application of new technologies in educational and creative process (Scheme 1).



Scheme 1 (Joklová, 2006)



Graph 1 : Basic forms of education (Joklová, 2006)

2.2 Virtual studio

„Virtual studio“ represents the studio education at long distance, conducted at various geographical places, applying more universities, students and professors and employing the ICT for communication, consultations, data, image and sound transfer, evaluation and project presentation.

Virtual studio enables long distance cooperation and consultation during the studio work. It´s no matter where the student is present at the moment. If the project details are digitally adjusted and accessible through Internet for pedagogical process, students and professors can virtualy communicate and consult their work on the various stages of elaboration, present it online via videoconferencing tools and data transfer. Virtual mobility can be understood as a complement or substitute to physical mobility. It may precede and/or extend

the physical mobility and thus offer new opportunities for students, who do not want or cannot benefit from the physical mobility.

2.3 Communication.

Communication has the substantial function in the electronic education and supplies the loss of immediate conversation, present in classical form of education. From the chronological point of view the communication can be:

- synchronous – happens in the same time
- asynchronous – occurs at the different time periods

The most common tools of asynchronous communication, which are realized through the ICT, are e-mail, web discuss forums and discuss groups. Synchronous communication (like telephone, chat, as an interchange of small text messages, and various types of videoconferencing) provides the basic favour of immediate response.

2.4 Videoconferences

Videoconference is the most sophisticated form of synchronous communication using ICT tools. It supplies the real time communication with the simultaneous projection and sound transfer. Videoconference implemented between two points is called two-point videoconference. Multipoint videoconference connects more than two participant points.

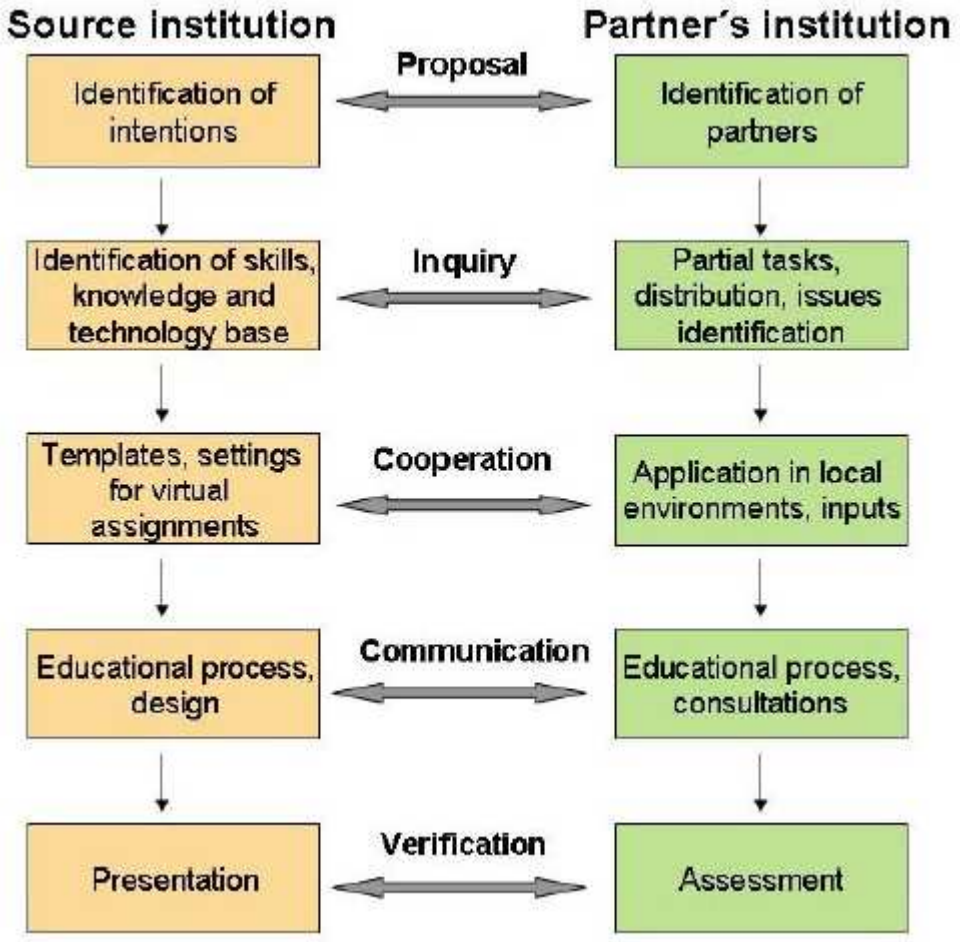
According to the technology of implementation, can be two essential forms of videoconferences :

- videoconferences through ISDN links (Integrated Services Digital Network) – are relatively cost demanding for the basic equipment and for the service (the payments for ISDN call), but are very credible for good sound and image transfers,
- videoconferences through computer nets and Internet (Netmeeting, MSN, Windows Messenger, FirstClass, VRVS, Skype etc.) – require the minimum of technology equipment (web camera, headsets or microphone and loudspeakers), and provide the low cost services (just the payment for network services). The specific time delay of the image and sound transfer, due to the data overload of computer nets, is their disadvantage.

Videoconferencing enables the visual presentation of the design in real time. In the architectural education it represents the method for verification of the design quality. On the other hand, professors and students have an opportunity to join the design process even if they are on abroad mobility. By the means of videoconferencing tools the education converges to practice and therefore could represent the important methodology tool in architectural education.

3 SYSTEM METHODOLOGY

Process of the long distance education in architectural and urban design studio starts with preliminary analysis of sources and demands of initializing institution or the draft of study programmes offered and wanted. Education gains the aspect of the commodity more and more. On the bases of identified intentions educational institution searches for inverse partners. Cooperation starts after the bi or multilateral agreement with the preparatory stage oriented on the specification of studio subject, time table, guarantee, priniples of long distance communication and the data transfer. Long distance studio teaching follows afterwards, based on the conventional tools of synchronous and asynchronous communication for consultations. Conclusive phase includes the final presentation of studio projects and the assesment by the participated students, tutors, guarantees and institutional committee. (Scheme 2)



Scheme 2 - Basic scheme of development and the process of virtual studio

4 EDUCATIONAL AND RESEARCH PROJECTS

Presented examples are various types of virtual studios applied to teaching and research process at the Department of Computer Aided Architectural Design, Institute of Design, Faculty of Architecture, Slovak University of Technology.

4.1 BRAGRALUWIE - International collaboration and design studio

As the initiative of the teachers from four different universities – Faculty of Design and Technology, University of Luton, U.K., Technische Universität, Graz & Technische Universität Wien, Austria and Faculty of Architecture, Slovak University of Technology, Bratislava, Slovakia several international design studios were created from 1995 till 1998.

“Projects had been successful in achieving completed design proposals at each participating institution. In educational terms the projects were benefitial in developing the awareness of the students on issues connected with collaborative working, differing architectural cultures and the potential of electronic communication in design. All the participants, particularly the teaching staff, learnt a great deal about the possibilities of using the Internet as a colaborative working tool.” [Koščo, eCAADe 1999]

Scheme 3 : Virtual studio participating

4.2 Street of 21st Century - International competition and design studio

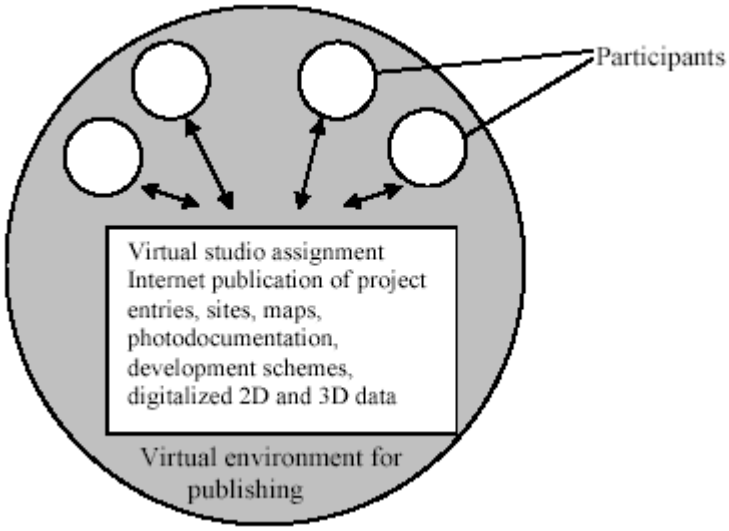
This study had been ellaborated in the scope of an international student competition in which the European Center for Architecture & Information Technologies - International Academy of Architecture in the cooperation with Bratislava City Council and the Faculty of Architecture specified the street (or better the whole district) to be designed for the 21st century requirements. The core aim had been to support the cooperation of talented students at European universities and to gather new, modern ideas for the participant cities redevelopment.

4.3 Bratislava Dockland Zone

Bratislava Dockland Zone had been a collaborative study focussed on the architectural re-development of the Danube dockland zone in Bratislava, using advanced computer based urban modelling and virtual cooperation through the Internet and digital communication technologies. It dealt with the area of old Bratislava port, which according to the model of urban renewal of old dockland area in London, was intended to promote urban re-development strategies in this area. The collaborative student design work and academic research between two universities, Bratislava and Luton (U.K.), was supposed to continue after the completion of this specific project. A core aim of the project was to achieve an impact upon urban renewal strategy and policy in both partner sites, and to participate in the formation of appropriate systems.The impact of the academic contribution in terms of student design projects was recorded through web based design presentations, end-of-year exhibitions and the reports of external examiners at the two participating institutions.

Fig.1. Web environment for Street of 21st Century and for Danube Docklands Zone

All these studies had the common methodological features. Basic informations about the projects, specific data entries, building regulations by the City council, site references and photodocumentation had been available on a server through hypertext organized web pages linked with other important sources. Two-dimmensional and three-dimensional vectorised models of the existing conditions of the designed areas had been created, published on Internet and able to download. Communication during the various stage of colaboration had been asynchronous, using e-mail, and synchronous, through ISDN videoconferencing. The result designs had been published at the web sites.



Scheme 4 – Common virtual studio assignment

Fig.2 : Aerial view of the site

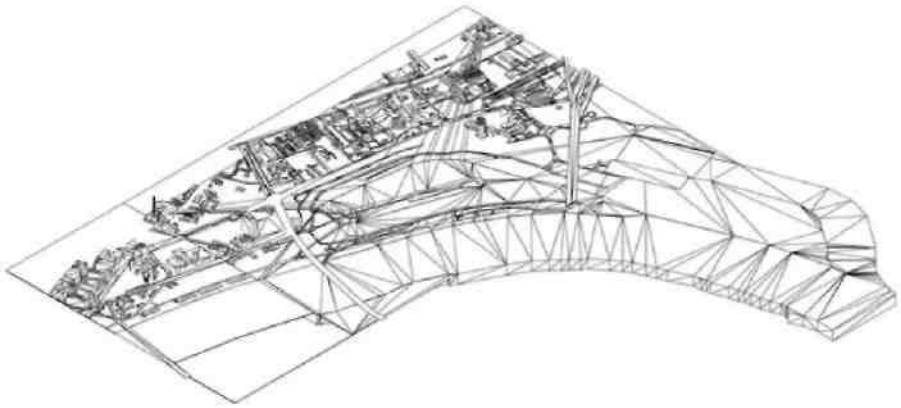


Fig.3 : 3D digital model of the area

Fig.4 : Photodocumentation

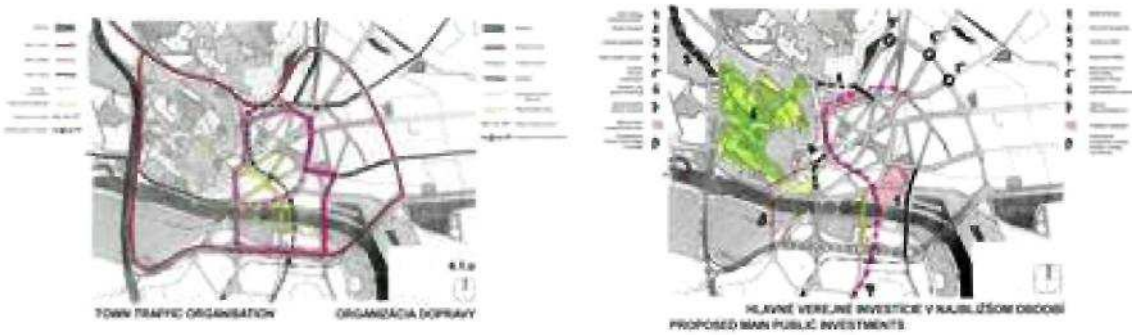


Fig.5 : Schemes, studies, regulations

Fig.6 : Videoconferencing through ISDN lines during the studio project consultation, Bratislava,SK Luton,U.K.

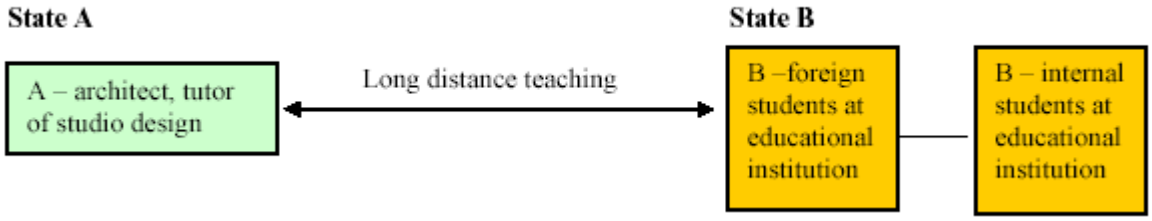
4.4 The Centre of Czech Architecture in Prague

This is an actual pedagogical experience with virtual collaboration between foreign students from Socrates–Erasmus mobility scheme, studying at the Faculty of Architecture, Slovak University of Technology,Bratislava and its professors, and american professor, Mr. Lizon, from University of Tenneessee, USA.The topic of the studio was the reconstruction and desing of the new spaces for Centre of Czech Architecture in Prague.

The combined face-to-face and long distance education has been used during the two terms of the studio works.The unique distant learning consisted from the initial, continuous and final intensive workshops at the Faculty and subsequent videoconferencing sessions and electronic communication between students in Bratislava and the teacher in the U.S.A. Graphic files of students ´ architectural design have been consulted through computer nets. For the long distance synchronous communication the systems of VRVS (Virtual Room Videoconferencing System) and Skype had been tested. Both systems belong to Internet videoconferences and require the minimum of technology equipment (web camera, headsets or microphone and loudspeakers) for long distant video, audio and data transfer. Final jury review has been realized

successfully at the the Faculty of Architecture, Slovak University of Technology,Bratislava with the jury chairman´s attendance trough the video-conference.

Fig.7 : Videoconferencing through VRVS system during the studio project consultation



Scheme 5 – Long distance studio teaching

5 METHODS OF VIRTUAL STUDIOS VERIFIED AT THE FACULTY OF ARCHITECTURE, SLOVAK UNIVERSITY OF TECHNOLOGY, BRATISLAVA

- **Studio assignment** can be accomplished either by the real attendance of the tutor or definitely virtually, if the project data are adjusted digitally and are accessible via computer nets and Internet.
- **Data transfer**. Frequent communication and the transfer of the partial design data, sketches, questions, comments, etc. are necessary for studio project correction and consultation during the various stages of creative proces. ‘
  Our realizations had shown, that distant teaching at these stages of studio project can be equally fruitful using simple ICT methods (e-mail, net data transfer, chat, skype, etc.) as the presence forms of studio teaching, if the consultations are frequent, regular and consequent and the students and professors have at least the basic computer knowledges.
- **Revision of elaboration** of studio projects is realized usually in the middle of the term as partial public presentation of student´s design before the fellows students and tutor. To keep the open form, the virtual studios use appropriate videoconferencing tools for long distance public presentation of the work. For the long distance synchronous communication has been verified videoconference systems :
- VRVS (Virtual Room Videoconferencing System) - belongs to Internet videoconferences and requires the minimum of technology equipment (web camera, headsets or microphone and loudspeakers). VRVS system is able to accomplish multipoint videoconference session and to adjust specific desktop as a sharing server for the presentation of digital work. Also the image transfer is satisfactory. Some problems have been caused by installation of the system to local PC stations of participants and by worse quality of sound transfer (sound echo).
- Skype - also belongs to Internet videoconferences and requires the minimum of technology equipment (web camera, headsets or microphone and loudspeakers). Skype provides good sound and video transfer and is very easy to manage. However, it did not allowed us the multipoint sessions and online digital data presentation, but the simplicity and user friendly environment of Skype caused its wider exploitation in the process of long distance teaching in virtual studios.

- ISDN (Integrated Services Digital Network) videoconference - is a circuit-switched telephone network system, designed to allow digital transmission of voice and data over ordinary telephone copper wires. It is relatively expensive from the point of view of the technology equipment (the special videoconference camera), and for running the sessions (telecomunication payments), but offers very good video and audio transfer. It could be realized just in case all distant participants have ISDN videoconference tools.
- Final studio project presentation is realized before the professional committee. The distant forms of virtual studios have used videoconference systems and results proved to be quite satisfied. Such forms offer to gather not only geographically distant students or tutors, but even geographically distant members of committee, without the necessity of traveling. The way of communication must be thoroughly agreed with all participants beforehand.

Fig. 9 : Recordings from final studio projects presentations, Bratislava,SK– Venice, U.S.A.

Fig. 10 : Recordings from final studio projects presentations, Bratislava,SK – Venice, U.S.A.

6 RESULTS

The valorisation of realised pedagogical and research projects, as well as the structured analysis of acquired experiences and results, may contribute the design of optimal digital environment and the model for realisation of the long distance education in architecture.

In general, the dual system, (the combination of face-to-face intensive workshops and the long distance education), can be considered as the most suitable and used model of long distance education in our experimental studies. The exception had been “The Street of 21st Century”, which, as the international competition, had been assigned explicitly through Internet without fixed pedagogic assistance. Every other experimental study had begun with the familiarisation of collaborative collectives, with the definition of problems and the approaches of their sollution, and afterwards the long distance education has been done. In that manner the human dimension has not been dropped from such form of education. The results of critical evaluation of realised pedagogical and research projects assign to at least equivalent effectiveness of studio projects, realized through the long distance ICT tools, the multinational and multiprofessional cultural outlook interchange is the added value.

The electronic communication technologies and multimedia offer wide opportunities for various supplements of traditional architectural education. They open the new methods for the cooperation, for the interchange of cultural values and knowledges and for the creative inspirations. Our experiences with the long distance education, design and research in architecture and urban design realized with the use of ICT technologies have shown the indisputable advantages, which concern mainly the:

- Overcomming the geographical, cultural and personal barriers
- Improvement of the availability of education materials and their reusability
- Increasing of computer literacy
- Improvement of the teaching technique
- Costs savings

7 REFERENCES

HUBA Mikulas, ZAKOVÁ Katarína, BISTÁK Pavol: „WWW and education". STU Bratislava 2003, ISBN 80-227-1999-4

FERKO, Andrej: „Museum with the future", Slovenské pohl'ady 2005

KOŠČO, Igor: „Videoconferences in architectural education", Virtual text book, LSDV, FEI STU, 2003

KOŠČO, Igor, JOKLOVÁ, Viera: Annual report for educational and research project KEGA, „Crossroads for ideas", January 2006

KOŠČO, Igor : „How the world became smaller", In Architectural Computing, from Turing to 2000, conference proceedings,2001, pg.230-237, ISBN 0 9523687 5 7

WILLEY, D. S.: Architectural Education in the Digital Environment", In. Writings in Architectural Education, EAAE, No.26, 2005, ISBN 2-930301-22-8

JOKLOVÁ, Viera, KOŠČO, Igor: „Virtual communication and IT in architectural education", In proceedings from 7th international conference „Virtual University - VU'06", 2006, pg. 233-238 ISBN 80-227-2542-0

JOKLOVÁ ,Viera, KOŠČO, Igor: Communication and IT in architectural education and practice", In: Spatial Simulation and Evaluation, the sixth EAEA Conference Proceedings, 2003, pg. 116-122, ISBN 80-227-2088-7

JOKLOVÁ Viera: "Street of 21st Century ", In. Proceedings of Institutional Research, 2003

DOBSON Adrian: „Digital creativity - architectural design in the electronic age", In. International workshop and scientific seminar: integration of arts, science and technology in higher education, utilization of ICT for e-learning and long distance cooperation", 2005, conference proceedings ALFA 4/2006, pg.33-50

KOUTAMANIS Alexander, BARENDSE Peter, KEMPENAAR Jan Willem: „Web-based CAAD instruction - the Delft experience", In Architectural Computing, from Turing to 2000, conference proceedings,2001, pg. 159-168, ISBN 2-930301-22-8 BETÁKOVÁ, Janka, JOKLOVÁ, Viera, MICHALKO, Ján : Jnnovative processes in the study of sustainable development", In. Proceedings from international conference Jnnovative processes in the field of university study of social and economic sciences", Trencin, 2006, pg.41-45, ISBN 80-8075-139-0

JOKLOVÁ, Viera : „E-learning and ICT in architecture and urban design", dissertation study In. conference proceedings ALFA 4/2006, pg.75-91

Should Planning-Support Tools rely on Public Participation or on Expert´s Judgments?

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1 INTRODUCTION

The fast and somehow chaotic urban growth process faced by many cities around the world demands the adoption of new planning methods to ensure a sustainable growth process, meant to improve the overall community quality of life. For that reason, many research teams are nowadays working on the development and adjustment of techniques for getting a stronger community participation in the planning process.

The participation of the community in the planning process can make the discussion about urban problems more comprehensive and effective, and in theory it can legitimate both the decision-making and decision-taking processes. That means that the solutions of urban issues would rely not only on politicians and planners, but also on the community affected by the decisions. Therefore, participative planning should be able to drive the development of a city for reaching sustainable development and to improve the community quality of life through an organized process. That is one of the reasons why most of the new planning support tools currently under development worldwide are in one way or another including public participation channels in the planning process. However, there is no evidence that community is always tuned with the planning requirements and, above all, constraints. Many factors (e.g., social and cultural) and the knowledge gap between the common citizens and the experts are likely to generate distinct planning alternatives and priorities. As a consequence, the overall planning process can take different directions depending on the judgments it is based upon.

In order to evaluate the impact of the different points of view assumed by regular citizens or by experts on a planning initiative, we built an experiment using PLANUTS, a Decision Support System developed for sustainable mobility planning in Brazil. Given the internal structure of the system, five Categories were considered for analyses: Transport and Environment, Transport Management, Transport Infrastructure, Transport Planning, and Socio-economic Aspects of Transport. Each one of the Categories was divided in Themes, which were further subdivided into Indicators (close to one-hundred). Categories and Themes were then evaluated by the two groups, one of experts and the other one formed by common citizens, in order to identify their relative weights and to look for differences in their evaluations.

2 METHODOLOGY

We have compared the results of the evaluations carried out by two groups of users with the Scale of Points, which is the the multicriteria analysis technique adopted in PLANUTS. The first group was formed by three experts, while the second group was formed by three community members. The selection of the groups was based on the following aspects: i) the experts were individuals involved in the development of systems for urban mobility planning, ii) the community members were individuals with different levels of knowledge about urban mobility issues, about computational tools, and with different technical and cultural backgrounds.

As shown in Figure 1, the five-points scale was the alternative adopted in PLANUTS for the evaluation of urban mobility aspects. That was as an attempt to keep the evaluation process as simple as possible, given that in a participatory planning process one can expect to have users with different backgrounds and distinct levels of knowledge about the urban mobility aspects being evaluated. The evaluation process of PLANUTS is available in Internet. The entire system is constituted by four modules for the evaluation of urban mobility aspects through Categories, Themes, and Indicators, as earlier proposed by Costa (2003). In the experiment designed for the present study, only the first module of PLANUTS was considered. That module allows the identification of the most important Categories and Themes for urban mobility planning, according to the evaluators. This is done in two phases: the first one only for Categories, and the second one for Themes.

Figure 1: Five-points evaluation scale used in PLANUTS

Considering the characteristics of the evaluations and the essentially qualitative nature of the analyses we planned to conduct with their outcomes, we choose to analyze the results using non-parametric statistical methods. Two aspects were particularly interesting for our study: the intensity of agreement among evaluators and the degree of similarity of the ranks obtained with the two methods. So, we needed statistical methods that could be used to evaluate the data correlation or the level of agreement in the judgments. Thus, we selected Kendall's Correlation Agreement Coefficient to compare the level of agreement in the evaluations of the two groups, and Kendall's Correlation Ranking Method to check if the final results of both groups were similar in terms of ranking.

3 ANALYSIS OF THE RESULTS

As a first step of the analyses, the evaluation results were used to calculate the mean values of the weights found for Categories and Themes by each group. The weights found for Categories and Themes per evaluator in each group and the mean and standard deviation values are shown in Table 1. The information contained in Table 1 made possible to identify the results (or weights) per evaluator and per group that are within an interval considered as acceptable. We defined that interval as one standard deviation to each side of the mean value obtained per criterion. Therefore, the values in dark gray cells in Table 1 are below that interval, while (light) gray cells are associated with values above that interval. The other values of Table 1 (in the non-colored cells) are within the specified interval.

An analysis of the Categories in Table 1 showed that the evaluations were quite homogeneous in both groups. In Group I, 73 % of the values are within the interval predefined as acceptable. The weights outside the interval are balanced below and above it. In the individual analysis of the evaluators, only evaluator 'A' had all results within the acceptable interval. Group II had the same number of evaluations outside the acceptable interval (27 %), but they were spread in the three evaluators.

A similar analysis was also done for the Themes, in which the evaluations were more heterogeneous. The main points observed were: i) 34 % of the values in Group I are ouside the acceptable interval (17 % below and 17 % above it); ii) 25 % of the values in Group II are ouside the acceptable interval (10 % below and 15 % above it). A more detailed analysis was done per evaluator, as follows of Group I:

- Evaluator 'A' had 80 % of the results within the acceptable interval against 20 % of the weights outside the same interval (10 % above it and 10 % below it).
- Evaluator 'B' had half of the results within the acceptable interval. The weights outside the same interval were balanced (25 % above it and 25 % below it).
- Evaluator C had 66 % of the results within the acceptable interval against 34 % of the weights outside the same interval.
- A similar analysis was also done for Group II, as follows:
- Evaluator 'D' had 55 % of the results within the acceptable interval against 45 % of the weights outside the same interval (25 % above it and 20 % below it).
- Evaluator 'E' had 80 % of the results within the acceptable interval against 20 % of the weights outside the same interval (15 % above it and 5 % below it).
- Evaluator 'F' had 90 % of the results within the acceptable interval. The weights outside the same interval were balanced (5 % above it and 5 % below it).

The analysis per evaluator allowed a comparison of the results found for each criterion in both Groups. When looking to all values outside the acceptable interval in Table 1, for instance, only a few criteria had weights in the same relative position (evaluators B and E for Urban Population and C and D for Costs, for example). That analysis approach focusing only on the mean and standard deviation values, however, was not enough for checking the intensity of agreement among evaluators within the Groups and the degree of

similarity of the ranks derived from the weights found by the two Groups. This was done with the specific methods discussed in the following subsections.

CRITERIA		GROUP I			GROUP II			MEAN	STD DEV
		A	B	C	D	E	F		
CATEGORIES									
TRANSPORT AND ENVIRONMENT		0.211	0.200	0.238	0.208	0.158	0.227	0.207	0.028
TRANSPORT MANAGEMENT		0.158	0.150	0.190	0.167	0.211	0.227	0.184	0.031
TRANSPORT INFRASTRUCTURE		0.158	0.150	0.143	0.208	0.158	0.136	0.159	0.026
TRANSPORT PLANNING		0.263	0.250	0.238	0.208	0.263	0.182	0.234	0.033
SOCIOECONOMIC ASPECTS OF TRANSPORT		0.211	0.250	0.190	0.208	0.211	0.227	0.216	0.020
THEMES									
TRANSPORT AND ENVIRONMENT	ENERGY	0.188	0.200	0.313	0.235	0.214	0.167	0.219	0.051
	ENVIRONMENTAL IMPACTS	0.313	0.333	0.250	0.235	0.286	0.278	0.282	0.037
	AIR QUALITY	0.250	0.267	0.188	0.294	0.286	0.278	0.260	0.039
	NOISE	0.250	0.200	0.250	0.235	0.214	0.278	0.238	0.028
TRANSPORT MANAGEMENT	ECONOMIC STRATEGIES	0.231	0.333	0.231	0.313	0.250	0.278	0.273	0.043
	MONITORING	0.308	0.167	0.308	0.188	0.188	0.222	0.230	0.063
	MOBILIDADE URBANA	0.231	0.250	0.231	0.188	0.250	0.222	0.229	0.023
	NEW TECHNOLOGIES	0.231	0.250	0.231	0.313	0.313	0.278	0.269	0.038
TRANSPORT INFRASTRUCTURE	FLEET	0.188	0.250	0.231	0.118	0.214	0.222	0.204	0.047
	ROADWAY SYSTEM	0.313	0.375	0.308	0.294	0.286	0.278	0.309	0.035
	TRANSPORT SERVICES	0.250	0.250	0.231	0.294	0.286	0.278	0.265	0.025
	TRAFFIC	0.250	0.125	0.231	0.294	0.214	0.222	0.223	0.056
TRANSPORT PLANNING	URBAN ACCESSIBILITY	0.278	0.294	0.250	0.222	0.364	0.333	0.290	0.052
	URBAN GROWTH	0.278	0.294	0.250	0.278	0.273	0.267	0.273	0.015
	URBAN POPULATION	0.222	0.176	0.250	0.222	0.182	0.200	0.209	0.028
	TRIPS	0.222	0.235	0.250	0.278	0.182	0.200	0.228	0.035
SOCIOECONOMIC ASPECTS OF TRANSPORT	COSTS	0.188	0.222	0.250	0.250	0.200	0.211	0.220	0.026
	SOCIOECONOMIC IMPACTS	0.250	0.222	0.250	0.250	0.267	0.263	0.250	0.016
	ROAD SAFETY	0.313	0.278	0.250	0.250	0.267	0.263	0.270	0.023
	PUBLIC TRANSPORT	0.250	0.278	0.250	0.250	0.267	0.263	0.260	0.012

Table 1: Weights found for the Categories and Themes per evaluator and per Group

3.1 The Agreement within Groups

The Kendall's Correlation Agreement Coefficient makes possible to compare the intensity of the agreement observed in multiple sets of data, based on their ranking. The correlation coefficient (W) produced with the method varies from zero to one. The interpretation of the coefficient values is straightforward: zero indicates no correlation, one indicates total correlation, and the values in between show the intensity of the relationship as they approach zero (low correlation) or one (strong correlation). The application of the method in our study was done to verify the intensity of agreement among evaluators in each one of the Groups. The results of the application of Kendall's Correlation Agreement Method for Categories and Themes are shown in Table 2.

In the case of the Categories, the results in Table 2 showed a strong agreement of the evaluators in the group of experts (W = 0.846). Conversely, that agreement was not so strong in the Group of community members (W = 0.235). The W values for the Themes shown in Table 2 were calculated within the Categories. The Categories with the strongest agreement were: Transport Planning, for Group I; and Transport and Environment, Transport Management, Transport Infrastructure, and Socioeconomic Aspects of Transport, for Group II. The agreement was evident in the Theme Transport Management for Group I (W = 0.867) On the other hand, the same Theme had a very low coefficient for Group II (W = 0.144). That difference in the value of W reflects the distinct points of view of experts and community members regarding the aspects of transport management in the city.

3.2 The Similarity of the Results Obtained

The Kendall's Correlation Ranking Method made possible to check if the final results of both methods were similar in terms of ranking. The correlation coefficient (τ) produced with the method is in the interval $-1 \leq \tau$

≤1. The interpretation of the coefficient values is direct: zero indicates no correlation, and one (either positive or negative) indicates total correlation. Positive values indicate a direct relationship while negative values show an inverse relationship. The application of the method in our study was done to verify how similar are the results obtained by the different groups in terms of ranking. The data used in the calculation and the results obtained are displayed in Table 3. The analyses of the results show a perfect positive correlation in the case of the Categories ($\tau = 1.000$), but a relatively low value for the Themes ($\tau = 0.471$).

CRITERIA		RANKING						W (Kendall's Coefficient)	
		GROUP I			GROUP II			GROUP I	GROUP II
		A	B	C	D	E	F		
CATEGORIES									
TRANSPORT AND ENVIRONMENT		2	3	1	1	4	1	0.846	0.235
TRANSPORT MANAGEMENT		4	4	3	5	2	1		
TRANSPORT INFRASTRUCTURE		4	4	5	1	4	5		
TRANSPORT PLANNING		1	1	1	1	1	4		
SOCIOECONOMIC ASPECTS OF TRANSPORT		2	1	3	1	2	1		
THEMES									
TRANSPORT AND ENVIRONMENT	ENERGY	4	3	1	2	3	4	0.333	0.623
	ENVIRONMENTAL IMPACTS	1	1	2	2	1	1		
	AIR QUALITY	2	2	4	1	1	1		
	NOISE	2	3	2	4	3	1		
TRANSPORT MANAGEMENT	ECONOMIC STRATEGIES	2	1	2	1	2	1	0.144	0.867
	MONITORING	1	4	1	3	4	3		
	MOBILIDADE URBANA	2	2	2	3	2	3		
	NEW TECHNOLOGIES	2	2	2	1	1	1		
TRANSPORT INFRASTRUCTURE	FLEET	4	2	2	4	3	3	0.792	0.818
	ROADWAY SYSTEM	1	1	1	1	1	1		
	TRANSPORT SERVICES	2	2	2	1	1	1		
	TRAFFIC	2	4	2	1	3	3		
TRANSPORT PLANNING	URBAN ACCESSIBILITY	1	1	1	3	1	1	0.647	0.462
	URBAN GROWTH	1	1	1	1	2	2		
	URBAN POPULATION	3	4	1	3	3	3		
	TRIPS	3	3	1	1	3	3		
SOCIOECONOMIC ASPECTS OF TRANSPORT	COSTS	4	3	1	1	4	4	0.569	0.667
	SOCIOECONOMIC IMPACTS	2	3	1	1	1	1		
	ROAD SAFETY	1	1	1	1	1	1		
	PUBLIC TRANSPORT	2	1	1	1	1	1		

Table 2: Kendall's Correlation Agreement Coefficient (W) for Categories and Themes

4 CONCLUSIONS

The main conclusions drawn from the application of the non-parametric statistical methods for comparing the results of the evaluation carried out by the groups of experts and of community members were:

- The application of the Kendall's Correlation Agreement Method indicated a considerable difference in the evaluations conducted within the two Groups. While the group of experts agreed in the analysis of Categories, they did not agree in the evaluation of the Themes. It happened exactly the opposite in the evaluations of the community members.
- Through the Kendall's Correlation Ranking Method we observed a positive correlation of the results obtained by the two Groups for both Categories and Themes related to urban mobility. In the case of the Categories, there was a perfect correlation. In the case of the Themes, however, the value of the correlation coefficient found suggests a reasonable difference in the points of view of the two Groups.

In an overall comparison of the results obtained in the evaluations of the different Groups, we found that our system apparently should not rely only on the judgements of experts, given the differences in the judgments expressed by the two groups. However, as the experiment involved only small groups of both experts and community members, further analyses with larger groups and with other methods of analysis are needed.

CRITERIA		FINALWEIGHTS		RANKING		τ (Kendall's Coefficient)
		GROUP I	GROUP II	GROUP I	GROUP II	
CATEGORIES						
TRANSPORT AND ENVIRONMENT		0.217	0.200	2	3	1.000
TRANSPORT MANAGEMENT		0.167	0.200	4	3	
TRANSPORT INFRASTRUCTURE		0.150	0.169	5	5	
TRANSPORT PLANNING		0.250	0.215	1	1	
SOCIOECONOMIC ASPECTS OF TRANSPORT		0.217	0.215	2	1	
THEMES						
TRANSPORT AND ENVIRONMENT	ENERGY	0.051	0.213	9	18	0.471
	ENVIRONMENTAL IMPACTS	0.065	0.277	3	9	
	AIR QUALITY	0.051	0.298	9	4	
	NOISE	0.051	0.255	9	10	
TRANSPORT MANAGEMENT	ECONOMIC STRATEGIES	0.044	0.280	14	5	
	MONITORING	0.044	0.263	15	19	
	MOBILIDADE URBANA	0.039	0.289	16	16	
	NEW TECHNOLOGIES	0.039	0.395	16	2	
TRANSPORT INFRASTRUCTURE	FLEET	0.032	0.243	19	20	
	ROADWAY SYSTEM	0.049	0.378	12	12	
	TRANSPORT SERVICES	0.036	0.378	18	12	
	TRAFFIC	0.032	0.324	19	17	
TRANSPORT PLANNING	URBAN ACCESSIBILITY	0.069	0.295	1	1	
	URBAN GROWTH	0.069	0.273	1	3	
	URBAN POPULATION	0.054	0.205	7	15	
	TRIPS	0.059	0.227	5	11	
SOCIOECONOMIC ASPECTS OF TRANSPORT	COSTS	0.048	0.222	13	14	
	SOCIOECONOMIC IMPACTS	0.052	0.259	8	6	
	ROAD SAFETY	0.060	0.259	4	6	
	PUBLIC TRANSPORT	0.056	0.259	6	6	

Table 3: Input data and results of the calculation of the Kendall's correlation ranking method for Categories and Themes

5 ACKNOWLEDGEMENTS

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6 REFERENCES

ABDI, H.: The Kendall Rank Correlation Coefficient. URL: http://www.utdallas.edu/~herve/Abdi-KendallCorrelation2007-pretty.pdf

COSTA, M.S.: Sustainable Urban Mobility: a Comparative Study and the Bases for a Management System in Brazil and Portugal. MSc Thesis, University of São Paulo, São Carlos, SP, Brazil, 2003.

CRAIG, J.W.; HARRIS, T.M.; & WEINER, D.: Community participation and Geographic Information Systems; Taylor and Francis. London and New York, 2002.

MAGAGNIN, R.C.; RODRIGUES, D.S.; RAMOS, R.A.R. & SILVA, A.N.R. da.: A Spatial Decision Support System for Participative Planning. In: CUPUM 05 - Computers in Urban Planning and Urban Management. Londres: CASA - Centre of Advanced Spatial Analysis - University College London, 2005.

SILVA, A.N.; RAMOS, R.A.R.; SOUZA, L.C.L.; RODRIGUES, D.S. & MENDES, J.F.G.: SIG: Uma plataforma para introdução de técnicas emergentes no planejamento urbano, regional e de transportes: uma ferramenta 3D para análise ambiental urbana, avaliação multicritério, redes neurais artificiais; São Carlos; SP; Ed. dos autores, 2004.

reviewed paper

What kind of society are we planning for? The formation of urban social areas in a postmodern society – the example of Vienna and the Vienna Metropolitan Region

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1 PREFACE

Post-modern restructuring of society, as attributed to globalization and restructuring of labor, has led to a growth in intra-urban social disparity and even polarization. In US-American cities Neo-liberal policies have led to hyper-segregation of social classes by a concentration of low-income groups and minorities in derelict ghettos on the one hand and by a gating of the upper class in communities of their own, isolating themselves from the rest of urban society and its related problems on the other hand. In European Welfare States, this process has been associated with cutting back interventions in planning by urban authorities. Planning has shifted from active comprehensive planning to reactive fragmented planning. Studies from Western European Countries as well as from Northern America reveal that the new form of postmodern urban planning, even though guided by ideas of social sustainability, contributes to the polarization of urban society. The increasing polarization of urban society is argued to be represented in the socio-spatial patterns of the city. The identification of socio-spatial polarization, accompanied by a spatially fragmented society, is the common cause of research issues on the postmodern restructuring of urban society. An analysis of the socio-spatial patterns in the City of Vienna and the Vienna Metropolitan Region is aimed at illustrating how postmodern restructuring has affected the structure of urban society and the related socio-spatial patterns. Extracting the driving forces of the formation of socio-spatial patterns is the main purpose of the study in order to provide insights into chances and limits of planning social sustainability in a postmodern urban society.

2 THEORIES AND CONCEPTS ON THE FORMATION OF SOCIO-SPATIAL AREAS

Analyses of the formation of socio-spatial patterns in urban areas were guided by concepts developed and applied by social area analysis. The theory of social area analysis is based on the assumption of socially homogeneous neighborhoods within the city. The formation, shaping and the related socio-spatial patterns of these neighborhoods in urban areas can be reduced to and explained by three dimensions: A socio-economic dimension, a demographic dimension and an ethnic dimension, each of them corresponding to specific shapes. Sectoral structures were considered as typical of the socio-economic dimension, zonal structures of the demographic dimension and clustered patterns of the ethnic dimension. MURDIE (1969) integrated the feature of the urban fabric into this theoretical framework. Various analyses in the 1970s and 1980s proved that this model more or less applies to a majority of cities in the industrialized countries of the "western hemisphere", characterized by modern societies (see HATZ, 1998 and FASSMANN, HATZ, 2006). With the restructuring processes in economy, the concept of social area analysis became more and more criticized.

Based on the tradition of how urban societies developed in the welfare states of the 1970s and 1980s, concepts called for an increasing fragmentation of social space, distinguished rather by different lifestyles than by social classes. Theories and concepts referring to the restructuring of urban society due to globalized economies, focus on an increasing polarization within the city, marked by highly skilled employees working for international companies on the one hand and a growing proportion of unskilled workers in the service industries providing the services for the highly skilled work force on the other hand. This polarization of society was intensified by the process of de-industrialization – the relocation of manufacturing either to the outskirts or to countries providing cheap labor force, while the control and command functions as well as the related executive jobs increasingly concentrated in the "global cities" (see SASSEN, 1991). Economic restructuring and fiercer competition made even European political strategies shift from emphasizing "welfare" to policies guided by Neo-Liberal ideas. Even if the rise of the service sector could compensate for part of the dramatic loss of work places in manufacturing, it could not replace all jobs that had become redundant. Consequently, unemployment rates increased and participation in labor not only in terms of employment and unemployment but also in working hours have become the typical features of post-modern society. Economic restructuring has not only resulted in a polarization of society, this process has also been accompanied by a loss of the middle classes, forced out of the city by a booming real estate market. In US-

American cities the loss of middle class and the issue of affordable housing have become a top agenda of urban planners and policy-makers (see MLLENNIUM HOUSING COMMISSION, 2002).

This transformation of society is reflected in the urban socio-spatial patterns, in terms of a polarized "Dual City" as stated by CASTELLS (1989) and MOLLENKOPF, CASTELLS (1992). Other authors have developed concepts of a city split into at least three social subdivisions – an "International City", a "Marginalized City" and a "Middle Class City" (HÄUSSERMANN, SIEBEL, 1987) – or in a "quartered" city (MARCUSE, 1989). The common cause of recent theories on the restructuring of urban society and its related social patterns is the re-evaluation of the theoretical framework of social area analysis, becoming obsolete in a postmodern urban society and eventually being replaced by either polarization or social fragmentation of urban spaces. The given theoretical concepts on the transformation of socio-spatial structures do not only provide the cause for an analysis of the dynamics of socio spatial patterns itself, but also are building the theoretical framework of the questions of research guiding the analysis:

- How and to what extent has postmodern restructuring affected the social structure of the Vienna Metropolitan Region and what indicators are relevant to identify these changes?
- What effects on the socio-spatial patterns in the Vienna Metropolitan Region can be determined?
- Have features of polarization, fragmentation and the exodus of the middle class already affected the socio-spatial patterns in the Vienna Metropolitan Region?

These questions can be regarded even more as central issues, as the "global trends" restructuring urban societies and spaces are juxtaposed by the welfare policy of urban planning in Vienna. Within Europe and maybe even worldwide with about one quarter of the housing stock Vienna holds the highest share of social housing apartments. The soft urban renewal program, supported by grants of the city to avoid "gentrification" – the replacement of low income groups by the affluent in inner city neighborhoods – and to provide affordable housing units in renovated apartment complexes, has become another central focus of planning social sustainability in Vienna. Opposed by "fragmented" urban planning in the suburban region, effectiveness and limits of planning the social sustainability in the City of Vienna and the Vienna Metropolitan Region is another major concern of the analysis.

3 FEATURES OF THE SOCIO-DEMOGRAPHIC STRUCTURE AND THE HOUSING MARKET IN THE VIENNA METROPOLITAN REGION

The selection of variables integrated in the analysis of postmodern restructuring is crucial as they are supposed to indicate the relevant features of a post-modern society. On the other hand, the selection of indicators is limited due to the availability of data and the requirements of the selected method of analysis. All in all 32 variables have been selected for the analysis, covering the social, demographic and ethnic structure of the population as well as features on housing in the Vienna Metropolitan Region. In the City of Vienna, the analysis was guided at the level of census tracts, in the suburban region at the level of municipalities and communities.

3.1 Socio-economic features

An analysis that refers to polarization and the emerging "Middle Class City" requires a refined data set, not only focusing on the top and the bottom of the social ladder, but also the social groups "in between".

	University degree		High school		Vocational school		Apprenticeship		9th grade	
	1971	2001	*1971*	2001	*1971*	2001	*1971*	2001	*1971*	2001
City of Vienna	*3.9*	10.4	*9.5*	15.0	*10.1*	10.6	*29.9*	28.6	*46.5*	33.2
Austrian Citizens	*3.7*	8.9	*9.0*	13.3	*7.5*	9.9	*29.4*	26.1	*44.1*	24.3
Suburban Region	*1.9*	6.7	*5.7*	13.3	*7.6*	13.3	*25.1*	33.6	*59.7*	30.2
Austrian Citizens	*1.8*	6.0	*5.4*	12.4	*7.5*	12.9	*24.7*	32.0	*56.6*	25.9
Vienna Metropolitan Region	*3.5*	9.4	*8.7*	14.5	*9.5*	11.3	*28.9*	30.0	*49.7*	32.4
Austrian Citizens	*3.3*	8.1	*8.2*	13.0	*9.4*	10.7	*28.4*	27.7	*46.9*	24.8

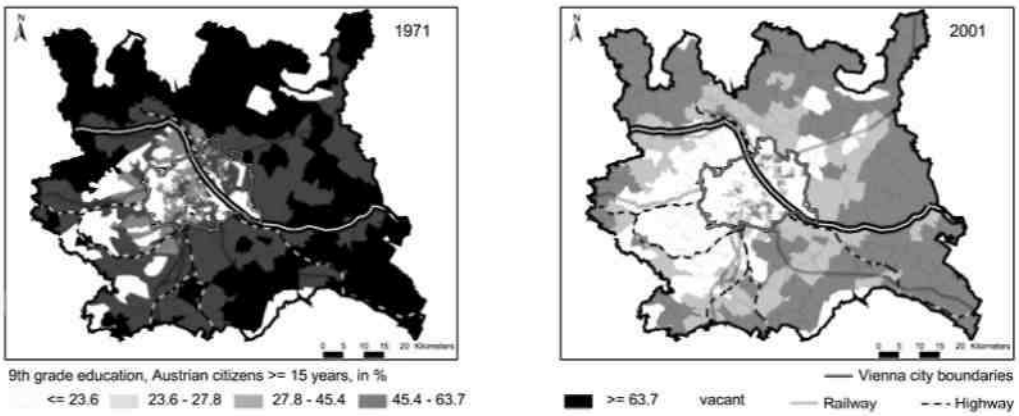
Table 1: Residents by educational skills and citizenship, Vienna Metropolitan Region (Statistik Austria, author's calculation)

Indicators for the social structure have been chosen by the educational skills of the residents, as these data can be differentiated by citizenship. This differentiation enables the analysis to identify not only features of

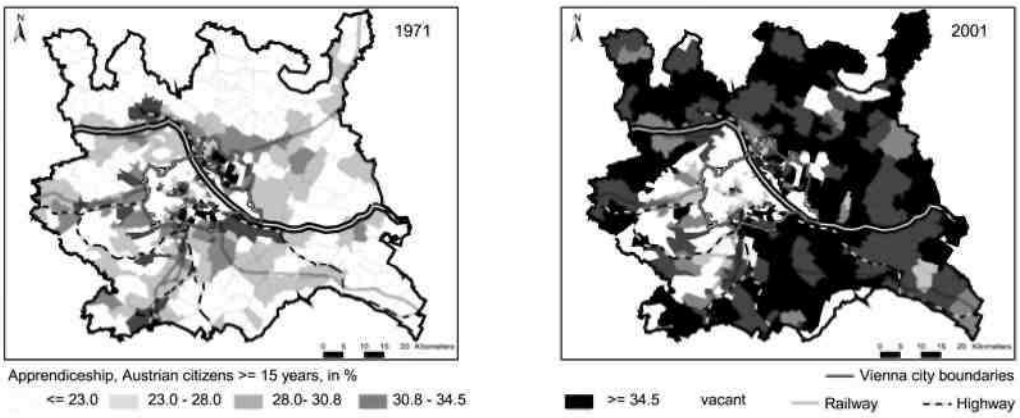
the ethnic dimension but also effects that have resulted from the internationalization of the post-modern urban society.

3.1.1 The dynamics of social-spatial patterns and the emergence of the "Marginalized City and the "Middle Class City"

The dynamics of the socio-spatial patterns seem to support the hypothesis of the exodus of the middle classes out of the city proper, and it becomes obvious that these dynamics are regulated by qualifications and professional skills as an indicator of social stratification. Because of higher educational levels, the share of residents with 9th grade or compulsory education has decreased nearly in all areas of the Vienna Metropolitan Region. Considering citizenship, it becomes obvious that unskilled immigrants have in part replaced low-skilled Austrian citizens. In 2001, more than one quarter of residents with 9th grade education did not hold an Austrian citizenship; in 1971, the respective share only amounted to about 5%.

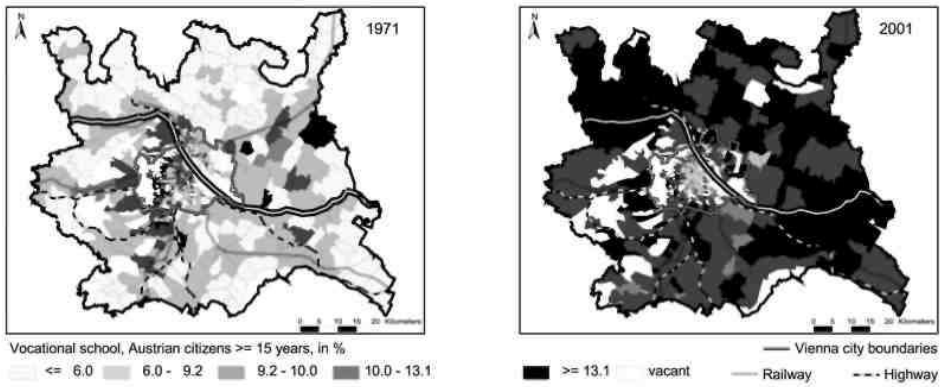


Graph 1: 9th grade (compulsory) education, Austrian citizens in the Vienna Metropolitan Region 1971 and 2001



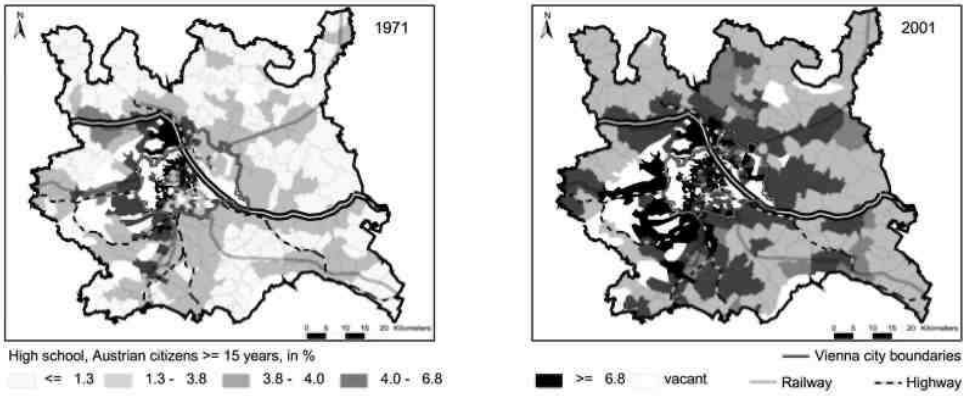
Graph 2: Apprendiceship, Austrian citizens in the Vienna Metropolitan Region 1971 and 2001

What is observed for 9th grade residents does not hold true for residents who have learned a trade and those who have a diploma of Vocational Schools. The share of Non-Austrian citizens is the lowest compared to other educational levels. The dynamics of residents with respective qualifications show the highest significant shift between the City of Vienna and the Suburban Region. In the City of Vienna, the share was constantly around 10 % for Vocational Schools and 28 % for apprenticeship, showing a slight increase of around 1 percentage point. The respective shares in the Suburban Region increased by nearly 6 percentage points for graduates of Vocational schools and by more than 8 percentage points for residents with qualifications based on apprenticeship. These dynamics at a first glance seem to support the emergence of a middle-class city in the Suburban Region. The dynamics of the spatial distribution at the level of census tracts and municipalities in the suburban region provide a more detailed insight. In 1971 residents with apprenticeship or Vocational School as their highest educational level, were concentrated in the city proper or in the Suburban Region bordering the City of Vienna. These patterns have changed dramatically over the past decades. Compared to 1971, in 2001 these residents, considered as "middle classes", had more or less disappeared in the inner city and now are dominating most parts of the suburban region.

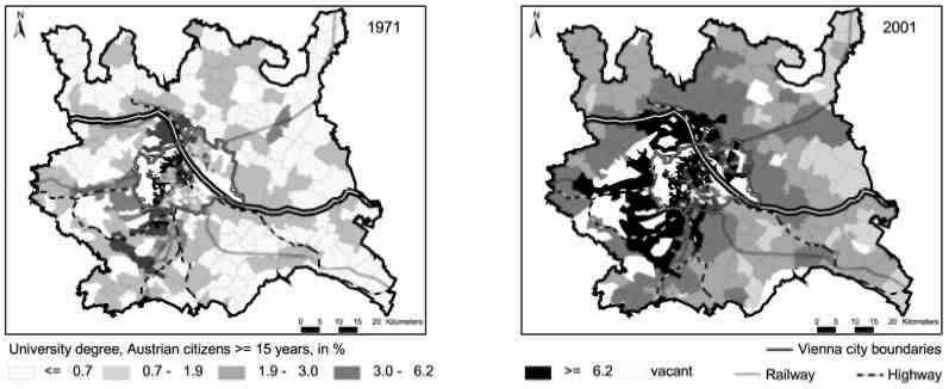


Graph 3: Vocational school, Austrian citizens in the Vienna Metropolitan Region 1971 and 2001

The dynamics of high school graduates and residents holding a university degree provide further evidence of the selective socio-spatial dynamics creating the "Middle Class City". Even though they have spread out into the suburban areas as well, they are still highly concentrated in the city proper. What is more, in contrast to residents with lower qualifications, the share of well-educated residents has increased within the city proper and the "upper class neighborhoods" have spread out into the neighboring districts. The dynamics of the spatial patterns within the city proper suggest that the middle class gets displaced by an increasing concentration and sprawl of upper class neighborhoods. In the Suburban Region, the "sprawl" of highly skilled residents seems to be sensitive to distance. The closer to the city proper, the higher are the shares and the respective increase of high school and university graduates.



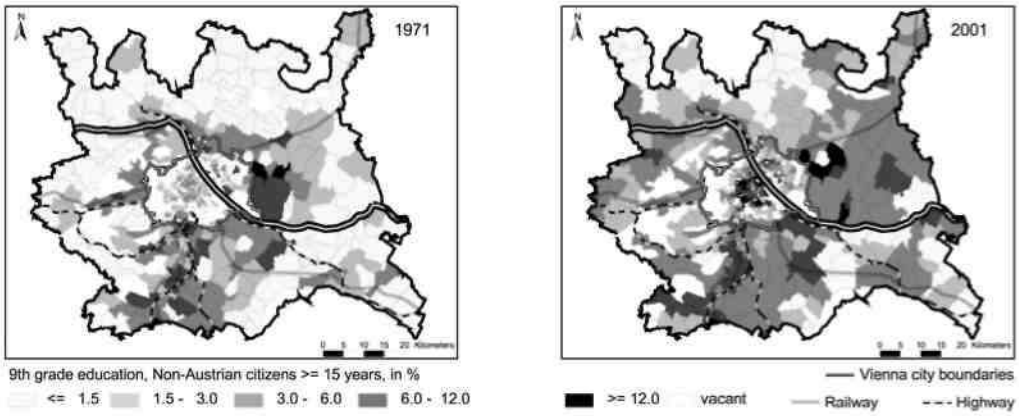
Graph 4: High school, Austrian citizens in the Vienna Metropolitan Region 1971 and 2001



Graph 5: University degree, Austrian citizens in the Vienna Metropolitan Region 1971 and 2001

The increase of low-skilled work force, mainly provided by immigrants, reinforces polarization of postmodern social areas. Since the 1970's the share of non-Austrian citizens in the city proper increased from 3.8 % in 1971 to 16 % in 2001, most of them unskilled immigrants from the successor states of former Yugoslavia and Turkey. Not only on the labor market but also on the housing market, these immigrants have taken over positions left by the low-skilled Austrians who had gained additional qualifications as well as

improved their living conditions as far as the standard of housing is concerned. Apart from highly skilled residents, immigrants show the highest rates of increase within the city proper. In accordance to their increase by number, a "Migration City" has emerged in the inner districts of the city, spreading out to the areas occupied by the better-off residents. In the western part of the city proper a polarization of the urban society seems to transform the socio-spatial patterns. By extending the area of observation to the suburban region, the model of a postmodern restructuring of the city into three socio-spatially homogenous subdivisions seems verified.



Graph 6: 9th grade (compulsory) education, Non-Austrian citizens in the Vienna Metropolitan Region 1971 and 2001

Even if the analysis of socio-economic features and their dynamics over the time provides first hints on the restructuring of socio-spatial patterns in the Vienna Metropolitan Region, it cannot answer the questions of the driving forces behind these developments in a satisfactory way. Educational skills do not sufficiently represent the restructuring of the labor market by the globalized economy and deindustrialization in terms of sectorial dynamics. So self-employed in scientific and technical professions as well as in production and service industries were added to the set of socio-economic indicators, just as the share of unskilled workers. Unfortunately, the census does not offer any direct data on the income situation. For this reason the spatial income distribution was estimated by multiplying the occupational distribution by the average income for each of the occupational categories and gender (see FASSMANN, HATZ, 2007).

Suburbanization might be guided more by demographic features, like family with children, than by socio-economic features, even as features of the housing market might force or hinder certain social groups to settle in specific neighborhoods. For understanding the restructuring and formation of these socio-spatial patterns, respective indicators have to be included into the analysis.

3.2 Housing market

	Substandard apartments	Social housing apartments	Homeownership	Single family/semi-detached houses
City of Vienna	8.3	24.8	20.2	48.9
Suburban Region	3.2	4.5	67.2	83.1
Vienna Metropolitan Region	7.0	19.7	32.1	68.6

Table 2: Legend (Statistik Austria, author's calculation)

What is most important for "planning" issues related to social sustainability are features of the housing stock and housing market. The housing market of Vienna is primarily a rental market. About 80 % of the apartments in the City of Vienna are rented, owners occupy only 20 %. In the suburbs homeownership increases to two third out of the housing stock. Homeownership is one of the most decisive features dividing the City of Vienna and its Suburban Region. The same holds true of social housing apartments, just the other way round. With about one quarter of social housing apartments out of all apartments the City of Vienna does not only hold an outstanding position within the Vienna Metropolitan Region but also in Europe. What makes social housing so distinctive for explaining socio spatial segregation is the strict limitation of access to these apartments. Access is regulated by a maximum household income, but it is also limited to citizens of the EU.

Even though the soft urban renewal program the stock of substandard apartments has been remarkably reduced in the last decades, in 2001 still 8.3 % of the apartments in the City of Vienna were not equipped with running water and/or toilet inside. The opposite of the low quality and densily built-up areas in the inner fringe of the City is the Suburban Region, dominated by single family or semi-detached houses.

As the real estate and housing market is probably influenced most by urban policies, the respective indicators selected for representing the building fabric of the city do not only refer to quality and size of apartments but also to living standards indicated by the type of the building. Homeownership, rental housing and social housing do not only reflect the distribution of property and therefore are an indicator for the social differentiation as well, but also represent the interventions and the chances of interventions by urban planners and decision makers into the local housing market.

3.3 Demographic Features

Demographic features have been added in order to represent and analyze the restructuring of urban areas caused by the post-modern diversification of family types and household forms. It is argued that the diversification of family types results in a diversification of requirements on urban spaces, forming specific demographic milieus in the city. The model of the quartered city, as conceptualized by MARCUSE (1989), describes the social milieus of the quartered city not only as a result of the diversification represented by the socio-economic structure of society but also by specific forms of lifestyles and partnerships. With this in mind, it seemed necessary not only to consider the "classical" set of demographic data, but also data representing the diversification of forms of households and living together. Besides, the age structure of the residents, indicated by the share of residents younger than 15 and residents aged 60 and older, the share of married and unmarried couples and the number of children in the household have been included into the analysis. Assuming, that children are bound to the social milieu of their parents, the share of residents younger than 15 years has been calculated for Austrian citizens and non-Austrian citizens. "Added values" for the lifestyle analysis are provided by the variables "living space per capita", but also by the period when the apartments were built. Analyses on urban lifestyles attach the new emerging urban classes to the historic building fabric like "gentrifiers", "YUPPIES" (young urban professionals)", "BOBOs (Bourgeois Bohemiens) or "DINKS (Double Income, No Kids)". The variable "apartments built in the period between 1991 and 2001" provides information on the emergence of social milieus in new housing developments.

4 DIMENSIONS OF URBAN SOCIAL AREAS

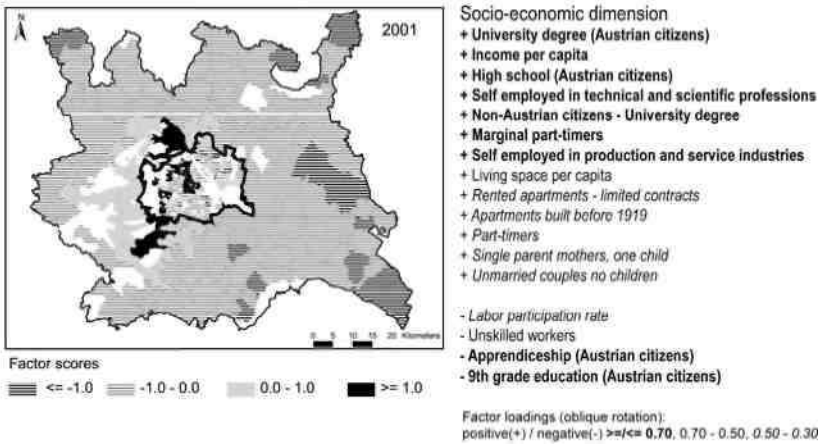
It becomes clear that certain sets of variables are mutually dependent and a uni-variate analysis of the selected indicators will not answer the question on the formation and features of social areas. The formation of socio-spatial patterns has to be considered as result of a complex interplay of various variables resulting in specific dimensions that shape specific social areas. To identify these dimensions a method that pools those variables and extracts the dimensions resulting from this interplay is required. In socio-area analysis, factorial ecology has proven as an adequate method for identifying those dimensions. Factor analysis provides the required technique and has been chosen for analyzing these indictors with regard to their interdependence. Factor analysis is a multivariate statistical technique that extracts the underlying factors from a large set of variables. It is assumed that there are only a few central dimensions (= factors) determining the individual variables and their bivariate correlations, which can be identified by Factor Analysis (see BAHRENBERG, GIESE and NIPPER 1992). The dimensions extracted by factor analysis are represented by their "loadings", indicating the positive or negative association of the single variables with the extracted dimension. Factor scores represent the extracted dimension in the single entities the analysis is based on, in that case the spatial units. The higher (positive) or lower (negative) the factor scores have been calculated for a single unit, the more the unit is characterized by the respective positive or negative loadings of the respective dimension.

Factor Analysis for the Vienna Metropolitan Region extracted four dimensions, forming respective social areas. The extracted dimensions support the findings of the social area analysis and can be labeled as socio-economic, ethnic and demographic dimensions that still form the social areas in the Vienna Metropolitan Region and explain 77,7 % of the variance of the indicators included in the analysis. What is most remarkable at a first glance is the subdivision of the socio-economic dimension that indicates a fragmentation of social classes in the Vienna Metropolitan Region on the one hand and a polarization of social areas within

the city proper on the other hand. The detailed analysis of the structure of the dimensions and their related spatial patterns provides an understanding of the underlying forces.

4.1 Socio-economic Dimension

The socio-economic dimension explains 26.9 % of the variance of the analyzed indicators. According to the concepts of social area analysis, the socio-economic dimension shows a sector-shaped pattern of high status neighborhoods extending from the city center to the west and south of the suburban region. In these neighborhoods, professionals with high personal income per capita are concentrated. Long-term studies show that the pattern indicating neighborhoods inhabited by well-educated residents with high social status has prevailed at least over the last 30 years, slightly expanding at its fringes (see HATZ, 1998). Opposite to low- or unskilled Austrian citizens, high status groups expand and intensify within the city proper or close to it. Consequently, it is not the high social status groups who are responsible for the expansion of the Suburban Region. The positive correlation of apartments built before 1919 with the variables indicating a high social status supports this statement. The internal structure of this factor reveals its transformation to an "International City", resulting from globalization. Highly skilled non-Austrian citizens can be found in these neighborhoods as well as self-employed in professions attached to "New Economy", including fields like science, technology and research. One of the most remarkable findings is the high concentration of marginal part-timers in areas of high social status. This might indicate that females are employed in companies, offices or surgeries of their husbands for a few hours per week. But it could also be concluded that students earning some extra money and still living in their parents' households contribute to the high share of marginal part-timers in these areas. These assumptions are supported by the fact that marginal part-timers show the highest shares in the age groups of 20 to 30 years (one third of all marginal part-timers in the city and one quarter in the sourrounding province of Lower Austria). In the age groups of 30 to 60 years in the City of Vienna nearly 50 % of marginal part-timers are married females, in Lower Austria this share goes up to 70-80 percent of the respective age groups.



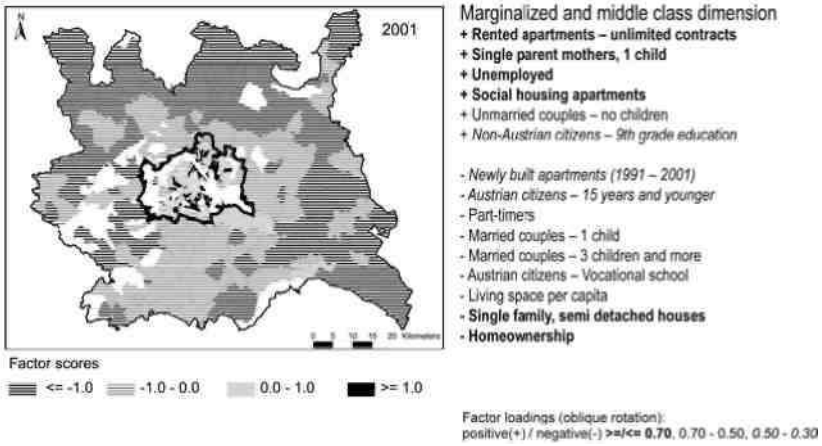
Graph 7: Socio-economic dimension, Vienna Metropolitan Region (factor loadings and factor scores)

The opposite is true of low social status residents. Austrian citizens working in trade or having completed only 9th grade (compulsory) education are structurally and spatially clearly separated from neighborhoods attached to high socio-economic features. Social areas characterized by residents with low educational skills correlate with higher labor participation rates but also to a certain degree with single or semi-detached houses. Concerning access to work and labor market, the results suggest the hypothesis that marginal-part time work in high-income neighborhoods can be regarded as an "additional benefit". In low-income areas high participation in the labor market seems to be rather a "must" than an option, which means integration in the labor market, even though it is just the low-salary segment, is an absolute necessity in order to achieve a more or less comfortable standard of living and a certain amount of security.

4.2 Marginalized and middle class dimension

If polarization and the exodus of the middle classes are considered as crucial for the post-modern restructuring of urban society and space, the dimension extracted from features of the marginalized and the middle class is the most decisive one. This dimension explains 22.4 % of the variance of the variables included in the analysis. In Vienna, the neighborhoods dominated by social housing complexes are becoming

the new Marginalized City. In social housing schemes, providing unlimited rental contracts, unemployment is high and families in need like single mothers are the norm. This fact also reflects the policies of allocation of social housing apartments, preferring those most in need. In this context the contribution of social housing policy in Vienna by providing affordable and adequate housing for those most in need has to be underlined. On the other hand it has to be considered that by an increasing polarization of urban society resulting in increasing risks for those negatively affected by this polarization, features of marginalization are becoming even more predominant in areas where the disadvantaged are concentrated any way. As a result, socio spatial inequalities might increase even if the related socio-spatial patterns remain unchanged. Despite the restrictions the share of Non-Austrian citizens in social housing apartments is slightly increasing, as those foreigners who do hold an Austrian citizenship and therefore are eligible for social housing apartments are now able to provide family members, relatives or colleagues accommodation in these apartments. But this does not hold true for the majority of unskilled immigrants who has to find other free and affordable niches in the housing market.



Graph 8: Marginalized and middle class dimension, Vienna Metropolitan Region (factor loadings and factor scores)

With regard to the chances of planning strategies and political measures, their limited influence is revealed if the upper income levels for social housing apartments are taken into account. These maximum limits are at a comparably high level and would even make middle class households eligible. Even if they can afford it, they prefer to pursue different life-styles, distancing themselves from the "Marginalized City". Features of marginalization have become features of the city proper. In contrast to the "Marginalized City", the "Middle Class City" is becoming more and more a feature of the suburban region. The suburban region has become home for traditional family units – nuclear families of married couples with one ore more children – living in municipalities and communities characterized by individually owned single family or semidetached houses, providing comfortable living space per capita. It is not the affluent who live in these areas, as income per capita is not a decisive feature there. It is the absence of typical working class residents, together with the correlation of Austrian citizens holding a diploma of a Vocational school, indicating this dimension as a middle class dimension.

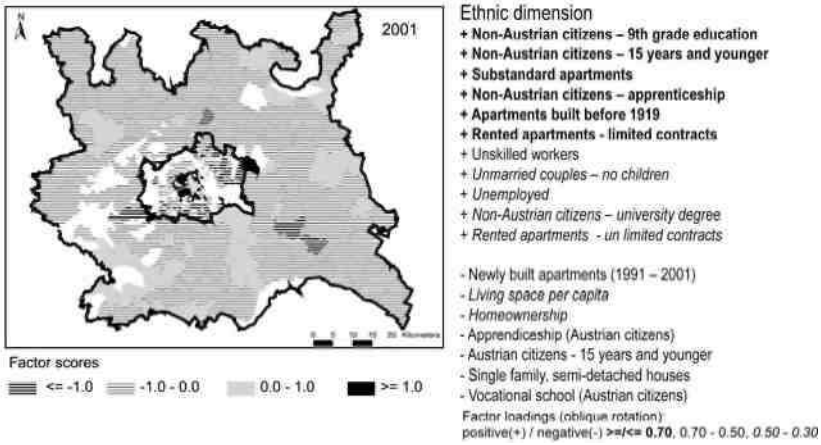
The spatial patterns of this dimension reveal that its features are becoming more prominent with growing distance from the city proper. As neither homeownership nor single and semi-detached houses seem to be related to the dimension of high status neighborhoods, these features and the respective demographic regimes can be considered as a specific life style of the middle classes. Beyond the city limits and the affluent suburban region these life-styles are clearly obvious. These are the fringes of the suburban areas, where land values are comparably low and space for new construction is available. Homeownership is supported by generous subsidies for the construction of new homes or the remodeling of older buildings by the province of Lower Austria, legally responsible for most of the suburban region. Additionally, DIY and support from relatives and neighbors in building large-scale single family houses contribute a great deal to making the dream of homeownership come true. Unfortunately, no data on loans, debits or interest rates for these areas and the households living there are available.

The correlation of newly built apartments in this dimension is not only another additional feature of the "Middle Class City", it also supports the assumptions that suburban sprawl is guided by the sprawl of the middle-classes who can only afford a lifestyle they aspire far away from the city. On the one hand, the high

status groups who occupy the attractive locations in the city proper and in the suburban areas, close to the city center, force middle-classes out to the edge of the Vienna Metropolitan Region. On the other hand, the middle classes are leaving behind the marginalized who cannot afford moving out of the city at all.

4.3 Ethnic Dimension

The features forming the ethnic dimension, explaining 20.7 % of the variance of the analyzed indicators, meet the assumptions formulated in the theoretical approach. Immigrant families with low educational skills concentrate in areas dominated by substandard-apartments dating back to the second half of the 19th century. In contrast to other Metropolitan Areas, the formation of this "Migration City" is not associated with social housing apartments due to the strict limitations regulating eligibility. Households of low-skilled immigrants are forced to cluster in poorly-equipped apartments, holding just limited rental contracts. As the housing situation of these immigrants can be considered as precarious, the same holds true of their access to the labor market. The neighborhoods of the "Migration City" are associated with unemployment and together with low-quality housing features the "Migration City" seems to meet the criteria of a "Marginalized City". The segmentation of the Viennese housing market divides the "Marginalized City" into a city of the "welfare class" and a "Migration City". Nevertheless, neither income per capita nor precarious employments seem to be typical features of the Migration City.



Graph 9: Ethnic dimension, Vienna Metropolitan Region (factor loadings and factor scores)

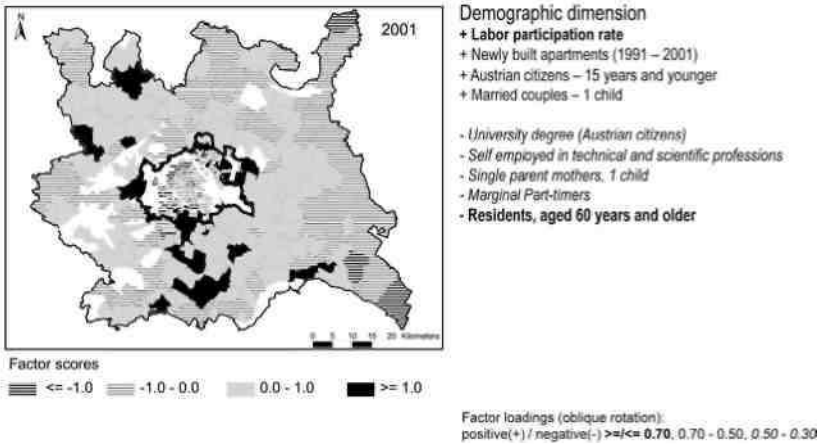
The formation of the "Migration City" itself is clearly a feature of the inner city neighborhoods that is in stark contrast to the emerging "Middle Class" City of Austrian citizens and single families or semi-detached houses in the Suburban Region. Even though focusing on the historic building fabric, the soft urban renewal program could obviously not contribute to improving the housing conditions of low skilled immigrants. With respect to the soft urban renewal program of the City of Vienna, what was revealed by analysis at the level of renovated houses (see HATZ, 2004) becomes evident at the level of census tracts as well. Even the soft urban renewal program aims at the social sustainability of renovating and improving substandard apartments and to create affordable living space, at the long term, this program has neither reached the low skilled immigrants nor the middle-classes. Even though huge amounts of public money were invested in the program (between 1984 and 2003 about 4 billion €, see FASSMANN, HATZ, 2006), on the long-term, those renovated units have been taken over by the groups of high social status, who "infiltrate" into the neighborhoods of the "Migration City". "Soft urban renewal" has succeded in reducing the substandard housing stock in Vienna, starting by about 30 % in 1971 and ending up by 8 % in 2001. However, by upgrading these dwellings and not providing options for low-income immigrants, the problems of the "Migration City" have become even more concentrated.

4.4 Demographic dimension

The "weakest link" in the formation of social areas seems to be the demographic features extracted in the demographic dimension. Demographic regimes explain just 7.8 % of the variance of the indicators integrated in the analysis. This appears to be particularly remarkable, as in the "golden era" of the welfare state it was argued that diversification of society would be encouraged rather by lifestyles than by socio-economic features. Demographic regimes like unmarried couples, labeled as "YUPPIES", "DINKS" or "BOBOs" have

been considered as such lifestyles (see for example HELBRECHT, POHL, 1995). In the Vienna Metropolitan Region these specific lifestyles are relevant indicators but "spread" across all dimensions formed by ethnicity or socio-economic features. Even if single parent mothers concentrate in areas where social housing is available, they can be found "across the dimensions" in high status neighborhoods as well as in the "Migration City" and the same holds true of unmarried couples with no children. In contrast, the analysis reveals that specific demographic regimes like single parent mothers are exposed to a greater risk of dropping below the poverty line on the one hand and the traditional family model is rather a lifestyle typical of a specific class – in that case the middle classes. Specific lifestyles appear to be more likely features of specific social classes that primarily contribute to the formation of social areas.

The variables forming the demographic dimension indicate that families with children have different requirements and expectations, like an abundance of green space, from the elderly residents who rather prefer aspects associated with urbanity. Young couples deciding to cohabitate and have children, usually look for a new apartment where they can live together. Due to the low mobility of households in Austria, the availability of empty apartments is considerably low and young families have to look for newly built apartments as indicated by the respective variable. It is hardly surprising that in those neighborhoods the labor participation rate is high, compared to the neighborhoods of senior residents. According to the model developed by social area analysis, the demographic dimension shows a concentric pattern, but the pattern is highly dynamic, as residents that settle in a neighborhood at a given time, stay until they are getting older and never move away.



Graph 10: Demographic dimension, Vienna Metropolitan Region (factor loadings and factor scores)

In the City of Vienna, the residents of the high status neighborhoods in the western outskirts are now aging (see HATZ, 1998). In the Suburban Region, this explanation has to be extended. The more distant to the city proper the share of senior residents increases, but this will change in the near future as those areas are the edge of an expanding Suburban Region. In the Suburban Region the concentric structure of the demographic dimension is "disturbed" by the local policy of municipalities providing land for new developments. All in all, it can be stated that demographic features and the exodus of the middle classes are the driving forces – not of suburbanization in general, but of suburban sprawl. This suburban sprawl is characterized by new developments spreading out to the edge of the Vienna Metropolitan Region. As the planning of new developments is under the authority of the individual municipality, this sprawl is uncoordinated and the more distant from the city, the more the suburban region transforms in "a city without a city", characterized by a homogeneous social and demographic structure that is entirely different and distant from the "polarized" but socially diversified urban society.

5 "ACROSS THE DIMENSIONS" – CONCLUSIONS AND OUTLOOK

The detailed results of the study have to focus on statements referring to the questions of research. Considering the assumptions and results of social area analysis and concepts on the postmodern restructuring of urban social areas it can be stated that for the Vienna Metropolitan Region both approaches hold true. Even if the "classical" data set of social area analysis is extended by data referring to the features that characterize the post-modern urban society, it is still an ethnic dimension, a dimension of socio-economic status and a demographic dimension that form and shape the socio-spatial patterns in the Vienna

Metropolitan Region. If only the city proper is considered, an emerging polarization can be observed. If the analysis is extended to the suburban region, the concept of a city divided into three subdivisions is supported. The high status neighborhoods are increasingly transformed into an "International City", the City of those who are integrated into global economy. Due to the regulations of social housing, the "Marginalized City" is split into a "Migration City" and a "Welfare City". As result of the exodus of the middle class, the polarization between the "International City" and the "Marginalized City" – not so much of social groups and patterns but of social inequalities in the city proper – becomes the feature of the City of Vienna, while in the suburban region the emergence of a "Middle Class City" can be observed. It is those classes that leave the city, forced by pursuing their desire of a specific lifestyle including the traditional family living in a single family house of their own, but also forced by the expanding "International" City and the "Marginalized City". As the middle classes cannot afford their lifestyle within the city proper or close to the city boundaries, they are pushed to the edge of the suburban region. Fragmented planning of developers as well as by communities and municipalities in the suburban region ends up in an uncoordinated sprawl of the emerging Middle Class City. The more distant from the actual city, the more resulting in a city without a city as described by SIEVERTS (2003).

By looking "across" the dimensions not only these statements but also theories on the transformation of socio-spatial patterns in metropolitan regions have to be qualified. Even if segregation of social groups in European Cities is considerably low compared to US-American Cities, by an increase of social polarization in terms of income or employment, the polarization between social areas increases even if the patterns of social areas and segregation remain unchanged.

Even though employment and unemployment have become a feature of post-modern society, with regard to participation in labor in general and in terms of working hours it is remarkable that marginal part-time work seems to be a feature of the high status neighborhoods, part-time work for the middle classes and a high labor participation rate for young families with children but low educational skills. This might indicate that the lower the socio-economic status the more additional income is required for families. Not only to maintain the standard of living that has been achieved or chosen but also not to drop below the poverty line and be forced to the City of Marginalized, as it is indicated by single mothers, who are a decisive feature of the "Welfare City", as unemployment is.

Considerations that tie more diverse forms of family and household types to specific social areas, forming new specific urban neighborhoods of their own, cannot be supported by the analysis undertaken for the Vienna Metropolitan Region. Even if single parent mothers concentrate in social housing neighborhoods, they can just be found in areas of high social status and the same holds true for unmarried couples with no children. Married couples with children might be a distinctive feature between the city proper and the suburban region. Nevertheless, the analysis reveals that this traditional family model is more characteristic of the middle classes, as it cannot be attached to neighborhoods of high social status neither in the city proper nor in the suburban region, even though the children of low skilled immigrants are bound to the milieu of the Migration City.

As driving forces of changes in the socio-spatial patterns not only processes tied to the global economy, like the restructuring of the "International City" and the formation of the "Migration City" can be identified. Paradoxically it is also the welfare policy of the City of Vienna that contributes to this polarization. About one quarter of the housing market is "reserved" for those at the bottom of the social ladder and adequate and affordable housing within the city limits has become scarce for the middle classes. Their demands on quality of life and life style are met beyond the borders of the city, where they are "welcomed" by developers and supportive housing policies. Even the ambitious soft urban renwal program could maybe weaken but not avoid a polarization in the city proper and reveals the limits of planning social sustainability in a postmodern society.

6 REFERENCES

BAHRENBERG, G., GIESE, E., NIPPER, J.: Statistische Methoden in der Geographie 2, Multivariate Verfahren. 1992.

CASTELLS, M.: The Informational City: Information Technology, Economic Restructuring and the Urban-Regional Process. 1989.

FASSMANN, H., HATZ G.: Urban Renewal in Vienna. In: ENYEDI G. and KOVÁCS Z. (eds.): Social Changes and Social Sustainability in Historical Urban Centres. The Case of Central Europe. Pecs .Hungarian Academy of Sciences. Centre for Regional Studies. p. 218-236. 2006.

FASSMANN, H., HATZ, G.: Social inequalities in the Vienna Metropolitan Region. In: Discussion Papers; Centre for Regional Studies, Hungary. In press.

FASSMANN, H., HATZ, G.: Socio-spatial Structures and their Dynamics in Vienna and in the Vienna Metropolitan Region. In: Die Erde, 137, 1-2. pp. 105-134. 2006.

HATZ, G.: Sozialraumstrukturen und sozialer Wandel in Wien 1971-1991. In: Geographischer Jahresbericht aus Österreich 55 (1996); S. 57-82. 1998.

HATZ, G.: Sozialräumliche Folgen der Stadtsanierung durch Public-Private-Partnership. Das Modell der sanften Stadterneuerung in Wien. In: Geogrpahischer Jahresbericht aus Österreich 60/6; S.77-106. 2004.

HÄUSSERMANN, H., SIEBEL, W.: Neue Urbanität. Suhrkamp; 1987.

HELBRECHT, I., POHL, J.: Pluralisierung der Lebensstile: Neue Herausforderungen für die sozialgeographische Forschung. In: Geographische Zeitschrift 83/3-4; S. 222-237. 1995.

MILLENNIUM HOUSING COMMISSION: Meeting our Nation's Housing Challenges. Report of the Bipartisan Millennial Housing Commission. Appointed by the Congress of the United States. Washington D.C. 2002.

MOLLENKOPF, J., H., CASTELLS, M.: The dual City: The restructuring New York. 1992.

MARCUSE, P.: "Dual City". A muddy metaphor for a quartered city; In: International Journal of Urban and Regional Research 13/4. 1989.

MURDIE, R: Factorial Ecology of Metropolitan Toronto (1951-1961). An Essay on the Social Geography of the City. Department of Geography (University of Chicago), Research Paper 116.

MUSTERD, S. : Amsterdam unfragmented: Social, ethnic and spatial integration in a dutch welfare city. In: MAYR, A., MEURER, M. and VOGT, J., (eds.): Stadt und Region. Dynamik von Lebenswelten (=Tagungsbericht und wissenschaftliche Abhandlungen. 53. Deutscher Geographentag Leipzig). Leipzig: Deutsche Gesellschaft für Geographie. S. 261-273. 2002.

SASSEN, S.: The Global City. Princeton University Press, 1991.

SIEVERTS, T.: Cities without cities. An interpretation of the Zwischenstadt. 2003.

Upwind for (planning) projects?
Rethinking urban planning and regional development with a gender approach

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1 BACKGROUND AND STARTING POINT

Based on the authors experience in urban planning and regional development as well as in the managing of the Alpine Space INTERREG IIIB project "GenderAlp! spatial development for women and men"[1] the paper trys to rethink the state of the art in planning practice, the key skills, tools and instruments of planning professionals and of politicians. Special interest lays on social innovation and on social sustainability of cities and regions.

Two words to the GenderAlp! project: its focus is the integration of gender mainstreaming strategy and equality goals into planning practice as well into publcic subsidies and public budgeting. The main target groups are administrations and politicians in urban and regional governments, urban and regional managments as well as in the field of EU-programms and projects.

2 QUESTIONS AND APPROACHES

Which answers have to be given for new challenges in cities and regions, as demographic changes, lifestyle changes, deconstruction of social roles of women and men, european integration, etc. ?

Does gender mainstreaming assure quality planning practice?

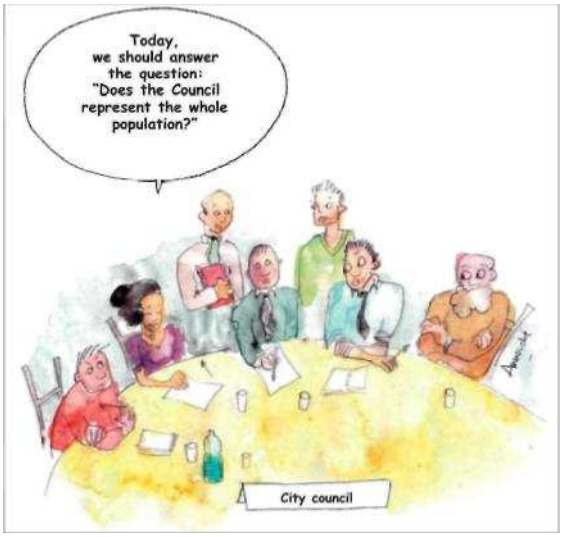
What is the role of planning professionals in and outside of administrations?

Do we have to change instruments? do we have to change targets? Do we have to change our decision making procedures in front of the challenges of a wor Do we have to change procedures?

Does parity of women and men in decision making boards and in governements assure equality?

What are the success factors for good governance in urban planning and in regional development?

How can standard project management tools help for a better implementation and for quality assurance in planning practice?



Graph 1: French example for rethinking decision making[2]

[1] More information on GenderAlp! see www.genderalp.com (english), www.genderalp.at (german), www.genderalp.si (slovenian) and www.genderbudget.it (it)

[2] Exemple from GenderAlp! partner CFPPA (= Centre de Formation professionnelle et de promotion agricole) Digne-Carmejane for a sensitization campagne in rural area in 2005, translation into english in 2007 for GenderAlp! project.

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3 SOME EXEMPLES FROM PARTNER PROJECTS

Within the GenderAlp! framework, the 12 partners integrated the gender mainstreaming approach and equality goals into their day to day practice. 32 partner projects have been implemented for developing tools and standards for similair projects and procedures after the GenderAlp! projects' closure.

3.1 Impact and requirement oriented planning for urban quarters and industrial zones (projects from city of Freiburg, Land Lower Austria / NÖ and Land Salzburg)

Three projects have been dealing with an impact and requirement oriented approach in planning for urban quarters and for regions. On the one hand the City of Freiburg focuses on quality-management in the planning process of a light-rail with a requirement-oriented and gender-sensitive approach. On the other hand, Lower Austria focuses on the site optimization of business parks and industrial zones managed by the public-private real estate and businesspark-management company Eco-plus. Last but not least, Land Salzburg focuses on the strategic spatial planning programm for industrial zones as well as for housing areas in the Salzburg region.

Some experiences: rethinking planning procedures with a "gender-look" brings back into the center of planning social structure of the target groups, age and sex, their professional background, their position in lifecycle, the family situation. The main questions are: which structures, networks, urban infrastructure are user friendly and offer high quality for living and working? Which strictires are multifunctional and flexible enough for future needs? So it demands deep analyses of the area and the projects before decision making. This means statistical analyzis, inquiries and investigations, structure and use of buildings, streets and public space, communication systems and provision etc. This also means to rethink (traditional) planning concepts like the separation of the functions living and working (Charta of Athens): places of living are also places of work for those who keep the household, those who do child-care; more and more people are independent working in their homes without leaving for working places. And: places of working are more and more places of living: employees and not only commuters are spending the whole day on their working place, also sparetime and leisure time.

For the GenderAlp! partner projects, this means that for exemple the design of the light-railway does not only plan the new trace, the stations and the street, where the railway is situated but also the whole quarter and their inhabitants. This means for the industrial zones and business parks, that not only the development area has to be optimized but also the relations to the regional economy and to the labour market.

Further: the choice between different decisions demands clear political targets and a dialogue with politicians before and during the planning procedure. Binding political goals as well as equality goals have to be defined for planners in administrations as well as for external experts.

All projects confirm the necessity of integrative and interdisziplinarity in planning procedures: This demands department spinning procedures within administration and the development of a new cooperation culture within administration and beyond. That is why unusual cooperation platforms like project groups and project management tools have to replace the usual but slow and unflexible administration procedures.

Last but not least: the design of an adequate participation procedure as well as the dialogue with the public and with other decision makers is one of the key factors in planning practice. Transparancy of the decisions, defined framework of cooperation and open discussions of the goals and different possibilities are crucial for these procedures. Many papers of the corp show good practice in these procedures.

3.2 Impact of public subsidies in cities and regions (projects from City of Munich, City of Salzburg, Land Salzburg and Land Upper Austria)

Impact oriented approaches in planning have to include investments and finances: the best plans do not help if they do not become reality, that means money and investments. As GenderAlp! tries to improve the impact of administrative decisions and investments on the quality of a city or region as well as on equality for women and men. The most important question is: how much money is spent for which target group and for which goal? Who benefits from public subsidies? In total, 9 partner projects of GenderAlp! project have focused on this "gender budgeting" question, 4 of them focus in the question of the allocation of public subsidies and the impact for women and men as well as on the development of measures and procedures for changing inequalities in this field.

3 levels have been investigated:

- the inpact of selected subsidy programms of cities and regions: Who are the benificiaries – women and men? What is the impact? How could be changed imbalanced situations?
- the procedure of analysis as well as of developing, design of target, implementing, monitoring, evaluating and redesigning subsidy programms for cities and regions including EU-funded programms.
- the analyse of selected fields ot the complete budget of cities and regions for defining the impact of these expenditures on women and men.

City of Munich has analysed the use of public subsidies for start-ups, for tourism measures as well as for labour market measures. City of Salzburg has analysed the use of public money for apprenticeship-subsidies. Upper Austria has analysed the impact of selected subsidy programms from Land Oberösterreich. Land Salzburg has analysed the impact of target 2 programms in Salzburg the regions Pinzgau, Pongau and Lungau from the periode 2001 – 2006.

All analyses have revealed, that there are big diffrences in the use and so in the benefits of subsidies between women and men. The lack of equality goals and of monitoring indicators in almost all projects does not allow to steer the impact on subsidies in terms of benificaries. Further the structure of budgets does not help for more transparancy in impact analysis: mostly, it is not possible to distinguish between sexes and between target groups. In short: without special data-collection, it is not possible to evaluate the impact of subsidy programms.

Some people say that this transparancy is not wanted by politicians nor by administration. If we are thinking on the discussion during EU-comissions proposition and obligation of the publication of the use of subsidies from EU-funded projects this comments seem to be right.

But: as we are living in times of reduced public budgets and with concepts of “good governance”, which means high efficiancy and maximum of impact for a minimum of investement, the improvement of these programms seems to be very important. If equal opportunities for women and men and equality for all (2007 is the European Year of Equality for all) is an european value, the improvement in “gender-fair” use of money and “gender-fair” public subsidies is necessary.

Not only austrian industry managers have discovered women as new target group for skilled workers and for technical jobs!

3.3 Change management in administration for project orientation and governance capacity

All projects show, that planning procedures as well as the daily work of administration in economic and regional development are in constant transformation: new skills and competences have to be developed: e.g building project management competence within a project oriented administration, politics and management by goals and by benchmarks will be more accepted and less “exotic”.

Governance capacity has to be defined in different field and at different levels of government; what is certainley included is a new relationship between politicians, administration, public sector, private investors as well as the citizens and people living in cities and regions. Some good exemples of a new relation between external and internal experts, planners and politicians, investors and enterprises have already been presented and discussed in the corp-congresses of the last years. Some projects of the GenderAlp! team also show good practice in this direction[3]. Building gender competence is already part of the development of human ressources in some Cities like Freiburg and Munich and (as far as I know) in Vienna.

4 DO WE HAVE ANSWERS TO SOME QUESTIONS?

We do have some answers, we do have lots of questions and would like to take part in the discussion of the corp audience.

Let me give some short answers to the questions (Q) formulated in Chapter 2.

Q: Which answers have to be given for new challenges in cities and regions, as demographic changes, lifestyle changes, deconstruction of social roles of women and men, european integration, etc. ?

- Answer: Many european cities have developed new approaches in planning and in decision making. Politics is still male as well as budgeting and economic leadership. The gender approach and the question of social innovation is -in my opinion and in GenderAlp! Projects experience – one of the key factors in urban and regional development for social cohesion and competitiveness.
  Sometimes it is not possible to "deconstruct" the roles, but only to improve the living conditions of women. They are still responsible for most of the unpaid "care economy",

Q: Does gender mainstreaming assure quality planning practice?

- Answer: Yes it does, because it is necessary to deepen the analysis as well as to define precise (equality) and planning goals for the planning procedure. Further this approach requires a project oriented organization which coordinates different sectors and different target groups.

Q: What is (or could be) the role of planning professionals in and outside of administrations?

- Answer: bringing in the differenciation between different male and femal users. To give the voice to under represented groups in planning and in decision making process as well as to define "public interest" based on these target groups.

Q: Do we have to change instruments? do we have to change targets? Do we have to change procedures?

- Answer: Yes, we have to adapt the focus in planning. More differenciation in analysis, defining of equality goals and social goals, which means mor binding procedures in decision making and in developing targets and measures as well as in deciding on public subsidies and public budget.

Q: Does parity in decision making boards and in governements assure equality?

- Answer: Certainly no! Female sex does not mean more gender-sensitivity and the other way round. It is no use to wait for parity in politics and in decision making boards! MALE decision are now learning gender-sensitiveness; at the same time women will be systematically more involved in politics and in urban and regional development.

Q: What are the success factors for good governance in urban planning and in regional development?

- Answer: a project oriented administration and a cooperation culture between administration, politics, private sector and public; clear targets (from politicians) and department spinning procedures in planning and in budgeting. Transparancy in decision making and in implementation of projects.

Q: How can standard project management tools help for a better implementation and for quality assurance in planning practice?

- Answer: In a very important way: interdisciplinarity in planning projects needs clear rules of cooperation and clear definitions of the goals and the results of a project.

[3] Besides the projects reports and publication of the partnes all GenderAlp! projects experience and documentation will be published as a good practice database on www.genderalp.com till october 2007.

Final question: Are these questions and answers not part of "good planning practice" and of "good administration and politics"?

- Answer: Partly yes! Nothing new? With one restriction: as austrian planner and project manger, I see big differences in planning culture and participation culture in my country (in general) compared to Germany, Swiss, Netherlands or northerncountries. Only Vienna and the capitals of our Federal States do have a more elaborated planning practice and participation culture (not only in the question of gender sensitive planning). Compared with these cities and regions, sometimes I am ashamed of our profession (!). But there is still hope…..

5 REFERENCES

Advisory COMITEE on EQUAL OPPORTUNITIIES between WOMEN and MEN 2006: Opinion on Gender Dimenstion in the next programmingperiod of the structural funds 2007 – 2013. Brussels.

Bundesamt für BAUWESEN und RAUMORDNUNG (Ed) C. FÄRBER et. al 2001: Gender Mainstreaming im Städtebau (= EXWOSt-Forschungsfeld): Umsetzung von Gender Mainstreaming in der Städtebaupolitik des Bundes. Im Auftrag des Bundesamtes fürBauwesen und Raumordnung. Internetversion:http://www.bbr.bund.de/nn_21888/DE/Forschungsprogramme/ExperimentellerWohnungsStaedtebau/Forschungsfelder/GenderMainstreaming/Expertise.html

Bundesamt für BAUWESEN und RAUMORDNUNG (Ed) 2006: Städtebau für Frauen und Männer, Werkstatt: Praxis Heft 44. Bonn. Online version: http://www.bbr.bund.de/cln_005/nn_23486/DE/Veroeffentlichungen/WP/2006__Heft44.html

Bundesamt für STATISTIK (HG) 2006: Frauen- und Gleichstellungsaltlas Schweiz. Elisabeth Bühler. Bern. Online version.http://www.bfs.admin.ch/bfs/portal/de/index/regionen/gleichstellungsatlas.html

City of FREIBURG 2007: Quality management in the planning process "light-rail extension Zähringen" with a requirement-oriented and gender-sensitive approach (English and german version). Details to Freiburg Trafic planning and statistics see http://www.freiburg.de/servlet/PB/menu/1146874_l1/index.html 2005 ff: Details to the procedure of change management and implementation of Gender Mainstreaming into the city administration see german homepage http://www.freiburg.de/servlet/PB/menu/1148777_l1/index.html Geschäftsstelle Gender Mainstreaming, Cornelia Hösl-Kulike und zur Stadtplanung und Flächennutzungsplanung siehe http://www.freiburg.de/servlet/PB/menu/1143621_l1/index.html

City of MUNICH - Referat für Arbeit und Wirtschaft (Ed) / SIM-Sozialwissenschaftliches Institut (Author) 2006: Gender Budgeting in the Munich Economic Development. Abridged Version in English.. Munich.Download see http://www.genderalp.com/IMG/pdf/Gender_Budgeting_Kurzfassung_englisch-2.pdf

City of SALZBURG 2006: Geschlechtergerechte Lehrstellenförderung. Die Anwendung von Gender Mainstreaming und Gender Budgeting am Beispiel der Lehrstellenförderung der Stadt Salzburg. (Magistrat Salzburg Wirtschaftsservice and Frauenbüro der Stadt.) Download see. http://www.genderalp.at/wDeutsch/aktuelles/studiegeschlechtergerechtelehrstellenfoe.pdf (Summary in english at theend of the publication, pg. 28 - 29)

GAREIS, Roland 2002: A Process-based Maturity Model for the Assessment of the Competences of Project-oriented Companies.University of Economics and Business Administration. Vienna.

HEISS, Michael. 2006: Knowledge Networking for Increasing the Productivity of Distributed Projects. IN: Procedures of the PMA-Focus congress Vienna 2006 „Über Grenzen vernetzen“ pg. 29 – 58. Vienna. (see also www.p-m-a.at)

Land NIEDERÖSTERREICH (2006): Who, what, when, why. Questions and answers to the GenderAlp! project – Equal opportunities in Business parks Site optimization according to the gender Mainstreaming Strategy: download of the English version see http://www.genderalp.com/IMG/pdf/NO_Questions_Answers-GenderAlp.pdf

Land SALZBURG (Ed), ZIBELL, Barbara 2006: Requirement oriented spatial planning. Gender Practice and Criteria in Spatial Planning. (=Materialien zur Raumplanung 22). Salzburg. Download of the english version see http://www.alpinespace.org/uploads/media/GENDERALP__ROSP_abstract.pdf

Land SALZBURG (Ed), SIM-Sozialwissenschaftliches Institut München 2007: Geschlechter „gerechte“ Regionalentwicklung für Frauen und Männer. Gender Mainstreaming als Innovationsstrategie in der Regionalpolitik.download see http://www.genderalp.at/wDeutsch/projekte/GM_Innovationsstrategie%20in%20Regionalpolitik.pdf (german version;English version will be uploaded till June 07).

Land SALZBURG (Ed), WANKIEWICZ, Heidrun & SCHRENK, Multimediaplan 2005: Zur Geschlechterdifferenzierte Raumanalyse im Zentralraum Salzburg und im angrenzenden Oberösterreich und Bayern. Download (german version) see siehe http://www.planwind.at/publikationen/sp_zentralraum-endbericht.pdf

MANGOLD Roland 2006: Evaluation und Lernen in internationalen Projekten. Freyakademie.IN: Procedures of the PMA-Focus congress Vienna 2006 „Über Grenzen vernetzen“ pg. 81 -97. Vienna. (see also www.p-m-a.at)

PROJECT MANAGEMENT AUSTRIA - PMA-Austria: (2006) : Project – management baseline. Knowledge elements on project and programmmanagement and for the management of project oriented organisations. Vienna. Download see http://debian.p-m-a.at/docs/pm_baseline_en.pdf

🏆 *reviewed paper*

Großprojekte – UFOS für die Regional- und Kommunalplanung?

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1 AUSGANGSLAGE

Vom abstrakten Plan zum konkreten Projekt ist es oft ein weiter Weg. Die Stolpersteine liegen in unterschiedlichen Herangehensweisen, Planungskulturen und Entscheidungslogiken zwischen der öffentlichen Hand, welche Pläne für die Nutzung des Gesamtraumes erlässt, einerseits und privaten Projektbetreiberinnen und -betreibern, welche (Bau-)Projekte realisieren wollen andererseits. Stellt nun ein privater Investor in einer Gemeinde ein Projekt (z.B. Golfplatz, Freizeitpark etc.) vor, so treffen dadurch zwei von ihrer Entscheidungslogik her divergierende Welten aufeinander.

Wie diese Welten aussehen und wo oftmals die Verständigungsschwierigkeiten liegen, davon handelt der erste Teil des Artikels. Der zweite Teil beschreibt, welche Herausforderungen bestehen, wenn sich die Welt der politischen Entscheidungsfindung dem ökonomischen Prinzip von Investorinnen und Investoren annähert und welche Konsequenzen sich daraus ergeben.

2 DIE GEMEINDESICHT: EIN UFO WILL LANDEN

Eine durchschnittliche österreichische Gemeinde hat im Tagesgeschäft selten mit großen Investoren oder Projektentwicklern zu tun. Ob ein Investor eine Gemeinde für sein Projekt auswählt, ist für diese zumeist nicht planbar. Der Projektentwickler mit seinem Projekt erscheint einer Gemeinde oftmals unvorhersehbar aus dem Nichts - überspitzt formuliert wie ein UFO, das unerwartet landen will.

Eine daraus resultierende Verhandlungssituation mit einem Projektentwickler oder großen (inter)nationalen Investor ist in den allermeisten Fällen für eine Gemeinde eine Herausforderung, insbesondere auch, da sich solche Akteure nicht nach den in einer Gemeinde bekannten Handlungsmustern verhalten, wie sie von Bauwerbern für Einfamilienhäuser, Wohnbaugenossenschaften oder auch Gewerbebetrieben und Handelsbetrieben bekannt sind.

Ferner verfügen Entwickler von Großprojekten in der Regel auch über größere wirtschaftliche Kapazität und fachliche Kompetenz als das bekannte Klientel einer Durchschnittsgemeinde und oft auch als die Gemeinde selbst. Ein wenig ist damit so ein Investor wie das unheimliche Wesen aus einer fremden Welt: Man hat keine Erfahrung im Umgang mit seinesgleichen und Respekt vor dem Unbekannten.

Eine Gemeinde steht jedoch den potenziellen Projektbetreibern nicht hilflos gegenüber. Über die Flächenwidmung teilt sie den Grundeigentümern per Gemeinderatsbeschluss Nutzungsoptionen zu und hat damit erheblichen Einfluss auf die Entwicklung ihres Gebietes.1[154]

Im Prozess der Erstellung bzw. Änderung eines Flächenwidmungsplanes werden unterschiedliche öffentliche und private Interessen gegeneinander abgewogen und im Sinne einer aus kommunaler Perspektive gesamthaft wünschenswerten Entwicklung entschieden. Die Flächenwidmung orientiert sich dabei nie allein an den Wünschen der Grundeigentümer, sondern betrachtet immer die Einbettung einer Fläche in einen Gesamtraum (Amt der NÖ Landesregierung 2002) und damit auch in den regionalen Kontext.

Setzt nun ein Großprojekt zur „Landung“ in einer Gemeinde an, ergibt sich durch einen solchen Impuls von außen für die Gemeinde eine zwiespältige Situation: Einerseits ist damit die Hoffnung auf Arbeitsplätze, höhere Kommunalsteuereinnahmen und das Image einer prosperierenden Wirtschaft verbunden, was natürlich auch in ihrem öffentlichen Interesse liegt. Andererseits besteht – vor allem seitens der unmittelbar betroffenen Bevölkerung – Angst vor der Beeinträchtigung der Lebensqualität durch das Projekt selbst bzw. die daraus resultierenden Sekundärwirkungen, wie z.B. dem induzierten Verkehr.

Die regierenden kommunalen politischen Entscheidungsträgerinnen und Entscheidungsträger müssen nun abwägen. Einerseits brauchen sie ökonomische Impulse, um Steuereinnahmen zu generieren, die wieder

[154] vgl. § 12, Burgenländisches Raumplanungsgesetz LGBl. Nr. 18/1969 i.d.F. 47/2006, § 1 Kärntner Gemeindeplanungsgesetz 1995, LGBl 23/1995 i.d.F. 88/2005, § 14 NÖ Raumordnungsgesetz 1976 LGBl 13/1977 i.d.g.F., § 18 Oö. Raumordnungsgesetz 1994 LGBl. 114/1993 i.d.F. 1/2007, § 15 Salzburger Raumordnungsgesetz 1998 LGBl 44/1998 i.d.F. 96/2004, § 22 Steiermärkisches Raumordnungsgesetz 1974 LGBl. 127/1974 i.d.F. 13/2005, § 35 Tiroler Raumordnungsgesetz 2006 LGBl. 27/2006, § 12 Vorarlberger Raumplanungsgesetz LGBl. 39/1996, i.d.F 23/2006, § 1 Bauordnung für Wien LGBl 1930/11 i.d.F. 61/2006

investiert werden können und so den finanziellen Handlungsspielraum einer Gemeinde erhöhen und damit auch der Erfolg ihres politischen Handelns widerspiegeln.

Andererseits ist Geld aber nur eine der Währungen der Politik, die deren Handlungsspielraum maßgeblich bestimmt. Politikerinnen und Politiker sind von der Zustimmung der Wählerinnen und Wähler abhängig, um handlungsfähig zu sein. Nur wenn eine politische Gruppierung über eine Mehrheit in den Entscheidungsgremien verfügt (z.B. Gemeinderat), kann sie überhaupt Regierungsverantwortung übernehmen und so die gesellschaftliche und räumliche Entwicklung mitbeeinflussen (Dallhammer 2005). Wer an den Wählern vorbei agiert, wird abgewählt. Aufgebrachte Bürger, in Bürgerinitiativen organisiert, haben schon öfter politische Mehrheitsverhältnisse verändert.2[155] Politiker müssen daher ihre Entscheidungen auch vor dem Hintergrund des strategischen Ziels der Stimmenmaximierung treffen (vgl. Pisa 1993, Bökemann 1982).

Die Entscheidung für oder gegen ein Großprojekt ist sowohl für die Entwicklung einer Gemeinde, als auch für die künftigen Handlungsspielräume der verantwortlichen Gemeindepolitikerinnen weitreichend. Ein erfolgreichen Projektes kann es eine positive Entwicklung initiieren: mehr Arbeitsplätze, mehr Steuereinnahmen, das Image einer erfolgreichen Gemeinde und damit verbunden ein positives Image für jene Kommunalpolitiker, die diese Entwicklung ermöglicht / unterstützt / mitgetragen haben. Im negativen Fall - wenn ein Projekt nicht ökonomisch erfolgreich ist - können der Gemeinde problematische räumliche und finanzielle Folgen bleiben: überdimensionierte Infrastruktur, Gebäudeleerstand und Bauruinen, möglicher Weise auch finanzielle Belastungen aus kommunalen Beteiligungen, ein negatives Image für die Gemeinde. Für die verantwortlichen Politiker folgt daraus die Gefahr des Imageverlustes und der „Abwahl".

Aufgrund dieser für eine Gemeinde zwiespältigen Situation begegnen die kommunalen Akteure Großprojekten mit einer gewissen Skepsis. Sie möchten die Auswirkungen des Projektes möglichst früh und exakt erfahren und die aus ihrer Sicht notwendigen Randbedingungen vereinbaren, um ihr Risiko ersten möglichst genau zu kennen und zweitens zu minimieren.

3 DIE INVESTORINNENSICHT: DIE GEMEINDE IST AM ZUG

Private Wirtschaftstreibende agieren nach anderen Maximen als die öffentliche Hand: Um am Markt bestehen zu können, müssen sie ihre betrieblichen Entscheidungen an den Gesetzen und Logiken des Marktes ausrichten. Für einen Investor folgt die Standortwahl daher in erster Linie betriebswirtschaftlichen Überlegungen. Aus einer Reihe von Standorten wird letztendlich der am meisten Erfolg versprechende gewählt, sei es weil die regionalökonomischen Randbedingungen passen, sei es weil die Lage und Erreichbarkeit der Märkte gegeben ist, sei es einfach auch weil das Grundstück verfügbar ist und keine unkalkulierbaren Such- und Anbahnungskosten dadurch entstehen.

Aus seiner Sicht bietet er mit seiner Standortwahl einer Gemeinde jedenfalls positive Nebeneffekte: die Chance auf Arbeitsplätze und Steuereinnahmen. Daher erwartet er auch die Unterstützung der Gemeindepolitik bei der Projektentwicklung.

Als Voraussetzung, um ein Projekt weiter zu verfolgen und vertiefte Planungen zu finanzieren, benötigt eine Investorin neben der Verfügungsgewalt über das Grundstück auch Rechtssicherheit: Bei Einhaltung der rechtlichen Spielregeln, erwartet sie eine rasche Realisierbarkeit, denn eine Zeitverzögerung mindert die Gewinnspannen. So bewirkt eine Verfahrenskürzung von einem Jahr aufgrund der früheren Projektfertigstellung Kosteneinsparungen von bis zu 2,7% des Investitionsvolumens (Grossmann, Helmstein, 2002). Eine frühere Vorhabensrealisierung würde sich durch früher realisierbare Steuereinnahmen zudem auch volkswirtschaftlich positiv niederschlagen und sollte aus seiner Sicht daher auch von der Gemeinde positiv gesehen werden.

4 DIE WIDMUNG ALS DER ZENTRALE HEBEL

Da keine Gemeinde in der Regel eine entsprechende Widmung für diverse mögliche Großprojekte „auf Vorrat" ausgewiesen hat, ist es notwendig, dass der Gemeinderat über die Flächenwidmung eine Ent-

[155] Ein Beispiel für die Änderung von Mehrheiten in einem Gemeinderat, die maßgeblich auch von der Frage der Stellung der politischen Gruppierungen zu einem Großprojekt mitverursacht war, war die Diskussion um die Errichtung eines Themenparks in einer Gemeinde südlich von Wien: Nach heftigen Diskussionen um ein geplantes Großprojekt wechselte bei den nächsten Wahlen die Mehrheit im Gemeinderat und das Amt des Bürgermeisters wurde von dem Vertreter einer Bürgerliste, die gegen das geplante Projekt auftrat, übernommen (dargestellt in Dallhammer 2004)

scheidung trifft: Entweder dem Projektanten entgegen zu kommen und als Voraussetzung für die Planumsetzung den Flächenwidmungsplan am Standort zu ändern, um das Vorhaben zu ermöglichen. Oder eben eine Umwidmung nicht zu beschließen und damit das Projekt zu verhindern: Damit verzichten die Gemeindeverantwortlichen auf die Chance auf zusätzliche wirtschaftliche Prosperität, haben aber gleichzeitig auch kein Risiko zu tragen, sollte das Projekt negative externe Effekte produzieren, welche die Bevölkerung nicht tragen möchte, oder sollte es ökonomisch nicht erfolgreich sein.

Für die Gemeinde ist die Umwidmung des Grundstückes folglich der zentrale Hebel, mit dem sie ihre Interessen gegenüber Projektwerberinnen und Projektwerberndurchsetzen kann. Es besteht nämlich für einen Grundeigentümer kein Recht auf eine bestimmte Widmung. Kein Gemeinderat kann dazu verpflichtet werden, im Flächen-widmungsplan für ein bestimmtes Grundstück eine bestimmte Widmung auszuweisen. Diese Situation stärkt im Stadium der Projektentwicklung die Position der Gemeinde gegenüber Projektwerbern.

Was in dieser Phase von der Gemeinde nicht durchgesetzt werden kann, ist aus ihrer Sicht später für sie noch schwerer erreichbar. Ist einmal die erforderliche Widmung vom Gemeinderat beschlossen, hat der Projektbetreiber einen Rechtsanspruch auf die erforderlichen Bewilligungen - sofern er sich gesetzeskonform verhält. Der Einfluss der Gemeinde auf die weitere Projektentwicklung beschränkt sich dann auf die in den projektbedingt erforderlichen Bewilligungsverfahren (Baurecht, Wasserrecht, Naturschutzrecht, Forstrecht etc.) vorgesehenen Behördenrechte und Parteienstellungen. Bei anderen Wünschen der Gemeinde bezüglich der Projektkonfiguration gerät sie in eine Rolle als Bittsteller gegenüber den Projektbetreibern. Daher versuchen Gemeindepolitikerinnen und -politiker, möglichst alle für sie wichtigen Fragen möglichst exakt vor dem Umwidmungsbeschluss durch den Gemeinderat zu klären.

Für Projektwerber ist die Frage der für das Vorhabenden „passenden“ Widmung mit einer hohen Unsicherheit verbunden: Er hat kein Recht, auf eine bestimmte Widmung. Gleichzeitig ist die „richtige“ Widmung eine wesentliche Voraussetzung für die weitere Projektentwicklung. In der Regel machen Investoren eine endgültige Finanzierungszusage für ein Projekt vom Vorliegen der erforderlichen Widmung abhängig. - Eben weil sie sich der Tatsache bewusst sind, dass ein Gemeinderat als demokratische gewähltes Entscheidungsorgan rechtlich nicht gezwungen werden kann, auf einem Grundstück eine bestimmte Widmung auszuweisen. Auch wenn ein gutes Einvernehmen zwischen der Mehrheitsfraktion (oder auch allen Fraktionen im Gemeinderat) und dem Projektentwickler herrscht, freie Mandatarinnen und Madatare können ihre Meinung ändern. Mehrheitsverhältnisse können sich verschieben: innerhalb der Zusammensetzung von Fraktionen in einer Legislaturperiode ebenso wie bei Wahlen.

All diese Unabwägbarkeiten eines Entscheidungsprozesses in einer Gemeinde liegen prinzipiell außerhalb des Einflussbereiches eines Investors. Er kann zwar mit Einzelpersonen Einvernehmen herstellen, kommunalpolitische Prozesse jedoch laufen oftmals nach anderen Logiken ab, als seitens eines Investors vorhersehbar.

Um das finanzielle Risiko zu minimieren, sind Investorinnen und Investoren daher bestrebt, bis zur projektadäquaten Widmung ihrer Grundstücke möglichst geringe Investitionen in die Projektentwicklung zu stecken und die Planungskosten bis zu diesem entscheidenden Zeitpunkt gering zu halten. Insbesondere ist es vielfach für sie unakzeptabel, detaillierte Unterlagen für eine Umweltverträglichkeitsprüfung (UVP) auszuarbeiten, bevor nicht die Widmung geklärt ist.

5 DAS DILEMMA DER AKTEURINNEN

Aus dem oben skizzierten – aus der jeweiligen Individualperspektive verständlichen – unterschiedlichen Positionen entsteht eine Pattsituation. Die Gemeinde möchte möglichst alles bereits vor der Widmung geklärt, die Investorenseite möchte Rechtssicherheit, bevor hohe Ausgaben in der Planung getätigt werden. Dabei wollen oftmals beide auch ein Stück weit das gleiche: ein wirtschaftlich erfolgreiches Projekt, das Einnahmen bringt, Arbeitsplätze schafft und zu einem positiven Image beiträgt.

Um aus diesem Dilemma zu kommen, und eine - aufgrund durchaus auch übereinstimmender Zielsetzungen mögliche - Win-Win-Situation zu schaffen, bedarf es einer guten Abstimmung zwischen den Akteurinnen und Klärung verfahrensrechtlicher Fragen sowie eines vertrauensbildenden Prozesses.

Am erfolgreichen Ende eines solchen Prozesses kann eine vertragliche Vereinbarung über die Vorgangsweise (z.B. in Form der sog. „privatwirtschaftliche Maßnahmen“3[156]) oder auch ein PPP-Modell stehen. Allerdings sind in der Abstimmung zwischen den hoheitlichen Aufgaben der Gemeinde (als Erlassungsorgan des Flächenwidmungsplanes) und der Verknüpfung mit privatwirtschaftlichen Vereinbarungen (z.B. in Form von Verträgen) noch rechtliche Fragen offen (vgl. Kanonier 1999).

6 VERHANDLUNG ÜBER DEN AUSGLEICH ZWISCHEN ÖFFENTLICHEM INTERESSE UND PRIVATEN INTERESSEN

Durch die Zuteilung von Nutzungsoptionen mittels Widmungsfestlegung verteilt die Gemeinde auch Wertsteigerungen. 1 m2 Bauland ist um ein Vielfaches mehr wert als 1 m2 Grünland. Jede Neuwidmung von Bauland produziert so einen erheblichen Wertzuwachs für das betroffene Grundstück. Da im österreichischen Rechtssystem kein Planwertausgleich vorgesehen ist, kommt diese Wertsteigerung im „Normalfall“ ausschließlich dem Grundeigentümer zu Gute.

Mit dieser Wertsteigerung für den Grundeigentümer haben die Gemeindeverantwortlichen aber auch ein Argument, um den Investor bzw. Grundeigentümer zu einem Eingehen auf ihre Wünsche zu motivieren. In einer Verhandlungssituation im Zuge der Umwidmung der für das Vorhaben erforderlichen Grundstücke stehen für eine Gemeinde insbesondere folgende Aspekte im Zentrum:

- Die Reduktion negativer externer Effekte (Lärm, zusätzliches Verkehrsaufkommen, Landschaftsbildfragen etc.), welche durch das Projekt entstehen und die Lebensqualität der betroffenen Bevölkerung beeinträchtigen können.
- Eine derartige Konzeption des Projektes, um die positiven regionalen und kommunalen Auswirkungen zu erhöhen. Dabei geht es ein Stück weit auch darum, den Planwertgewinn zwischen privatem Investor und öffentlicher Hand so zu teilen, dass auch die Öffentlichkeit davon profitiert, indem z.B. im Rahmen eines städtebaulichen Projektes auch Einrichtungen der sozialen und technischen Infrastruktur – unter Mitfinanzierung durch den privaten Partner - errichtet wird.

Tritt eine Gemeinde mit einem Investor im Zuge der Diskussion um die Änderung des Flächenwidmungsplanes (und allenfalls des Bebauungsplanes) in Verhandlung, die auch die Frage der „Teilung“ des Planwertgewinns enthalten, und kommt es darüber zu einer Vereinbarung, so werden öffentliche Interessen mit privatwirtschaftlichen Mechanismen umgesetzt. Diese Praxis, im Zuge von Flächenumwidmungen Private an dem Kosten der für geplante Vorhaben notwendigen Infrastruktur zu beteiligen, ist prinzipiell nicht neu. Wird sie jedoch individuell verhandelt und vereinbart, ändert sich ein Stück weit jedoch auch die Handlungslogik der Gemeinde. Implizit gewinnt das Prinzip der die Marktkräfte bestimmenden betriebswirtschaftlichen Gewinnmaximierung an Bedeutung gegenüber den - den Aktivitäten der öffentlichen Hand zu Grunde liegenden – gesellschaftspolitischen und volkswirtschaftlichen Zielsetzungen.

Aufgrund des marktwirtschaftlichem Kalkül (wovon in einem Kooperationsfall sowohl ein privater Investor als auch die Gemeinde profitieren) sind die Festlegung jener Bebauungsbestimmungen welche maßgeblich die Nutzungsmöglichkeit eines Grundstückes und damit auch dessen ökonomische Verwertbarkeit mitbestimmen, besonders davon betroffen (Dallhammer 2005). Ein privater Partner wird versuchen, die kommunalen Entscheidungsträgerinnen und -träger dazu zu motivieren, die über Flächenwidmung- und Bebauungsplan festzulegenden planerischen Zielsetzungen zu seinen Gunsten zu beeinflussen.

Das Konstrukt, dass prinzipiell mit der Raumplanung unterschiedliche – auch einander widersprechende – Zielsetzungen verfolgt werden können, wobei im konkreten Planungsfall nachvollziehbar zu begründen ist, warum bei der Entscheidungsfindung ein Ziel gegenüber den anderen vorgezogen wird4[157], wird in den Hintergrund gedrängt. Entscheidungen werden bei solchen Kooperationen tendenziell sondern vom betriebswirtschaftlichen Kalkül aus einer Mikro-Perspektive heraus geleitet, denn von volkswirtschaftlichen Überlegungen aus einer Makro-Perspektive (Dallhammer 2005).

[156] vgl. z.B. § 22 Kärntner Gemeindeplanungsgesetz 1995, LGBl 23/1995 i.d.F. 88/2005, § 16 Oö. Raumordnungsgesetz 1994 LGBl. 114/1993 i.d.F. 1/2007, § 14 Salzburger Raumordnungsgesetz 1998 LGBl 44/1998 i.d.F. 96/2004

[157] vgl. den Begriff der „finalen Determinierung“ beschrieben u.a. in Penthaler 1990

Andere Zielsetzungen – wie soziale, umweltpolitische oder volkswirtschaftliche Ziele – müssen sich folglich den marktwirtschaftlichen Randbedingungen unterordnen. Dies trifft vor allem ein Kernziel der Raumplanung, das Ziel der „Herstellung gleichwertiger Lebensbedingungen in allen Teilräumen“ (Österreichische Raumordnungskonferenz 2002 S. 72) und der Organisation der Daseinsgrundversorgung nach dieser Zielsetzung.

Zwar war der Einfluss der Raumplanung auf die Organisation der Bereitstellung der zur „Herstellung gleichwertiger Lebensbedingungen“ erforderlichen Infrastruktur wohl immer mehr Anspruch denn Wirklichkeit, denn die relevanten Politiken blieben weitgehend sektoral außerhalb der Raumplanung organisiert. Innerhalb des Kompetenzbereiches der Raumplanung konnte und kann letztendlich vor allem das effektiv umgesetzt werden, was im Bauverfahren exekutierbar ist (Dallhammer 2005). Jedoch wird durch das Näherrücken von öffentlicher Planung und privater Investoren bei einzelnen Vorhaben die politische Verantwortung von den politischen Entscheidungsorganen, die über Wahlen der demokratischen Kontrolle unterliegen, ein Stück weit hin zu privatwirtschaftlich organisierten Unternehmungen ohne dieser politischen Kontrollmöglichkeit verschoben. Damit sinkt auch die Steuerungsmöglichkeit der räumlichen Entwicklung über ordnungspolitische Instrumente und volkswirtschaftliche Argumente greifen weniger, wenn nach betriebswirtschaftlichen Kriterien agiert werden muss. Diesen Effekt muss man vor Augen haben, wenn die Gemeindeplanung und -politik näher mit Investoren kooperiert.

7 DIE VERHANDLUNGSPOSITION DER GEMEINDE

Tritt nun eine Gemeinde mit einem Projektentwickler bzw. Investor in Verhandlungen über die Frage der Umwidmung von Grundstücken und der Optimierung des damit verbundenen öffentlichen Interesses, so hängt die Durchsetzbarkeit der Gestaltungsvorstellungen der Gemeindeverantwortlichen von zwei Aspekten ab:

- der „objektiven“ Attraktivität einer Gemeinde für Investoren als Standort für Großprojekte und
- der Einschätzung der Gemeindeverantwortlichen bezüglich der Attraktivität ihrer Gemeinde für Investoren als Standort für Großprojekte

Eine dynamische Gemeinde im Ballungsraum mit einer hohen Erreichbarkeit und hoher Standortgunst ist für viele potenzielle Investorinnen und Investoren attraktiv. Dementsprechend werden voraussichtlich immer wieder Vor-schläge von Projektentwicklern an eine solche Gemeinde herangetragen werden. Ihr stehen damit - auch in einer zeitlichen Perspektive - Wahlmöglichkeiten zwischen unterschiedlichen Entwicklungsoptionen offen. Die Ablehnung eines Projektes, das ihren Vorstellungen nicht entspricht, wird daher aufgrund der hohen Nachfrage weniger problematisch sein, als in einer peripher gelegenen, wenig dynamischen Gemeinde, für die sich plötzlich ein Investor interessiert. Von dieser unterschiedlichen räumlichen Voraussetzungen hängt die Attraktivität einer Gemeinde für als Standort für Großprojekte und folglich auch eine unterschiedliche Position der Gemeinde gegenüber einem Investor ab.

Neben dieser „objektiven“ Attraktivität einer Gemeinde für Investoren als Standort für Großprojekte spielt auch die Einschätzung der eigenen Position durch die kommunalen Entscheidungsträger und -trägerinnen eine wesentliche Rolle (siehe nachfolgende Grafik):

- Schätzen die Gemeindeverantwortlichen ihre Position - trotz einer objektiv hohen Standortattraktivität für Investoren - als eher schwach ein, so werden sie auch entsprechend „schwach“ agieren, und möglicher Weise auch auf potenzielle Vereinbarungen mit den Investoren im Interesse der Gemeinde verzichten. Dadurch werden Chancen vergeben, den Investor zu einem (höheren) Beitrag für die Öffentlichkeit zu bewegen („vertane Chancen“).5[158]
- Überschätzt eine Gemeinde ihre Position, so wird sie gegenüber dem Projektwerber zu forsch auftreten und ihn vielleicht mit für ihn unannehmbaren Forderungen konfrontieren, was einen Abbruch der weiteren Projektentwicklung bedeuten kann („Gefahr überzogener Forderungen“).
- Erkennt eine Gemeindevertretung ihre objektiv „schlechte“ Position gegenüber einem potenziellen Investor, wird sie auch nicht allzu viele Forderungen stellen können, sondern eher trachten, vor

[158] Vgl. z.B. auch die Divergenz der Einschätzung der Position der Gemeinde Wien gegenüber Investorinnen von Seiss im Vergleich zur offensichtlichen Eigeneinschätzung, diskutiert an mehreren Beispielfällen (Seiss 2007).

allem befürchtete negative Auswirkungen vermeiden, welche sie vielleicht auch – auf langwierigerem Wege, aber um die Gefahr zeitlicher Verzögerungen für den Investor – in den Genehmigungsverfahren als Partei durchbringen könnte („eingeschränkter Verhandlungsspielraum“).

- Ist die Position der Gemeinde gut und schätzt sie diese auch so ein, bestehen hohe Chancen, mit einem Projekt durch Vereinbarungen mit dem Investor auch positive Effekte für die Allgemeinheit zu erzielen(„Win-Win-Situation“).

		Einschätzung der Gemeindeverantwortlichen bezüglich der Attraktivität ihrer Gemeinde für Investoren als Standort für Großprojekte	
		niedrig	hoch
„objektive“ Attraktivität einer Gemeinde für Investoren als Standort für Großprojekte	hoch	„vertane Chancen“: Gemeindeverantwortliche können ihre „gute“ Position gegenüber Investoren nicht nützen, Gemeinde könnte gegenüber Investoren „mehr“ für das öffentliche Interesse „herausholen“	„Win-Win-Situation“: Vereinbarung zwischen Investor und Gemeinde führt zu einem Ergebnis, bei dem beide Seiten bestmöglich profitieren
	niedrig	„eingeschränkter Verhandlungsspielraum“ kann zu Vereinbarungen führen, welche sich vor allem auf Reduktion negativer externer Effekte beziehen, welche in anderen Bewilligungsverfahren geprüft werden.	„Gefahr überzogener Forderungen“: zu offensives Auftretens einer Gemeinde gegenüber Projektentwicklern kann durch überzogene Forderungen zum Verhandlungsabbruch durch Investoren führen.

Graph 1: Optionen einer Gemeinde zwischen tatsächlicher Position und eingeschätzter Position gegenüber Investoren

8 SCHLUSSFOLGERUNG

Die Frage der Umwidmung von Grundflächen durch den Gemeinderat, um ein Großprojekt eines privaten Investors zu ermöglichen, eröffnet eine Verhandlungssituation: Der künftige Projektbetreiber hat zwar keinen Rechtsanspruch auf eine bestimmte Widmung seiner Grundstücke, bietet vielfach jedoch vor allem ökonomisch positive Auswirkungen für Region und Gemeinde, und damit implizit auch für die Gemeindeverantwortlichen, die ein solches Projekt ermöglichen, was das Projekt attraktiv für eine Gemeinde macht. Gleichzeitig befürchten jedoch die kommunalen Entscheidungsträger negative externe Effekte und negative Konsequenzen bei einem Misserfolg.

Damit entsteht eine Situation, die häufig in einen Kommunikations- und Verhandlungsprozess führt, für den jedoch kein fester rechtlicher Rahmen besteht und die in den Raumordnungsgesetzen der Länder eigentlich nicht vorgesehen ist. Ob daraus eine Win-Win-Situation entstehen kann und wer letztlich am Ende als Gewinner dasteht, hängt wesentlich davon ab, ob es den Akteuren gelingt, die Gemeinsamkeiten zu erkennen und richtig auszuloten.

Ziel aus Sicht der öffentlichen Hand wird sein, die Projekte so in das kommunale und regionale Umfeld einzubetten, damit möglichst positive Spill-Over Effekte entstehen und negative externe Effekte möglichst vermeiden werden. Voraussetzung dafür ist eine realistische Einschätzung der eigenen Position gegenüber den Investoren und die Kenntnis jener Werkzeuge, welche erforderlich sind, um mit privaten Projektentwicklern auf Augenhöhe zu verhandeln und deren Denkwelten auch mitzupartizipieren. Zur Beeinflussung von im Raum ablaufenden Prozessen braucht es in der kommunalen Verwaltung und der Politik daher verstärkt die Nutzung jener Instrumente, welche die marktwirtschaftliche Logik aufgreifen.

Die Raumplanungsabteilungen der Länder und Gemeinden selbst haben wenige dieser Werkzeuge im eigenen Verfügungsbereich, läuft doch die Umsetzung der Raumplanung vor allem über das Baurecht. Nur wenige Länder haben in ihren Raumordnung- bzw. -planungsgesetzten überhaupt die Möglichkeit von „privatwirtschaftlichen Vereinbarungen“ im Zuge des Widmungsverfahrens vorgesehen. Wenn die Planungsbehörden ihr Potenzial zur Beeinflussung der räumlichen Entwicklungen im öffentlichen Interesse erhalten oder ausbauen wollen, werden sie hinkünftig ihre Verhandlungsfähigkeiten weiterentwickeln – auch unter Beziehung professioneller Beraterinnen und Berater.

Die Frage der Flächenwidmungsänderung kann bewusst als Möglichkeit wahrgenommen werden, um öffentliche Interessen mit privaten Interessen zu verbinden. Bei Übereinstimmung von privaten Zielsetzungen der Investoren und Zielsetzungen der öffentlichen Hand kann dann versucht werden, diese Chance für eine Projektoptimierung zu nutzen.

Werden Kommunikations- und Verhandlungsprozesse von der öffentlichen Hand bewusst als Entwicklungsinstrument eingesetzt und mit den entsprechenden fachlichen Kapazitäten ausgestattet, so kann auch sichergestellt werden, dass solche Großprojekte nicht wie Ufos mit schaurig-schöner Faszination betrachtet werden, sondern als eine Chance für die Entwicklung einer Gemeinde und einer Region, die es zu prüfen und im öffentlichen Interesse zu optimieren gilt.

9 LITERATUR

AMT DER NÖ LANDESREGIERUNG (2002). Infoblätter zur örtlichen Raumordnung. – o.O.

BÖKEMANN, Dieter (1982): Theorie der Raumplanung. - Wien.

DALLHAMMER, Erich (2005): PPP verändert Koordinatensystem der Raumplanung. – Forum Raumplanung, Zeitschrift der Österreichischen Gesellschaft für Raumplanung. Heft 2/2005.

DALLHAMMER, Erich (2004): „Wonderworld X“ A sustainable leisure park in the Vienna Region? Spatial impact assessment for mega-projects. – Critical Planning, Journal of the UCLA Departement of Urban Planning, volume 11, S. 83 - 97.

GROSSMANN, B; HELMSTEIN, Ch. (2002): Kostenersparnis bei Verfahrensbeschleunigung der UVP. IHS-Studie. Wien.

KANONIER, Arthur (1999): Investorenplanung im österreichischen Raumordnungsrecht. – Forum Raumplanung, Heft 1, S. 18-28.

ÖSTERREICHISCHE RAUMORDNUNGSKONFERENZ (2002): Österreichisches Raumentwicklungskonzept 2001. - ÖROK-Schriftenreihe Bd. 163, Wien.

PENTHALER, Peter (1990): Raumordnung und Verfassung (3). – Schriftenreihe der Österreichischen Gesellschaft für Raumforschung und Raumplanung, Bd. 30. Wien.

SEISS, Reinhard (2007): Wer baut Wien? - Wien.

reviewed paper

District Cooling – Chancen und Herausforderungen für die zukünftige Regional- und Immobilienentwicklung

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1 EINLEITUNG

Basierend auf nationalen und europäischen Studien wird für die kommenden Jahre ein deutlicher Anstieg des Energiebedarfs für Klimatisierung und Kühlung erwartet. Die Gründe für den steigenden Kühlbedarf, der derzeit hauptsächlich durch elektrisch betriebene Kompressionskältemaschinen abgedeckt wird, sind dabei vielfältig. Der Anstieg bringt jedenfalls eine Verschärfung der bereits bestehenden Probleme in der Energieversorgung – wie hohe Spitzenlasten im Sommer, weitere Importabhängigkeit und höhere CO2-Emissionen – mit sich. Diesem Trend können Kühlanlagen, die mit thermischer Energie aus Fernwärmenetzen angetrieben werden, entgegenwirken.

Der Einsatz thermischer Kältemaschinen wirkt sich positiv auf die Auslastung von Fernwärmesystemen aus. Im Jahresverlauf ist ersichtlich, dass außerhalb der Heizperiode Lasttäler für die Abnahme von Wärme bestehen. Abbildung 1 soll den Verlauf der Wärmeerzeugung am Beispiel der Fernwärme Wien verdeutlichen.Die Nutzung der Abwärme aus KWK-Anlagen, insbesondere auch aus regenerativ befeuerten Heizkraftwerken, und aus Abfallverwertungsanlagen im Sommer bewirkt eine Effizienzsteigerung und führt somit zu einer verbesserten Wirtschaftlichkeit der eingesetzten Erzeugungsanlagen. Weiters kann die Kühlungmittels Anlagen, die mit Fernwärme angetrieben werden, einen wesentlichen Beitrag zur Reduktion von CO2-Emissionen liefern.

Im Rahmen eines aktuellen „Intelligent Energy – Europe“ Projekts werden die technologischen, ökonomischen und ökologischen Aspekte des Einsatzes von Fernwärme zur Klimakälteerzeugung untersucht. Die Analyse von Fernkältenetzen, in die auch Erfahrungen und Ergebnisse aus vergangenen Projekten einfließen, wird durch die Darstellung und Untersuchung eines Best Practise Beispiels unterstützt.

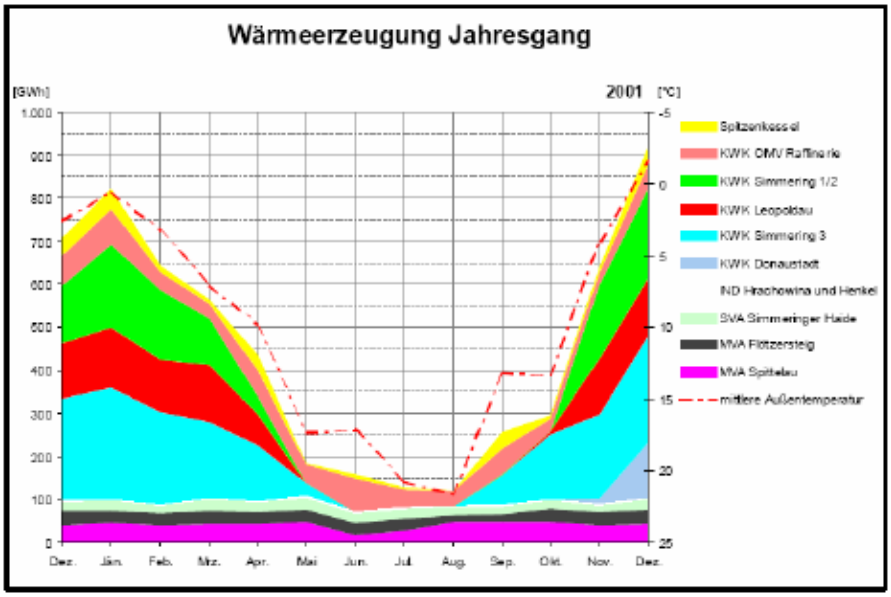

Abbildung 1: Jahresgang der Wärmeerzeugung (Fernwärme Wien GmbH)

2 TECHNOLOGIEN ZUR KLIMAKÄLTEVERSORGUNG MITTELS FERNWÄRME

Thermisch angetriebene Kältemaschinen zählen zu den Kaltdampfmaschinen und arbeiten entweder nach dem Absorptions- oder nach dem Adsorptionsprinzip. Dabei werden bestimmte Arbeitsstoffe, sogenannte Stoffpaare, eingesetzt, die sich aus dem Kältemittel und dem Sorptionsmittel zusammensetzen. Als Sorptionsmittel kommen entweder Flüssigkeiten (Absorption) oder feste Stoffe (Adsorption) zur

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Anwendung. Das Charakteristische an den Sorptionsmitteln ist dabei, dass sie gasförmige Stoffe – in dem Fall den Kältemitteldampf – aufsaugen. Folgende Technologien zur thermischen Kälteerzeugung stehen derzeit zur Verfügung:

- Lithiumbromid/Wasser-Absorptionsanlagen
- Wasser/Ammoniak-Absorptionsanlagen
- Silicagel/Wasser-Adsorptionsanlagen
- DEC-Anlagen (Desiccant-Evaporative Cooling)

Diese Technologien unterscheiden sich hinsichtlich der verfügbaren Leistungsgrößen, der erforderlichen Temperatur der Antriebswärme, des zu kühlenden Mediums (Wasser oder Luft) und des COP-Wertes (Coefficient of Performance = Kälteleistung zu Antriebswärmeleistung). Bei jenen Systemen, die Kaltwasser zu Kühlzwecken erzeugen, unterscheidet man grundsätzlich zwei Ansätze, wie die Erzeugung und Verteilung realisiert werden kann (vgl. EUROPEAN MARKETING GROUP DISTRICT HEATING AND COOLING, 1999).

2.1 Versorgungskonzepte

Einerseits können thermische Kälteerzeugungsanlagen direkt in oder bei den einzelnen Objekten errichtet werden. In diesem Fall ist dann zusätzlich zum Kaltwassersatz nur mehr ein Sekundärnetz zur Kaltwasserverteilung innerhalb des Gebäudes notwendig. Neben Absorptions- und Adsorptionskältemaschinen eignet sich der DEC-Prozess ausschließlich für die dezentrale Kälteversorgung. Bei diesem Verfahren wird nicht Kaltwasser, sondern Luft mit entsprechender Temperatur zur Raumkonditionierung erzeugt, und es muss daher ein entsprechendes Luftverteilungssystem im Gebäude berücksichtigt werden.

Eine andere Möglichkeit stellt die Errichtung und der Betrieb zentraler Großkälteanlagen dar. In einer derartigen Kältezentrale wird das Kaltwasser unter Einsatz von Fernwärme gewonnen und anschließend in einem eigens dafür vorgesehenen Kreislauf aus isolierten Rohren an die jeweiligen Verbraucher verteilt. Das Kaltwasser wird anschließend über ein Sekundärnetz in den Gebäuden verteilt. Dort nimmt es über Kühldecken und Fan-Coils die Wärme aus der Raumluft auf. Zusätzlich können sich auch (bestehende) Heizkörper eignen, wofür in der Regel jedoch ein 4-Leiter-System erforderlich ist. Bei der Entwicklung dieser innovativen Kühlungskonzepte übernehmen die Kältenetze die Versorgung zumeist abgegrenzter Stadtteile oder Gruppen von Büro- und Wohnbauten sowie von Gewerbebetrieben (vgl. Abbildung 2).

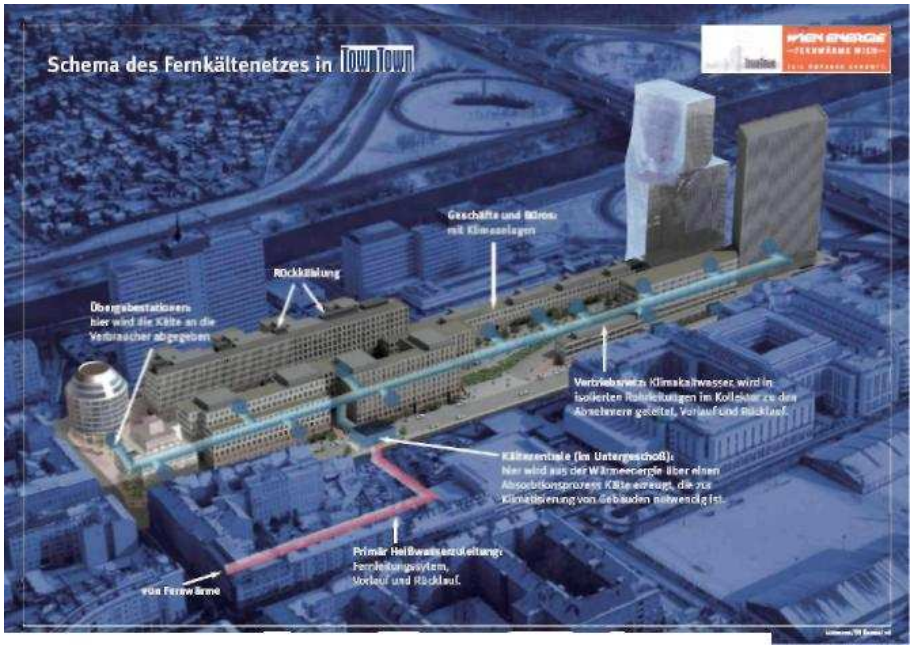

Abbildung 2: Fernkältenetz, TownTown, Wien (Fernwärme Wien GmbH)

Obwohl der Begriff der Fernkälte für den beschriebenen Modellfall und das dargestellte Beispiel nicht gänzlich zutreffend ist, soll hier in Anlehnung an den Ausdruck der Fernwärme von Fernkälte gesprochen

werden. Die Kälteleistungen dieser lokal abgegrenzten Netze liegen in der Regel im Bereich von 1 MW bis 20 MW. Da netzgebundene Infrastrukturen sehr langfristige Entscheidungen erfordern, sollte bereits im Planungs- und Entwicklungsprozess von bestehenden und neuen Stadtgebieten diese Form der Kältebereitstellung als Alternative in Betracht gezogen werden. Nachfolgend wird das Hauptaugenmerk – auch anhand des Best Practise Beispiels – auf derartige Fernkältenetze gelegt, und es wird vorrangig auf jene Technologien eingegangen, die für die Kaltwassererzeugung in Fernkältenetzen maßgeblich sind.

2.2 Thermisch betriebene Kälteprozesse - Absorptionskältemaschine

Im Unterschied zu Kompressionskältemaschinen, bei denen das Kältemittel mechanisch verdichtet und damit auf ein höheres Temperaturniveau gebracht wird, kommt es bei Sorptionskältemaschinen zu einer „thermischen Verdichtung“ des Stoffpaares, bestehend aus Kältemittel und Lösungsmittel (Sorptionsmittel). Beim Absorptionsprozess handelt es sich beim Lösungsmittel um eine Flüssigkeit. Die folgende Darstellung soll einen kurzen Einblick in die Besonderheiten der Absorptionskältemaschine geben.

Im Verdampfer entsteht bei niedrigem Verdampfungsdruck Kältemitteldampf, der anschließend im Absorber von einem Lösungsmittel absorbiert, d. h. aufgenommen wird. Eine Pumpe bringt die mit Kältemittel angereicherte Lösung auf den höheren Verflüssigungsdruck und fördert sie in den Austreiber, wo dem Prozess über Wärmetauscher Wärme – in diesem Fall Fernwärme – zugeführt wird. Durch die Wärmezufuhr wird das Lösungsvermögen des Absorptionsmittels herabgesetzt, und es kann das Kältemittel nicht länger binden. Das Kältemittel wird ausgetrieben, und das Absorptionsmittel liegt wieder als arme Lösung vor, die über ein Drosselorgan zum Absorberzurückströmt. Das ausgetriebene Kältemittel gibt seine Wärme im Kondensator (Verflüssiger) an den Kühlwasserkreislauf ab. Nach der Drosselung in einem Expansionsventil kann das Kältemittel im Verdampfer bei niedrigem Verdampfungsdruck und zugehöriger Verdampfungstemperatur wieder Wärme aus dem zu kühlendem Kaltwasser aufnehmen. Der Kreislauf ist somit geschlossen.Elektrische Antriebsenergie wird bei thermischen Kältemaschinen nur für den Betrieb der Lösungsmittelpumpe benötigt, was gegenüber vergleichbaren Kompressionskältemaschinen zu großen Stromeinsparungen führt.

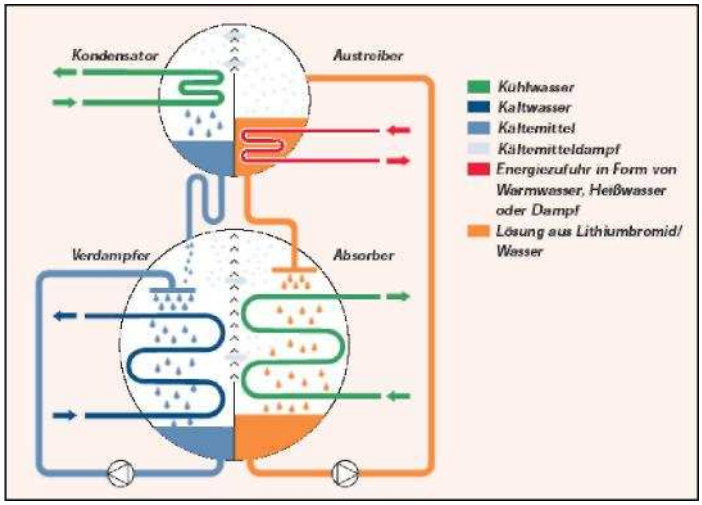

Abbildung 3: Schematische Darstellung des Absorptionsprozesses (Axima Refrigeration GmbH)

Zwischen Absorber und Austreiber ist in der Regel ein Gegenstromwärmetauscher geschaltet, der die Effizienz des Prozesses verbessert, indem der Wärmebedarf des Austreibers verringert wird und gleichzeitig die abzuführende Wärme aus dem Absorber sinkt. Für die Absorptionsfähigkeit des Lösungsmittels gilt, dass sie mit sinkender Temperatur zunimmt. Daher ist die Temperatur im Absorber möglichst tief zu wählen, und der Absorber sowie der Verflüssiger werden im Allgemeinen kühlwasserseitig hintereinander geschaltet.

Absorptionskältemaschinen verwenden in der Regel eines der beiden folgenden Arbeitsstoffpaare:

- Ammoniak–Wasser Beim Arbeitsstoffpaar Ammoniak–Wasser ist Ammoniak (NH3) das Kältemittel und eine wässrige Ammoniaklösung das Absorptionsmittel. Dieses Stoffpaar wird vorwiegend in Tieftemperaturanwendungen bis zu –60 °C eingesetzt. Je nach geforderter Kältetemperatur sind dazu allerdings Heißwasser bzw. Dampftemperaturen ab 100 °C notwendig. Um niedrigere Antriebstemperaturen im Bereich von rund 90 °C nutzen zu können, muss ein anlagentechnisch

aufwändigerer, mehrstufiger Prozess ausgeführt werden (ALEXANDRU G., GREILER E., KLEINBERGER J., 2004). Hinsichtlich des Einsatzes von Fernwärme soll dieser Typ nicht näher betrachtet werden.

- Wasser–Lithiumbromid Bei diesem Anlagentyp bildet Wasser das Kältemittel und Lithiumbromid das Lösungsmittel. Absorptionskältemaschinen sind bereits ab Leistungen von rund 10 kW Kälteleistungen (u. a. für die solare Kühlung) verfügbar. Jedoch liegt der Fokus der Technologierecherche auf einem größeren Leistungsbereich, da zentrale Applikationen der Kälteversorgung im Vordergrund der Betrachtungen stehen sollen.

Neben der oben beschriebenen, einstufigen Ausführung des Absorptionsprozesses gibt es zwei weitere Bauformen. Zweistufige Wasser-Lithiumbromid-Absorptionskältemaschinen nutzen die eintretende Antriebswärme doppelt und erzielen so das höchste Wärmeverhältnis. Sie benötigen höhere Antriebstemperaturen ab rund 125 °C, die in der Regel in Fernwärmenetzen im Sommerbetrieb nicht zur Verfügung stehen.

Eine weitere Bauart ist die Single-Effect/Single-Lift-Double-Lift (SE/SL-DL) Absorptionskältemaschine. Diese wurde speziell für den Antrieb mit Fernwärme entwickelt. Sie verbindet einen einstufigen (SE) mit einem zweistufigen (DL) Kreislauf und kann sich optimal den thermischen und hydraulischen Bedingungen eines Fernwärmenetzes anpassen. Der Unterschied zur herkömmlichen, einstufigen Anlage besteht darin, dass sie zwei Lösungskreisläufe besitzt, und die Wärme an drei Stellen des Kreislaufes auf unterschiedlichem Temperaturniveau eingekoppelt werden kann. SE/SL-DL ermöglichen insbesondere eine hohe Auskühlung des Heizmediums um 25 – 70 K (abhängig von der Vorlauftemperatur), wodurch für das Fernwärmenetz günstige Rücklauftemperaturen erreicht werden können (KROTIL R., GRAF M., MÜHL M., 2002). Tabelle 1 gibt einen Überblick über die wesentlichen Paramter der Wasser-Lithiumbromid Absorpitonskältemaschinen, die sich für zentrale Applikationen mit Fernwärme eignen.

Bauart	**Kälteleistung [kW]**[159]	**Kaltwasser-temperatur[°C]**	**Temp. Antriebswärme [°C]**	**COP**[2][160]
1-stufige LiBr-H_20	100 - 20.000	>6	80 - 135	<0,8
SE/SL-DL LiBr-H_20	400 - 10.000	> 6	80 - 130	<0,75

Tabelle 1: Wasser-Lithiumbromid Absorptionskältemaschinen (Österreichische Energieagentur)

Hinsichtlich der Effizienz und der erzielbaren Kälteleistung von thermischen Kältemaschinen sind die Temperaturniveaus der Antriebswärme, des zu erzeugenden Kaltwassers und des Kühlwassers von entscheidender Bedeutung. Für die dargestellten Absorptionskältemaschinen ist zumindest eine Warmwassertemperatur von 80 °C notwendig. Je höher die Antriebstemperatur liegt, desto größer ist die erzielbare Kälteleistung der verwendeten Maschine und auch die Temperaturspreizung zwischen Fernwärmevor- und -rücklauf. Bezüglich des Kaltwassers beeinflusst dessen Temperatur die erzielbare Kälteleistung indirekt proportional. Bei der Rückkühlung sind einerseits die erforderlichen Kühlwassertemperaturen zu beachten, andererseits ist der Tatsache Rechnung zu tragen, dass bei thermischen Kältemaschinen im Vergleich zu konventionellen Kompressionskältemaschinen die rund zweifache Menge an Wärme abzuführen ist.

Die Eignung von Absorptionskältemaschinen zur Kälteversorgung und die Wirtschaftlichkeit sind daher immer projektbezogen zu untersuchen, wobei die jeweils vorliegenden, technischen und netzspezifischen Rahmenbedingungen sehr sorgfältig beachtet werden müssen.

3 BEST PRACTISE – TOWNTOWN

Thermisch betriebene Kältemaschinen sind in Österreich bereits vereinzelt bei dezentralen Systemlösungen eingesetzt. Fernkältenetze stehen allerdings hierzulande im Vergleich zu anderen, auch europäischen Ballungszentren noch am Beginn ihrer Entwicklung. In Wien wird derzeit ein lokal begrenztes Fernkältenetz aufgebaut. Daher konzentrieren sich die Untersuchungen anhand dieses Best Practise Beispiels auf zentrale

[159] Kälteleistung in Abhängigkeit der jeweiligen Betriebsparameter: Temperaturen für Heizwasser, Kaltwasser und Kühlwasser

[160] COP in Abhängigkeit der jeweiligen Betriebsparameter: Temperaturen für Heizwasser, Kaltwasser und Kühlwasser und der Last.

Kälteversorgungskonzepte, und es werden die technologischen, wirtschaftlichen und ökologischen Rahmenbedingungen dafür dargestellt und untersucht.

3.1 Technische Beschreibung des Kältesystems

TownTown ist ein neues Stadtentwicklungsgebiet in Wien-Erdberg, das gerade errichtet wird. Auf dem Areal entstehen insgesamt 21 Gebäude mit einer Gesamtnutzfläche von über 100.000 m2. Neben Büros gibt es Gewerbebetriebe, Restaurants, Shops und ein Hotel (vgl. Abbildung 2 auf Seite 2).

Um den gestiegenen Komfortansprüchen an ein passendes Raumklima speziell in Geschäftslokalen und Büros gerecht zu werden, ist in allen Objekten eine Klimatisierung vorgesehen. Herkömmliche Versorgungskonzepte erzeugen die dafür notwendige Kälte in mehreren Kältezentralen, die dezentral in den einzelnen Gebäuden aufgestellt und betrieben werden. Fernwärme Wien hat alternativ zu solchen Überlegungen eine Versorgung des gesamten Areals aus einer Kältezentrale konzipiert, wobei die einzelnenn Objekte liber ein Kaltwassernetz an diese Zentrale angeschlossen sind (siehe Abbildung 4). Im Endausbau soil eine Kälteleistung von 8,4 MW installiert werden, die aus insgesamt drei Absorptions- und zwei konventionellen, elektrisch betriebenen Kompressionskältemaschinen bereit gestellt wird.

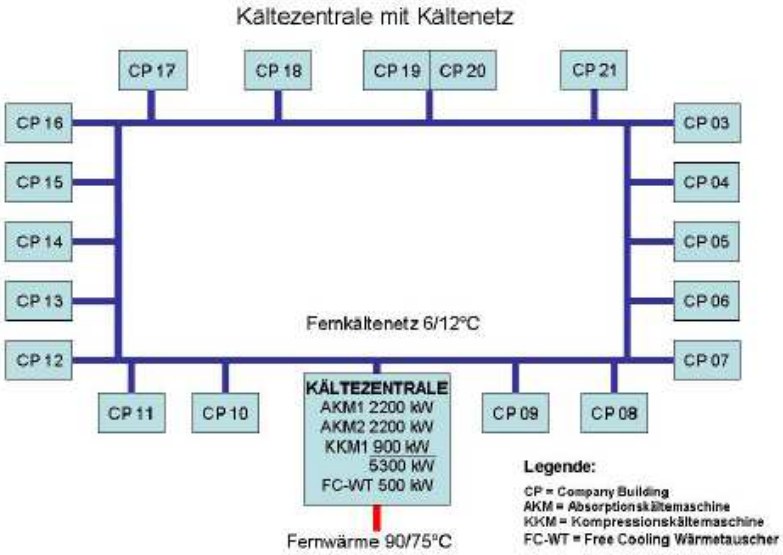

Abbildung 4: Schematische Darstellung des Fernkältenetzes, TownTown (Österreichische Energieagentur)

In seiner ersten Ausbaustufe beinhaltet dieses innovative Versorgungskonzept, das mehrere Technologien kombiniert, folgende Systemkomponenten. Zwei Absorptionskältemaschinen mit einer Leistung von jeweils 2.200 kW und eine Kompressionskältemaschine (Turboverdichter) mit einer Leistung von 900 kW sind installiert. Ähnlich wie bei der Beheizung wird hier auch bei der Kühlung eine Unterteilung in Grund- und Spitzenlast vorgenommen, wobei die beiden thermischen Kältemaschinen zur Abdeckung der Grundlast vorgesehen sind. Zusätzlich werden die Spitzenlasten bei den Objekten des TownTown-Projektes durch eine bauliche Maßnahme, der sogenannten Bauteilaktivierung, zu Gunsten der Grundlast verschoben.

Unter Bauteilaktivierung versteht man die Verwendung von Wänden und Decken zur aktiven Beeinflussung des Raumklimas, die durch Verlegung von Wasserrohrsystemen im Kern der Bauteile ermöglicht wird. Durch die Kühlung der Betondecken werden deren speicherwirksame Massen zum Temperaturausgleich genutzt. Die Bauteilaktivierung sorgt für eine Lastverschiebung von den Tagesstunden in die Nachtstunden, wodurch es zu einer Vergleichmäßigung der Kühllast kommt. Dieses Verfahren trägt dazu bei, dass die Absorptionskältemaschinen über einen möglichst langen Zeitraum bei konstanten Lasten gefahren werden können.

Die Rückkühlwerke der Verdichterkältemaschinen sind Hybridkühltürme, die je nach vorherrschenden Außentemperaturen eine Kombination aus Nass- und Trockenkühlung ermöglichen, wobei sich das Kühlmedium, ein Wasser-Glykol-Gemisch, in einem geschlossenen System befindet. Eine weitere Besonderheit der Kältezentrale ist, dass die Hybridkühltürme und der Kühlkreislauf über einen Wärmetauscher unter Umgehung der Kältemaschinen auch direkt mit dem Kaltwasserkreislauf verbunden sind. Dadurch wird ein so genannter Free Cooling Betrieb möglich. Das bedeutet, dass bei entsprechend

niedrigen Außentemperaturen die Bereitstellung des Kaltwassers durch Kühlung des Kühlwasser mittels Kaltluft oder Kaltwasser über das Rückkühlwerk erfolgt und den Betrieb der Kältemaschinen erübrigt.

Der Free Cooling Betrieb ist vor allem in der Winter- und Übergangszeit von besonderem Interesse, wenn trotz niedriger Außentemperaturen aufgrund von starker Sonneneinstrahlung eine Kühlung gewünscht wird. Weiters können während dieser Zeit Räumlichkeiten, die in Folge hoher interner Lasten (z. B. EDV-Anlagen) einer ganzjährigen Kühlung bedürfen, konditioniert werden.

3.2 Wirtschaftlichkeitsanalyse

Die Analyse der Wirtschaftlichkeit basiert auf der Annuitätenmethode nach VDI 2067, die neben den Kapitalkosten auch die betriebs- und verbrauchsgebundenen Kosten berücksichtigt. Für diese Betrachtung wurde die erste Ausbaustufe mit einer installierten Kälteleistung von 5,3 MW herangezogen.

Auf die Ermittlung eines Kältepreises werden sich insbesondere in der Einführungsphase des Fernkältesystems die Volllaststunden, die das System in der Realität erreichen kann, auswirken. Daher wurde der Kältepreis in Abhängigkeit der Volllaststunden dargestellt. Darüber hinaus fließen die Kosten für den Anschluss an das System in die Berechnung mit ein. Als mögliche Beispiele können hier eine finanzielle Unterstützung des Anschlusses aus Fördermitteln (z. B. EU-Förderungen), ein Baukostenzuschuss der Kunden für die Netzerrichtung oder eine Kombination beider genannter Maßnahmen angeführt werden. Weiters hängt ein möglicher Preis von der genauen Ausgestaltung des Kältetarifs ab. Dieser sollte beispielsweise auch eine Leistungspreiskomponente enthalten, die auf die örtlichen und netzspezifischen Parameter (z. B. Temperaturspreizung) der Kunden abgestimmt ist. Für das vorliegende Fernkältesystem kann davon ausgegangen werden, dass die Ausgestaltung des Kältepreises in der Bandbreite von 0,08 – 0,13 €/kWh liegt (siehe Abbildung 5).

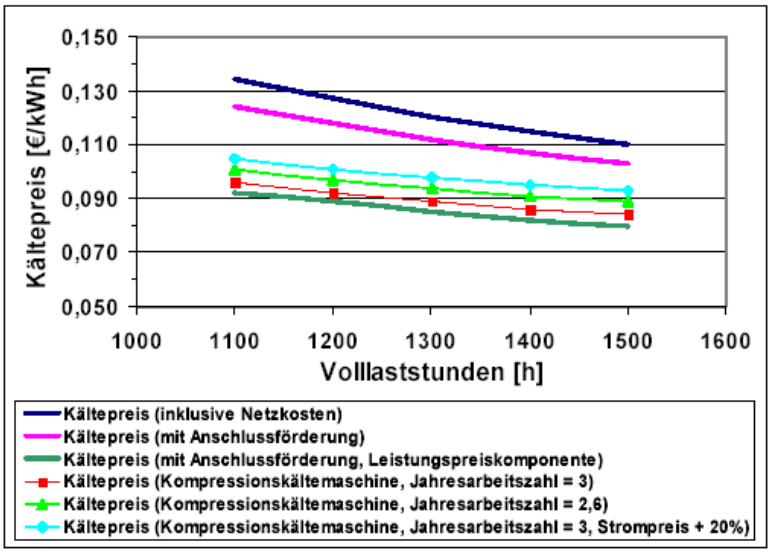

Abbildung 5: Kältepreis in Abhängigkeit der Volllaststunden (Österreichische Energieagentur)

Die zentrale Kälteversorgung wird mit konventionellen Kaltwassersystemen, die dezentral in den einzelnen Objekten angeordnet sind, verglichen. Dazu werden elektrisch betriebene Kompressionskältemäschinen zur Kaltwassererzeugung mit einer durchschnittlichen Kälteleistung von 300 kW herangezogen, wobei eine Ausfallsicherheit von 50 % angenommen wird, um ähnlichen Komfortansprüchen wie bei der Fernkälteversorgung genügen zu können. In Abbildung 5 sind auch verschiedene Paramtervariationen bezüglich der konventionellen Kälteerzeugung dargestellt. Wie aus der Darstellung ersichtlich, liegen die Kältepreise dafür am unteren Ende der Bandbreite für Fernkälte.

Jedoch wird auch der Einfluss zweier wesentlicher Parameter bei elektrischen Kompressionskältemaschinen, nämlich der Jahresarbeitszahl und des Strompreises, deutlich. Kompressionskältemaschinen der angeführten Leistungsgröße weisen Leistungszahlen in der Größenordnung von 3 auf. Um Jahresarbeitszahlen dieser Größe und damit einhergehende niedrige Kältekosten zu erzielen, sind günstige Rahmenbedingunen erforderlich. Dazu gehören unter anderem eine richtig eingestellte Betriebsweise sowie fachmännische Betreuung und Wartung der Anlagen. Der wichtigste Kostenfaktor bei Kompressionskältemaschine sind die

Stromkosten. Falls hier bei der Einzelobjektversorgung höhere Stromtarife angesetzt werden, als sie in einer Kältezentrale zur Verfügung stehen, wird das Ergebnis weiter merklich beeinflusst.

Allgemein gilt, dass bei der wirtschaftlichen Betrachtung der beiden unterschiedlichen Erzeugungssysteme jedenfalls alle Kostenkomponenten, wie in Abbildung 6 dargestellt, berücksichtigt werden müssen. Sehr häufig fließen bei der Beurteilung von Kosten für die Kühlung und Klimatisierung nur die verbrauchs- und betriebsgebundenen Kosten mit ein, und es wird vernachlässigt, dass die Investitionskosten für die Erzeugungsanlagen an die Kunden (Mieter) weitergegeben werden, beispielsweise über die Mieten. Abbildung 6 zeigt die Aufteilung der Kostenstruktur, die der Berechnung zu Grunde liegt.

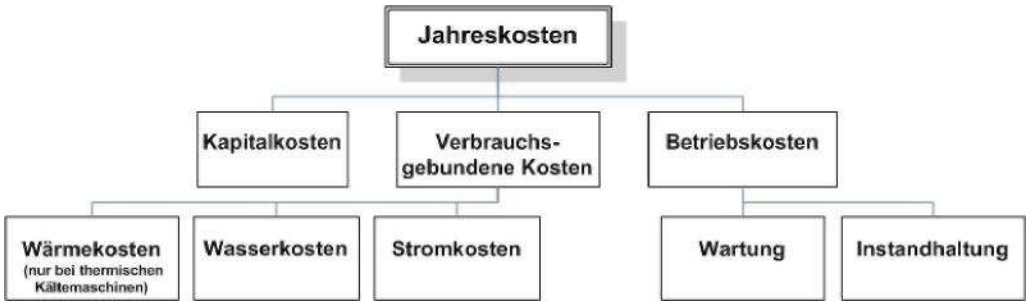

Abbildung 6: Kostenbetrachtung nach VDI 2067 (Österreichische Energieagentur)

Weiters ist die Auswahl des Systems oft von kurzfristigem Denken hinsichtlich geringer Investitionskosten geleitet, was in technischer Hinsicht und bei wirtschaftlicher Betrachtung über die Lebensdauer der Systeme nicht immer der optimalen Lösung entspricht. Diese erfordert eine genaue Analyse und eine ganzheitliche Betrachtungsweise der verschiedenen Technologien. Aufgrund der durchgeführten Vergleichsrechnungen kann unter den gegebenen Rahmenbedingungen mit großer Wahrscheinlichkeit davon ausgegangen werden, dass die Fernkälte auch in wirtschaftlicher Hinsicht eine echte Alternative zur konventionellen Kälteversorgung darstellen können wird.

3.3 Ökologische Bewertung

Die Emissionsberechnungen basieren auf einer geringfügig anderen Ausgangssituation, die noch aus der Vorplanung des Projekts stammt und 15 Objekte inkludiert. Die Kältezentrale weist eine maximale Kälteleistung von 5 MW auf, besteht aber ebenfalls aus zwei Absorptionskälte- und einer Kompressionskältemaschine. Als Vergleichssystem wurden dezentrale, konventionelle Kaltwassersätze in den einzelnen Gebäuden gewählt.

Für die Emissionsberechnungen bzw. -vergleiche wurden die Emissionsfaktoren berücksichtigt, die sich aus dem GEMIS Standard-Datensatz ableiten. GEMIS, das für Globales Emissions-Modell Integrierter Systeme steht, ist ein EDV-Programm, mit dem die Umweltauswirkungen verschiedener Energiesysteme verglichen werden können. Es kann dabei die gesamte „Energiekette“ – alle wesentlichen Schritte von der Primärenergie- bzw. Rohstoffgewinnung bis zur Nutzenergie- bzw. Stoffbereitstellung – berücksichtigt werden und bezieht den Hilfsenergie- und Materialaufwand zur Herstellung von Energieanlagen und Transportsystemen (die so genannte „graue Energie“) mit ein.

Die Bewertung der Emissionen aus Kompressionskälteanlagen wird mit dem TEWI (Total Equivalent Warming Impact) vorgenommen, der sich aus den direkten Emissionen zur Kälteerzeugung (Leckage- und Rückgewinnungsverluste) und den indirekten Emissionen für den Energiebedarf der Kältemaschinen zusammensetzt. Folgende Annahmen werden für die Berechnungen getroffen:

- Der zusätzliche Strombedarf für die Kompressionskälteanlagen kann entweder über thermische Kraftwerke oder durch Stromimporte abgedeckt werden.
- Für die Fernwärme wurde ein durchschnittlicher Emissionsfaktor des Kraftwerksparks einer Sommersituation berücksichtigt. Emissionen der Abfallentsorgung fallen hierbei an, egal ob Fernwärme für Kühlprozesse verwendet wird oder nicht. In diesem Fall werden diese der Entsorgung angerechnet. Weiters wird die industrielle Abwärme wie international üblich mit 0 bewertet. Der Fernwärmeabsatz im Sommer, der vorwiegend zur Warmwasserbereitung verwendet wird, wird größtenteils durch die bestehenden Müllverbrennungsanlagen abgedeckt.

Unter Berücksichtigung der obigen Annahmen werden für die Berechnungen folgende Emissionsfaktoren verwendet:

Emissionsfaktoren - $C0_2$	**kg/MWh**
UCTE Strommix *)	360
therm. ö. Kraftwerkspark	744
Fernwärme Wien **)	39

*) Union for the Co-ordination of Transmission of Electricity
**) Die Emissionsfaktoren beziehen sich auf die Wärmeproduktion in den Sommermonaten.

Tabelle 2: Verwendete Emissionsfaktoren (SIMADER, RAKOS 2005)

Wie bereits angeführt, werden als Vergleichsbasis die Emissionen des österreichischen, thermischen Kraftwerksparks (hinsichtlich der Emissionen für die Stromproduktion) und des UCTE Kraftwerksparks jeweils für die Kältezentrale und die dezentrale Kälteversorgung aus Kompressionskältemaschinen (KKM) herangezogen. Für beide Varianten wird von einer jährlichen Kühlenergie von 5500 MWh als Vergleichsbasis ausgegangen. Für die indirekten Emissionen aus etwaigen Leckage- und Rückgewinnungsverlusten wurde ein zehnprozentiger Verlust bei den Kompressionskältemaschinen angenommen.

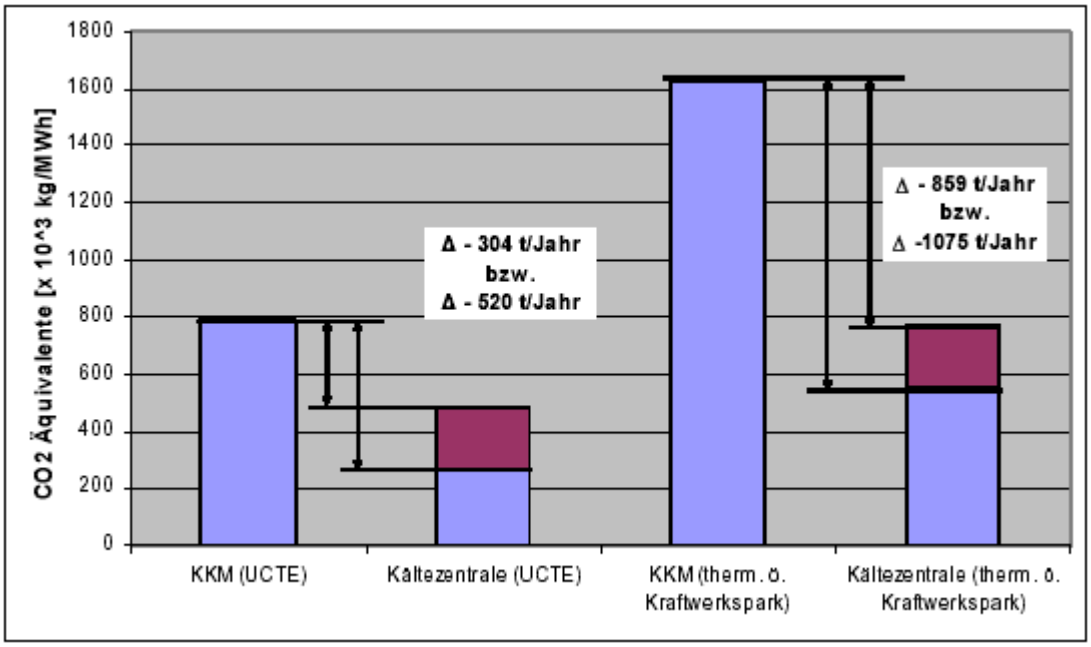

Abbildung 7: CO2 Emissionen pro Jahr von KKM und ABKM für zwei Szenarien: (i) unter Berücksichtigung des UCTE Kraftwerksparks und (ii) des österreichischen, thermischen Kraftwerksparks3[161] (SIMADER, RAKOS 2005) Erklärung: blau: Emissionen bedingt durch die Stromerzeugung, violett: Emissionen bedingt durch die Fernwärmeerzeugung.

Die Ergebnisse in Abbildung 7 zeigen das Reduktionspotenzial, das durch den Einsatz von Fernwärme in diesem Fallbeispiel erreicht werden kann. Abhängig vom Vergleichsszenario (Berücksichtigung der Emissionsfaktoren des UCTE Kraftwerkparks bzw. des österreichischen, thermischen Kraftwerksparks) können Einsparungen zwischen 304 bzw. 859 t CO2-Äquivalente/Jahr erzielt werden. Kann auf Wärmelieferungen aus industriellen Abwärmeprozessen bzw. aus der Abfallverbrennung zurückgegriffen werden, so können sich die Emissionen um weitere 216 t CO2-Äquivalente/Jahr reduzieren (= 520 t bzw. 1075 t CO2 Äquivalente pro Jahr).

4 RAHMENBEDINGUNGEN FÜR DIE ERRICHTUNG UND DEN BETRIEB VON FERNKÄLTE

Auf europäischer Ebene wurde eine Anzahl von Initiativen bzw. Richtlinien erlassen, die einerseits Einfluss auf die Errichtung und den Betrieb von gewöhnlichen Gebäudeklimaanlagen haben und andererseits

[161] Da bei den UCTE Emissionsfaktoren keine Vorketten berücksichtigt wurden, wurden die Emissionen Vorketten gerechnet

Rahmenbedingungen für die Nutzung von Fernwärme zur Kälteerzeugung schaffen. Aus diesen zahlreichen legistischen Maßnahmen, deren nationale Umsetzung es ebenfalls zu beachten gilt, seien zwei herausgegriffen.

Neben der KWK-Richtlinie, die eine Forcierung des Ausbaus von Kraft-Wärme-Kopplungen in der europäischen Union vorsieht, wird insbesondere die Richtlinie RL 2002/91/EG über die Gesamtenergieeffizienz von Gebäuden („Gebäude-Richtlinie“) für die Immobilienentwicklung und die damit verbundene Implementierung von alternativen Kühltechnologien in Österreich von Bedeutung sein. Darin ist unter anderem eine Alternativenprüfung vorgesehen. Konkret muss bei Neubauten mit einer Gesamtnutzfläche über 1.000 m2 zukünftig die technische, ökologische und wirtschaftliche Einsetzbarkeit alternativer Energiesysteme wie Fern- bzw. Blockkühlung vor Baubeginn berücksichtigt werden. Weiters ist darin vorgesehen, dass die Mitgliedstaaten die erforderlichen Maßnahmen treffen, um die regelmäßige Inspektion von Klimaanlagen mit einer Nennleistung von mehr als 12 kW zu gewährleisten. Diese soll eine Prüfung des Wirkungsgrads der Anlage und der Anlagendimensionierung umfassen und die Nutzer über mögliche Verbesserungen oder den Austausch der Klimaanlage sowie über Alternativlösungen informieren.

Die in konventionellen Kältemaschinen eingesetzten Kältemittel sind - neben dem Schädigungspotenzial der bereits verbotenen Fluorchlorkohlenwasserstoffe (FCKW) für die Ozonschicht - auch aufgrund ihrer Treibhauswirksamkeit klimarelevant. Daher schreibt die im Jahr 2006 erlassene EU-Verordnung 842/2006 über bestimmte fluorierte Treibhausgase Maßnahmen zur Emissionsminderung von bestimmten fluorierten Treibhausgasen (FKW) und Schwefelhexafluorid vor. Dies soll durch eine wirksame Reduzierung und bessere Überwachung dieser Gase bei Kühlanwendungen (Überprüfung der Dichtheit, Leckageüberwachung) sowie die Einführung von Beschränkungen für deren Inverkehrbringen und Verwendung in bestimmten anderen Sektoren erzielt werden.

Österreich nahm in einer Verordnung über Industriegase aus dem Jahre 2002 schon strengere Bestimmungen hinsichtlich des Einsatzes und der Verwendung von HFKW (teilfluorierte FKW) und FKW vorweg, die durch eine in der EU-Verordnung vorgesehene Schutzklausel beibehalten werden können. Die Verordnung beinhaltet ein Verbot von FKW als Kälte- und Kühlmittel (mit bestimmten Ausnahmeregelungen) seit Dezember 2002. Weiters war eine zeitliche Befristung (Ende 2007, ebenfalls mit Ausnahmeregelungen) für die Anwendung von HFKW als Kältemittel vorgesehen, die aber einem Evaluierungsprozess bezüglich des Standes der Technik unterworfen werden musste. Die Diskussionen dazu befinden sich in der Endphase. Ein finaler Entwurf ist in Vorbereitung, in dem allerdings von einem endgültigem Ausstiegsszenario für HFKW abgewichen wird und der noch Spielraum für den Einsatz hinsichtlich Leistungsgrenzen und mengenmäßiger Beschränkungen lässt.

5 ERGEBNISSE UND ZUSAMMENFASSUNG

Die Verwendung von Fernwärme im Sommer zur Klimakälteerzeugung weist vielfältige Vorteile auf. Die Nutzung der Abwärme aus KWK-Anlagen, insbesondere aus regenerativ befeuerten Heizkraftwerken, und aus Verbrennungsanlagen im Sommer bewirkt eine Effizienzsteigerung und führt außerdem zu einer besseren Auslastung von Fernwärmesystemen. Weiters kann, wie im Fallbeispiel gezeigt, eine Reduktion der CO2-Emissionen erreicht werden.

Ein wesentlicher Vorteil gegenüber Kompressionskälteanlagen ist der deutlich geringere Strombedarf und die Art des Kältemittels. Absorptionskältemaschinen verwenden Wasser als Kältemittel und sind frei von FCKW und FCKW-Ersatzstoffen. Damit ist auch eine Unabhängigkeit hinsichtlich gesetzlicher Bestimmungen und deren möglicher Verschärfungen für diese konventionellen Kältemittel gegeben, die sowohl die Ozonschicht schädigendes Potenzial aufweisen als auch treibhausrelevant sind.

Folgende weitere Aspekte und Vorteile, die im Speziellen auch bei der Entwicklung und Planung von Immobilien einfließen können, sind in Bezug auf Fernkältenetze anzuführen:

- Frei werdende Flächen: durch den Wegfall eigener Erzeugungsanlagen und der Rückkühlwerke bzw. Kühltürme zur Rückkühlung, die ebenfalls zentral angeordnet werden.
- Einfluss auf die Architektur: Wegfall der gewöhnlich auf dem Dach installierten Rückkühlwerke und Kühltürme bzw. Kompaktanlagen und damit verbundene Auswirkungen auf das architektonische Gesamtbild der Gebäude.

- Konzentration der Schallquellen auf einen Punkt.
- Bedienung und Wartung durch spezialisierte Energieversorgungsunternehmen.
- Geringere Wartungskosten als konventionelle Kaltwassersätze.
- Ausfallsicherheit und Komfort, die in Zeiten gestiegener Ansprüche an Bedeutung gewinnen.
- Der Wegfall der Investition in eigene Kälteerzeugungsanlagen kann bei einem starken Wettbewerb am Immobilienmarkt zu Vorteilen bei der Mietpreisgestaltung führen.

In einer Kältezentrale lassen sich zudem mehrere Techniken zur Deckung des unterschiedlichen Bedarfs (Grundlast, Spitzenlast) leichter kombinieren. Im beschriebenen Fallbeispiel wird bei entsprechenden Außentemperaturen auch die Möglichkeit des Free Cooling genutzt, das zu einer zusätzlichen Minimierung des Primärenergieaufwandes beiträgt. Nachteilig in Bezug auf Fernkältenetze ist der Umstand, dass bei einem stufenweisen Ausbau des Versorgungsgebietes Investitionen in das Kältenetz vorgehalten werden müssen. Gegenüber konventionellen Kompressionskältemaschinen sind zudem die höheren Investitionskosten zu berücksichtigen. Aus anlagentechnischer Sicht weisen sie einen höheren Platzbedarf und ein höheres Gewicht als gewöhnliche Kältemaschinen auf, und es ist eine größere Rückkühlleistung erforderlich.

Potenziale für den Aufbau von Fernkältenetzen bestehen in dicht bebauten Arealen, insbesondere bei Vorhandensein von Objekten mit hohem Kühlbedarf wie

- Großvolumige Bürogebäude,
- Krankenhäuser,
- Hotels (vorwiegend 3 – 5 Sterne Hotels),
- Gewerbebetriebe,
- Einkaufszentren und große Verbrauchermärkte.

Durch den verstärkten Einsatz von Kühlung mittels thermischer Kältemaschinen in den angeführten Gebäudekategorien (dezentrale Erzeugung eingeschlossen) kann für Österreich in den nächsten Jahren von Stromeinsparungen im Ausmaß von 80 bis 177 GWh ausgegangen werden. Hinsichtlich der Reduktion der CO2-Äquivalent Emissionen wird in den kommenden Jahren je nach verwendetem Referenzszenario ein Potenzial von rund 22.000 bis 135.000 t CO2-Äquivalent Emissionen gesehen. Für den Raum Wien gehen grobe Abschätzungen von einem theoretischen Potenzial von 61 bis 178 MW zu installierender Kälteleistung aus. Dieses Potenzial gilt es zu entwickeln (vgl. SIMADER, RAKOS 2005).

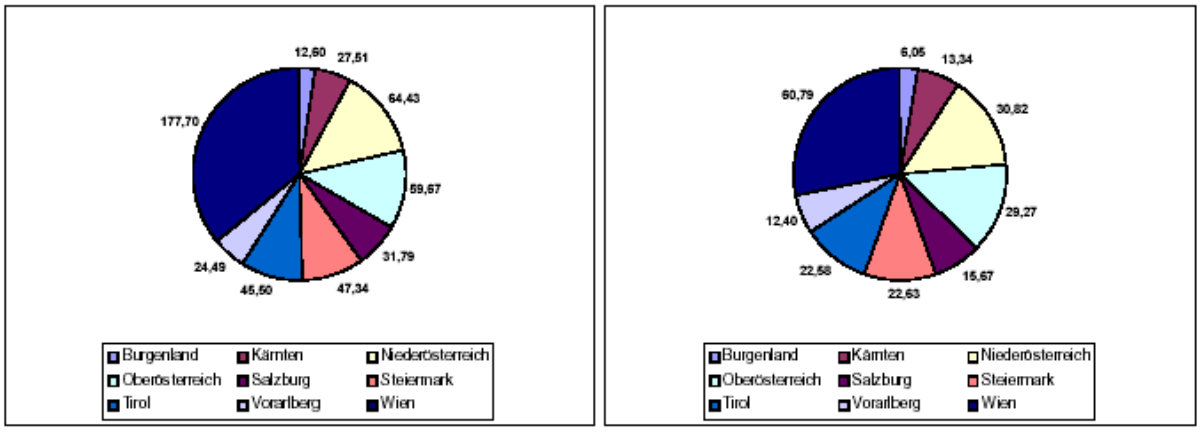

Abbildung 8: Verteilung der installierbaren Kälteleistungen für thermische Kühlanlagen in MW (SIMADER, RAKOS 2005)
Erklärung: Die linke Grafik stellt das max. Potenzial mit insgesamt 491 MW dar, die rechte das min. Potenzial mit insgesamt 214 MW.

Fernkältesysteme stellen eine innovative und zukunftsträchtige Form der Gebäudekühlung dar, deren Verbreitung und Anwendungsstand mit den Anfängen der Fernwärmeversorgung in Ballungszentren zu vergleichen ist. Große Chanchen für Fernkältenetze, zu denen es auch ein regional sehr starkes politisches Bekenntnis gibt, werden in räumlich begrenzten, verdichteten Gebieten gesehen. In Wien bilden bestehende und/oder sich in der Entwicklung befindliche, städtebauliche Gebiete wie das Areal um das Fernheizwerk

Spittelau oder die Donauplatte mit der angrenzenden UNO-City ein vielversprechendes Potenzial. Die Entwicklung und Implementierung innovativer Fernkälteprojekte liegt somit auch an der Schnittstelle zwischen der Immobilienentwicklung, bei der innovative Energiekonzepte und Energieeffizienz immer stärker in den Vordergrund rücken, und einer ganzheitlichen Stadtplanung.

6 QUELLEN

ALEXANDRU G., GREILER E., KLEINBERGER J.: Kraft-Wärme-Kälte-Kopplung – Innovative Wärmenutzung im Bereich Biogas. Graz, 2004.

EUROPEAN MARKETING GROUP DISTRICT HEATING AND COOLING (Hrsg.): The District Cooling Handbook. 2nd Edition, 1999.

KROTIL R., GRAF M., MÜHL M.: Heißwasserbetriebene Sorptionsanlagen zur Klimakälteerzeugung. In Heizung Lüftung Klimatechnik, 10/2002.

SIMADER G., RAKOS C.: Klimatisierung, Kühlung und Klimaschutz: Technologien, Wirtschaftlichkeit und CO2-Reduktionspotenziale. Materialband Österreichische Energieagentur, 2005.

🏆 *reviewed paper*

„Strategiepläne sind nicht genug“ – Herausforderungen für die städtische „Governance“ am Beispiel Wien[162]

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1 EINFÜHRUNG

Seit den 1990er Jahren erfreuen sich Strategiepläne auf der Ebene von Stadtregionen in Westeuropa wieder größerer Beliebtheit. In der Literatur (A. Faludi/W. Salet 2000; P. Healey et al. 1997) wird davon ausgegangen, dass gravierende Umstrukturierungen der städtischen Wirtschaft und Prozesse der Globalisierung sowie der Europäischen Integration zentrale Herausforderungen sind, denen sich die Stadt- und Regionalplanung auf strategischer Ebene stellen muss. Zunehmende fiskalische Engpässe, das Weiterbestehen und die Zunahme von Umweltproblemen, eine stärkere Ausdifferenzierung der Lebensweisen sowie die Zunahme sozial-räumlicher Polarisierungen werden als weitere Gründe für das Aufkommen einer strategieorientierten Stadtplanung angeführt .

Im planungstheoretischen Diskurs (vgl. U. Altrock 2004; S. Campbell/S. Fainstein 1996; A. Faludi/W. Salet 2000), steht die strategieorientierte Planung im Zusammenhang mit der Abkehr von rational-wissenschaftlichen und zumeist zentralistisch sowie hierarchisch erzeugten Planungsmodellen. Vor allem angesichts der Veränderung von Akteurskonstellationen und der Pluralisierung sowie Diversifizierung von Akteursinteressen wird die Frage nach der Legitimität und Effektivität von Planung erneut thematisiert. In den Vordergrund rückt daher weniger das exakte Ziel, sondern der „Prozess“ der Entwicklung und Umsetzung strategieorientierter Pläne, in welchem die unterschiedlichen Interessen und Wünsche städtischer Akteurinnen und Akteuren zusammengebracht werden. Der Prozess, bei dem der Kreis der Akteurinnen und Akteure ausgeweitet wird, wird letztendlich zum entscheidenden Faktor im Hinblick auf die Legitimität sowie die Qualität der praktischen Umsetzung der Pläne. Strategieorientierte Planung ist ein weitgehend offener, reflexiver sozialer Prozess; die strategieorientierten Pläne werden als Kommunikations- und Motivationsinstrumente gesehen.

Planung wird in dieser Sichtweise als kontextgebundenes, an bestehende politische Strukturen, an Akteurskonstellationen und deren Verhandlungsstrukturen gebundenes Unterfangen charakterisiert. Die zugrunde liegenden Annahmen dieses planungstheoretischen Zuganges sind u.a. einer soziologischen Theorie der Institutionen entnommen, in welcher – verkürzt gesagt – Institutionen als Muster sozialer Regulierungen angesehen werden (J.G. March & J.P. Olsen 1989).

In der institutionalistischen Perspektive ist der Prozess der Entwicklung, Entscheidungsfindung und Umsetzung strategieorientierter Planung ein entscheidender Qualitätsfaktor. Dadurch geraten das jeweilige politisch-administrative System mit seinen Organisations- und Entscheidungsstrukturen, den Wertorientierungen der relevanten Akteurinnen und Akteure sowie den Akteurskonstellationen in den Mittelpunkt des Interesses.

„… A strategy or a plan by itself does not much to coordinate. It is the social process of articulating and using it that achieve this. These involve organizational coordination as much as analytical and conceptual coordination“ (Healey 1997 et al.: 11).

Strategieorientierte Planung stellt eine Herausforderung für politisch-administrativen Systeme dar, da zumeist horizontale Kooperationen und Arbeitszusammenhänge innerhalb des traditionell hierarchisch und vertikal gegliederten Verwaltungsapparates, in zunehmenden Maße Kooperationen mit privaten Akteurinnen und Akteuren aus der Wirtschaft und der Zivilgesellschaft sowie die Integration unterschiedlicher politischer Felder angestrebt werden. Strategieorientierte Planung steht damit im Kontext des vielfach erwähnten Übergangs vom „Government“ zum „Governance“, wobei sich inzwischen in vielen Städten aufgrund von unterschiedlichen historisch gewachsenen politischen Strukturen und Kulturen verschiedene Erscheinungs- und Übergangsformen von „urban governance“ herausgebildet haben.

[162] Erscheint ausführlicher in: Hamedinger, Alexander; Dangschat, Jens. S; Frey, Oliver & Breitfuss, Andrea (Hrsg.) 2007: Strategieorientierte Planung im kooperativen Staat. Wiesbaden: VS Verlag für Sozialwissenschaft

Vor dem Hintergrund eines institutionalistischen, planungstheoretischen Zuganges werden in diesem Beitrag die folgenden Punkte diskutiert:

1. In welcher Form und mit welchen Inhalten wurde strategieorientierte Planung in Wien durchgeführt?

2. Inwiefern ist strategieorientierte Planung im Zusammenhang mit einem Übergang vom „Government“ zum „Governance“ in Wien zu sehen?

3. Welchen Stellenwert hat strategieorientierte Planung in der Steuerung städtischer Entwicklung in Wien?

2 DER THEORETISCHE UND METHODISCHE ANSATZ

2.1 Governance in der Stadt- und Regionalplanung:

Raumplanung und strategieorientierte Planung sind in unterschiedliche Kontexte von Governance eingebettet. Vor allem die strategieorientierte Planung ist auf Kooperationen und Verhandlungen zwischen einer Vielzahl von Akteuren und Institutionen angewiesen, um an Legitimität und Durchsetzungskraft zu gewinnen, weil im Implementationskontext zumeist weder auf rechtliche Sanktionsmöglichkeiten noch auf zusätzliche finanzielle Ressourcen zurückgegriffen werden kann.

Über „Governance“ wurde erstmals in der wirtschaftswissenschaftlichen Theoriebildung (z.B. in der Institutionenökonomie) gesprochen. In diesem Kontext wurde vor allem danach gefragt, wie ökonomische Transaktionen am effizientesten organisiert und koordiniert werden können (vgl. Le Galès 2002). Die Bildung von Regelsystemen, die Koordinierung und Steuerung unterstützen, stand dabei u.a. im Mittelpunkt des Interesses. Auf einer allgemeinen Ebene bezeichnet „‚Governance’ zumeist eine Gesamtheit von Prozessen, Strukturen, Regeln, Normen und Werten, durch welche kollektive Aktivitäten gesteuert und koordiniert werden sollen. Dabei können unterschiedliche Regelsysteme zur Anwendung kommen (z.B. Markt, Hierarchie), die das Steuern und Koordinieren erleichtern sollen“ (Hamedinger 2006: 12).

Eine andere Interpretation von Governance wurde im Zusammenhang mit der These des Übergangs vom „Government“ zum „Governance“ formuliert. Dabei wird hervorgehoben, wie sich städtische Steuerungsformen seit den 1970er Jahren verändert haben. „Es wird davon ausgegangen, dass sich die Grenzen zwischen zentralen Institutionen (Staat, Markt und Gesellschaft) zusehends auflösen, und dass eine Mischung von unterschiedlichen Regelsystemen (Markt, Hierarchie, Verhandlungsregel etc.) zu Steuerungszwecken Anwendung findet (‚Mix of Politics’) (vgl. Hamedinger 2006: 12). Ebenso verweist Benz (2004: 25) auf dieses Spezifikum des „Grenzüberschreitens“, welches die Idee des Governance treffend beschreibt: „Prozesse des Steuerns bzw. des Koordinierens sowie Interaktionsmuster, die der Governance-Begriff erfassen will, überschreiten in aller Regel Organisationsgrenzen, insbesondere aber auch die Grenzen von Staat und Gesellschaft, die in der politischen Praxis fließend geworden sind. Politik in diesem Sinne findet normalerweise im Zusammenwirken staatlicher und nicht-staatlicher Akteuren (oder von Akteurinnen und Akteuren innerhalb und außerhalb von Organisationen) statt“. „Governance“ unterscheidet sich dadurch von „Government“, dass mehr und vielfältigere Akteurinnen, Akteure und Institutionen in die politische Entscheidungsfindung miteinbezogen werden, dass umfassendere Kooperationen zwischen staatlichen und nicht-staatlichen Akteurinenn und Akteuren (z.B. public-private partnerships) für Steuerungszwecke eingerichtet werden, und dass sich das Staatsverständnis grundlegend wandelt, indem mehr vom „unternehmerischen“, effizient arbeitenden, modernisierten und „kooperativen“ als vom keynesianischen Wohlfahrtsstaat gesprochen wird (vgl. Voigt 1995, Heinelt & Mayer 1997, Grunow & Wollmann 1998). Zentrale Elemente von Governance sind:

- die Bildung von neuen formellen und informellen Netzwerken, Koalitionen und Partnerschaften zwischen unterschiedlichen Akteurinnen, Akteuren und Institutionen aus der privaten und öffentlichen Sphäre (z.B. public-private partnerships)

- die Öffnung der politisch-administrativen Systeme für die Interessen und Meinungen von Bürgerinnen und Bürgern in der Entwicklung, Planung, Entscheidungsfindung und Umsetzung von politischen Programmen und Projekten und damit eine Erhöhung der Anzahl von Akteuren in der po-litischen Entscheidungsfindung (Partizipationsverfahren)

- die Re-organisation bzw. Modernisierung der Verwaltungsapparate

- die Aufteilung und Delegation von politischen Aufgaben an unterschiedliche staatliche und nicht-staatliche Akteure sowie Institutionen (z.B. durch Dezentralisierungsmaßnahmen)

- eine Veränderung der Rolle des Staates in der Steuerung gesellschaftlicher und räumlicher Entwicklung, weg vom keynesianischen Wohlfahrtsstaat hin zum angebotsorientierten und rahmen-schaffenden kooperativen Staat

- die Lösung von politischen Konflikten und Problemen durch Verhandlungen zwischen staatli-chen und nicht-staatlichen Akteuren, in welchen nicht nur eine Instanz Entscheidungen trifft, sondern das Ziel der Einigung und der Konsensfindung zwischen den Beteiligten im Mittelpunkt steht.

- Entscheidungsfindung nicht nur aufgrund formeller Regelungen (z.B. Gesetze), sondern auch durch informelle Regelungen in verschiedenen Verhandlungsfora (vgl. (Pierre 2000, Stoker 2000, Benz 2004).

Im Folgenden wird die spezifische Erscheinungsform von Governance in Wien im Zusammenhang mit der Entwicklung und der inhaltlichen Ausrichtung des Strategieplans 2004 analysiert. Der methodische Zugang für die Analyse des Strategieplans bildet die „kritische Diskursanalyse". Die oben genannten Governance-Elemente dienen als Rahmen zum besseren Verständnis und zur Einordnung der Wiener Form von Governance im europäischen Kontext.

2.2 Kritische Diskursanalyse

Diskurse werden in der Tradition einer kritischen Diskursanalyse von Michel Foucault als soziale Praktiken angesehen, die einerseits soziale Realitäten produzieren, und andererseits selber von diesen Realitäten bestimmt werden.

„Dabei besteht eine dialektische Beziehung zwischen Diskursen und der ihren Kontext bildenden Sozialstruktur: beide wirken wechselweise als Bedingungen und Effekte. Diskurse konstituieren Welt, und sie werden umgekehrt durch sie konstituiert; sie (re-)produzieren und transformieren Gesellschaft; sie leisten die Konstruktion sozialer Identitäten, die Herstellung sozialer Beziehungen zwischen Personen und die Konstruktion von Wissens- und Glaubenssystemen" (R. Keller 2004: 28).

Diskurse umfassen eine Vielzahl von Aussagen, Themen und „Diskurssträngen", die etwa in Form von Texten Ausgangsdaten für eine Diskursanalyse sein können. Auf dieser Basis sind die Interessens-Positionen zu analysieren. Texte, wie eben Strategiepläne oder Stadtentwicklungspläne, sind Teil einer diskursiven Praxis, die in einen gesellschaftlichen und institutionellen Kontext eingebettet ist, und die ein bestimmtes Thema ansprechen. Im Rahmen einer solchen diskursanalytischen Zugangsweise wird danach gefragt,

In der Analyse des Strategieplanes wird daher das Augenmerk auf folgende Zusammenhänge gelenkt:

- In den Texten werden bestimmte Wahrnehmungen und Sichtweisen von städtischen Problemen und Herausforderungen sowie bestimmte Lösungsstrategien deutlich gemacht, die dazu dienen sollen, gemeinsame Anstrengungen einer Vielzahl von Akteurinnen und Akteuren anzuleiten. Im Text erfolgt eine spezifische Konstruktion und Interpretation von Realität, eine spezifische Darstellung von Wissen über die Entwicklung der Stadt und damit eine Produktion von „Sinn", auf welchen sich die Aktivitäten der Akteurinnen und Akteure beziehen sollen. Damit dient der Text und das in ihm vorfindbare Wissen der Regulation der Interaktionen zwischen den beteiligten Personen und gesellschaftlichen Gruppen.

- In diesen Sichtweisen und Interpretationen von Realität drückt sich ein Machtanspruch bestimmter hegemonialer gesellschaftlicher Gruppierungen aus, denn „Diskurse sind parteiisch und auf spezifische soziale Positionen bezogen" (N. Fairclough 2001: 342). Damit wird der Zusammenhang zwischen der Produktion von Diskursen zur wiederum Reproduktion von Machtverhältnissen, die die städtische Gesellschaft strukturieren, angesprochen. Die Darstellung der Aussagen im Text als objektive, zumeist auf der Basis von Expertenwissen erarbeitete Wahrheiten dient der Regulation von Konflikten, die sich aus unterschiedlichen Interpretationen und Sichtweisen über die zukünftige Entwicklung der Stadt entwickeln könnten. Diese Unterschiede sind Folge der Artikulation der Interessen verschiedener gesellschaftlicher Gruppierungen, die wiederum bezüglich ihrer Ausstattung mit Machtressourcen, mit ökonomischen, sozialem und symbolischem Kapital Differenzierungen aufweisen. Die Herstellung einer „gemeinsamen" Realität dient der Einbindung dieser sozialstrukturell differenzierten gesellschaftlichen Gruppierungen und damit der Verdrängung von Konflikten im Sinne der Durchsetzung hegemonialer Ansprüche. Wie Konflikte

im Text angesprochen, welche Widersprüche im Text deutlich sowie welche Aussagen ausgeklammert werden, sagt über die „Machtwirkungen“ des Diskurses sehr viel aus.

- In der Tradition einer Foucaultschen Diskurstheorie steht auch die Frage nach dem „Regelsystem“, das der Produktion eines Textes zugrunde liegt. Regelsysteme sind an institutionelle Strukturen und an Formen der Interaktion (kooperativ, netzwerkartig, hierarchisch etc.) zwischen Akteurinnen und Akteuren gebunden. Die Einbettung eines Textes in vorhandene Governance-Strukturen, in historisch entwickelte politische Kulturen und Sichtweisen auf Institutionen/Akteuren spielt für die konkrete Form des Regelsystems eine zentrale Rolle. Das, was im Diskurs erscheint, ist abhängig von den „institutionellen Logiken“ sowie von den Logiken der Formen der Interaktion, die aufgrund ihrer internen Strukturen, Prozesse und Akteurskonstellationen bestimmte „Wahrheiten“ erscheinen lassen. Im Kern wird also der Blick auf die Rolle der Akteure und der Institutionen in der Produktion eines Textes gelenkt. Relevante Fragen dazu sind: welche Akteurinne, Akteure und Institutionen wurden in welcher Form in die Entstehung des Textes eingebunden, wie wurde mit den unterschiedlichen Sichtweisen im Prozess der Entstehung umgegangen, wer wird im Text als zentrale Akteurinnen, Akteure oder Institutionen für die Umsetzung angeführt?

Damit wird deutlich, dass es eben nicht das Ziel der Analyse ist, „falsche“ bzw. „wahre“ inhaltliche Aussagen herauszuarbeiten oder Wahrheiten herzustellen, die aus einer bestimmten Sichtweise als legitim erscheinen. Vielmehr werden die Texte als Teile eines Diskurses über die zukünftige Entwicklung der Stadt Wien angesehen, welcher eine bestimmte gemeinsame Sichtweise auf die Stadt Wien herstellen, institutionelle Praktiken verändern, Kooperationen zwischen unterschiedlichen Akteuren herstellen und das Selbstverständnis aller involvierten Akteurinnen und Akteure mitformen sollen.

Aus diesen diskurstheoretischen Grundüberlegungen ergeben sich konkrete Fragestellungen, die die Analyse der Texte des Strategieplans 2004 anleiten:

1. Welche Probleme der gegenwärtigen und zukünftigen Stadtentwicklung werden angesprochen? Welche Probleme werden ausgespart? Welche Strategien zur Lösung dieser Probleme werden vorgeschlagen?

2. Welche Gründe für die Entwicklung dieser strategischen Pläne sowie der darin enthaltenen Strategien werden erwähnt (Frage nach den „driving forces“), handelt es sich mehr um exogene oder um endogene Begründungszusammenhänge?

3. Welche Akteurinnen, Akteure und Institutionen wurden in den Entstehungsprozess des Textes in welcher Form eingebunden? Welchen Einfluss hatten diese Akteure auf die inhaltliche Ausrichtung der Strategiepläne? Welche Rolle spielen diese Akteure bei der Umsetzung des Planes?

4. Wie wurde mit auftretenden Konflikten, die sich aus unterschiedlichen Sichtweisen und Interpretationen ergeben, im Prozess der Entstehung der Pläne umgegangen? Werden in den Texten selbst Widersprüche und Konflikte deutlich gemacht, oder werden solche übergangen?

5. Welche Formen von governance werden für die Umsetzung der Strategien vorgeschlagen? Werden institutionelle Neuerungen vorgeschlagen? (Kooperationen, Partnerschaften, etc.?) Welche Rolle spielt das klassische „government“, welches Bild über die zukünftige Rolle des Staates und damit über die Form von Staatlichkeit wird vermittelt?

6. Welchen Stellenwert haben diese Pläne in der Stadtpolitik? Handelt es sich nur um ein „nachahmendes“ planerisches Ritual oder entfalten die Strategiepläne eine eigene Steuerungskraft? Welcher Weg der Modernisierung wird deutlich gemacht?

3 DER WIENER KONTEXT: EINE KURZE BESCHREIBUNG DER „URBAN GOVERNANCE“

Historisch betrachtet sind die politische Kultur Wiens, die städtebaulichen und raumplanerischen Programme sowie die Struktur des politisch-administrativen Systems stark durch sozialdemokratische Elemente geprägt. Die Wiener Sozialdemokraten (früher: Sozialistische Partei) kontrollieren bis heute den lokalen Staat und setzten lange Zeit auf eine austrokeynesianische Wohlfahrtspolitik (etwa im Bereich der Wohnbaus und der Daseinsvorsorge). Die politische Kultur ist durch klientelistische Beziehungen zwischen versorgendem Staat und der Bürgerschaft gekennzeichnet, durch ein Fehlen von Partizipationstraditionen, durch die Dominanz der Verwaltung, durch top-down-Entscheidungsstrukturen sowie durch eine Haltung der „Konfliktvermeidung“, die ihre Wurzeln in einer Politik der Einbindung und der Kooptierung potentiell

widerständiger Gruppen der Zivilgesellschaft hat. Nach einem Prozess der politischen De-Konzentration in den 1990er Jahren, welcher die dominante Position der Sozialdemokratie schwächte (und zu einer Koalition mit der ÖVP führte), konnte die SPÖ in den letzten zwei Gemeinderatswahlen (2001 und 2005) die absolute Mehrheit an Stimmen und Sitzen wieder zurückgewinnen.

Seit einigen Jahren gibt es Bestrebungen, dieses System des fordistischen „Government" zu reformieren und zu modernisieren. Neben einigen Maßnahmen der Dezentralisierung in den 1980er und 1990er Jahren, welche den geringen Kompetenzbereich der Gemeindebezirke etwas erweiterte, der Ausgliederung von Organisationseinheiten (z.B. die Wiener Stadtwerke), der Gründung von stadteigenen Fonds (wie etwa der Wiener Bodenbereitstellungs- und Stadtentwicklungsfonds, der Wiener Arbeitnehmer-Förderungfonds, Wiener Integrationsfonds und der Fonds Soziales Wien), sowie der De-Regulierung im Bereich der Wohnungspolitik sind hier vor allem Bemühungen zur Verwaltungsmodernisierung sowie – im Bereich der Stadtplanung – zur Verbesserung der Beteiligungsmöglichkeiten für Bürgerinnen und Bürger zu nennen.

Die Verwaltungsmodernisierung wurde Ende der 1990er Jahre begonnen und hat das Ziel, aus dem Magistrat, einen modernen Dienstleistungskonzern zu machen. Über Anwendung eines Kontraktmanagements, das die Etablierung fixer Verträge für die Leistungserbringung einzelner Magistratsabteilungen vorsieht, soll ein Wandel in der Unternehmens- und Führungskultur eingeleitet werden. „Dabei sind die folgenden Schritte vorgesehen: Definition der Leistungen, Erfassen der Globalziele, Festlegen der Kundinnen und Kunden, Zuordnung der Arbeitszeit zu Produkten und Kundinnen sowie Kunden, Installierung einer Kosten-Leistungsrechnung und Aufbau eines Controllings und Berichtswesens" (A. Breitfuss et al. 2004: 80).

Die Förderung von Partizipationsmöglichkeiten an Planungsprozessen bezieht sich wiederum vor allem auf die Veränderung der Aufgabengebiete der Gebietsbetreuungen, die zentraler institutioneller Bestandteil der sanften Wiener Stadterneuerung sind, und auf die Durchführung von für Wiener Verhältnisse innovativen Beteiligungsverfahren im Rahmen der EU-Programme URBAN und Ziel-Gebiet 2 (etwa innerhalb von URBAN 1: Gründung eines Nachbarschaftsbeirates, innerhalb von Ziel 2: Implementation eines Grätzelmanagements). Damit wurden Akzente in Richtung eines partizipativen, bottom-up gesteuerten und integrativen Verständnis von Stadterneuerung gesetzt, die es in dieser Qualität in Wien bisher nicht gab.

Wie sich zeigen wird, spielen diese Elemente der städtischen Governance eine bedeutsame Rolle in Bezug auf die inhaltliche Ausrichtung und Entstehung des Strategieplanes.

4 DIE ANALYSE – DER STRATEGIEPLAN 2004

4.1 Entstehungsprozess, Begründungszusammenhänge, Akzentsetzung

Der Wiener Strategieplan 2004 hat den Untertitel „Strategieplan für ein erweitertes Europa". Er baut auf dem ersten Wiener Strategieplane (MA 18 2000: „Qualität verpflichtet – Innovationen für Wien") sowie auf Recherchen über Strategiepläne anderer europäischer Städte (beispielsweise Barcelona oder London), die etwa zeitgleich entstanden sind, auf. Daher basiert der neue Strategieplan auf einigen Grundannahmen seines Vorgänger-Planes, gleichzeitig gibt es allerdings auch einige inhaltliche Neuerungen und Akzentverschiebungen im Hinblick auf die zukünftige strategische Ausrichtung der Stadt Wien.

Der erste Strategieplan wurde vor allem auf Initiative des ÖVP-Planungs- und Zukunftsstadtrates der Stadt Wien und des SPÖ-Bürgermeisters entwickelt, während die Entstehung des zweiten Strategieplanes auf die Initiative des neuen SPÖ-Planungsstadtrates, ebenso des SPÖ-Bürgermeisters und der Gruppe Planung in der Magistratsdirektion der Stadt Wien zurückgeht. In den meisten offiziellen Interviews und Dokumenten wurde der integrative, ressortübergreifende und partizipative Charakter des ersten Planes hervorgehoben. Eine Öffnung des politisch-administrativen Systems gegenüber den Anregungen und Interessen unterschiedlicher staatlicher sowie nicht-staatlicher Akteure erfolgte in diesem Plan durch die Offerierung von Beteiligungsmöglichkeiten bei der Planerstellung auf verschiedenen Ebenen:

- für Magistratsabteilungen, Geschäftsgruppen und Büros der Stadträte, vor allem im Rahmen von thematisch ausgerichteten, geschäftsübergreifenden, verwaltungsinternen Arbeitsgruppen, in denen Ziele, Maßnahmen und Leitvorstellungen formuliert wurden;

- für Experten aus der Wissenschaft im Rahmen einer eigenen Beratergruppe, deren Mitglieder teilweise an den Sitzungen der Arbeitsgruppen teilnahmen und in die Konzeption sowie Durchführung der „Wiener Stadtdialoge“ involviert waren;

- für Institutionen und Akteure des korporatistischen Systems (Wirtschafts- und Arbeiterkammern) wiederum im Zusammenhang mit den Wiener Stadtdialogen sowie in informellen Konsultationen und Gesprächen mit Verwaltungsabteilungen (keine direkte Einbindung);

- für die Bevölkerung im Rahmen der „Wiener Stadtdialoge“, in denen ausgesuchte Themen des Strategieplanes in 10 Podiumsveranstaltungen („Stadtforen“) in jeweils unterschiedlichen Bezirken diskutiert wurden.

Die inhaltliche Steuerung lag in den Händen einer Lenkungsgruppe, die aus Vertreterinnen und Vertreter aller Geschäftsgruppen sowie einer Kontaktperson zum Bürgermeister bestand. Die Koordinationsarbeit leistete primär die Gruppe Planung der Magistratsdirektion und das Büro der Koordinationsstelle, das aus den externen Büros „KDZ—Managementberatung- und WeiterbildungsGesmbH“ und „Zukunfts.Station.Wien“ gebildet wurde. Während die Koordinationsverantwortlichen primär für die konkrete Textproduktion und für die Moderation von Sitzungen verantwortlich waren, wurden in der Lenkungsgruppe Entscheidungen über inhaltliche Fragen und Vorschläge gefällt, die aus den Arbeitsgruppen kamen. Die Lenkungsgruppe hatte primär eine Kommunikationsfunktion in die gesamte politische Ebene hinein.

Nach drei Jahren endete dieser Prozess der Erstellung des ersten Strategieplanes durch seine Annahme in einer Regierungsklausur Anfang der Jahres 2000. Der erste Strategieplan unterlag keinem Gemeinderatsbeschluss und entfaltete keine formalen Wirkungen für die Arbeit der Magistratsabteilungen. Allerdings wurde von offizieller Seite darauf hingewiesen, dass eine hohe Identifikation mit den Inhalten des Strategieplanes und damit eine indirekte Bindungswirkung für das Verwaltungshandeln durch die Art und Weise des Zustandekommens des Planes erzeugt wurden.

Auch nach der Fertigstellung dieses ersten Wiener Strategieplanes blieb die Lenkungsgruppe installiert, um den Umsetzungsprozess zu beobachten. Das KDZ wurde wiederum damit beauftragt, diesen Prozess zu evaluieren. Nachdem in einem internen Bericht festgestellt wurde, dass es in einigen Themenfeldern beträchtliche Entwicklungen gegeben hat, wurde der definitive Beschluss gefasst, den „alten“ Plan zu aktualisieren.

Im Gegensatz zum Entstehungsprozess des ersten Strategieplanes wurde für die Erarbeitung des neuen Planes vor allem auf magistratsinternes Fachwissen zurückgegriffen, das von der Gruppe Planung federführend zusammengeführt wurde; ressortübergreifende Arbeitsgruppen wurden diesmal ebenso wenig installiert wie für die Öffentlichkeit zugängliche Stadtdialoge. Der Entwurf wurde nach dem verwaltungsinternen Entstehungsprozess im Frühjahr 2004 den verschiedenen politischen Parteien vorgestellt, die in der Stadtentwicklungskommission des Gemeinderates vertreten waren. Politische Stellungsnahmen wurden über den Sommer eingearbeitet, sodass die Endfassung des Planes im Herbst noch einmal präsentiert werden konnte. Der Gemeinderatsbeschluss zum Strategieplan erfolgte schließlich im November 2004. Damit sollte signalisiert werden, dass der Strategieplan auf allen politischen Ebenen getragen wird, und dass er einen Rahmenplan für die zukünftige Entwicklung der Stadt darstellt, welcher sich in allen nach geordneten, ressortspezifischen Konzepten wieder finden muss. Der Strategieplan wird als Orientierungsrahmen für das Handeln aller Akteure des politisch-administrativen Systems betrachtet.

Die Begründungszusammenhänge für die Initiierung der beiden Strategiepläne sind einerseits akteursbezogen und unterliegen dem Ziel der Durchsetzung von Interessen bestimmter Personen und deren Klientel, sowie andererseits strukturell bedingt, da sich ökonomische, soziale, räumliche und politische Strukturen (s. etwa der Einfluss der EU auf Stadtpolitik) verändert haben. Neben der Nachahmung anderer großer europäischer Städte gibt es einige inhaltliche Begründungen für die Entwicklung des ersten Strategieplanes:

„Nach den Veränderungen der geopolitischen Lage am Beginn der 90er Jahr für die Stadt Wien waren ab Mitte der 90er Jahre neuerliche Änderungen der Rahmenbedingungen erkennbar, die deutliche Auswirkungen auf die Entwicklung der Städte, auch auf Wien, hatten. Es waren dies die sprunghafte Entwicklung neuer Technologien, insbesondere im Telekommunikationsbereich, geänderte Anforderungen

and die Verkehrs- und Standortpolitik durch die bevorstehende Erweiterung der Europäischen Union sowie die Veränderung der Lebensstile und Arbeitswelt“ (A. Klotz 2005: 85).

Die beiden Strategiepläne unterscheiden sich in ihren Akzentsetzungen , wie beispielsweise bezüglich der Themen Verwaltungsmodernisierung, Nachhaltigkeit, Diversitätspolitik, Europapolitik und regionale Entwicklung, die im „neuen“ Strategieplan wesentlich stärker verankert sind. Parallel zur Überarbeitung der strategischen Richtung wurde das politisch-administrative System modernisiert, letztlich auch, um die Legitimation des Systems (wieder) zu erhöhen. Im Text wird die Veränderung des Verständnisses von Staatlichkeit im Sinne des Übergangs vom „Government“ zum „Governance“ in diesem Aspekt der Verwaltungsmodernisierung immer wieder deutlich gemacht:

„Der Magistrat der Stadt Wien definiert sich als großer Dienstleistungskonzern, dessen Kundinnen und Kunden die Menschen dieser Stadt sind. …. Die Verwaltungsmodernisierung ist daher ein permanenter Optimierungsprozess zur Anpassung von Organisations-, Entscheidungs- und Verfahrensstrukturen. …. Die Rahmenbedingungen unserer Zeit erfordern zunehmend Partnerschaften zwischen öffentlicher Verwaltung, dem privatwirtschaftlichen Sektor und den Bürgerinnen und Bürgern…. Wie die Verwaltungsmodernisierung ist auch der Strategieplan kein ‚fertiges Programm’ im konventionellen Verständnis. Beide bedürfen einer permanenten Optimierung“ (Magistrat der Stadt

Im Strategieplan 2004 wurde die Verbindung zwischen Rahmen gebenden politischen Visionen bzw. Strategien und konkreten, umsetzungsbezogenen Projekten deutlich, welche die Funktion von „flagships“ oder „hot spots“ für die zukünftige Entwicklung der Stadt übernehmen. Den strategischen Projekten wird ein „Modellcharakter“ zugeschrieben; sie sollen als Innovationsmotoren dienen. Alle Strategiefelder werden sowohl einer Leitidee untergeordnet, als auch einem Handlungsprogramm mit strategischen Zielen, Umsetzungsüberlegungen und konkreten Projekten zugeordnet.

4.2 Die Wahl der Regelsysteme: Akteure und Institutionen

Wie die Rekonstruktion der Entstehung des Strategieplanes 2004 gezeigt hat kamen im Gegensatz zu der des Strategieplanes 2000 primär verwaltungsinterne Regelsysteme, deren institutionelle Logiken und Interaktionsstrukturen zur Anwendung. Während im ersten Strategieplan zumindest der Versuch gemacht wurde, Interessen und Wünsche einer „breiten Öffentlichkeit“ einzuarbeiten (etwa im Rahmen der öffentlichen Veranstaltungen der „Stadtdialoge“, die allerdings lediglich von einer „qualifizierten Fachöffentlichkeit“ besucht wurden), ist der Entstehungsprozess des zweiten Strategieplanes eindeutig verwaltungsdominiert. Eine Erweiterung des Akteursspektrums über Akteurinnen und Akteure aus dem administrativen System hinaus erfolgte lediglich durch die Berücksichtigung der Interessen der im Gemeinderat vertretenen politischen Parteien im Rahmen der Stadtentwicklungskommission. Damit wird offensichtlich, dass der Entstehungsprozess des Strategieplanes 2004 mehr im Stile des „government“ als im Sinne von „governance“ abgewickelt wurde. Obwohl informelle Gespräche zwischen den Institutionen und Akteuren des lokalen Staates und den Akteuren/Institutionen aus der Privatwirtschaft sowie dem korporatistischen Umfeld immer wieder stattgefunden haben, konzentrierte sich die Beteiligung auf Institutionen und Akteuren des Staates sowie auf die Regulation von Konflikten im Rahmen der Möglichkeiten der repräsentativen Demokratie. Geringe finanzielle Spielräume sowie die zeitgleiche Erarbeitung des Stadtentwicklungsplanes 2005 haben zur effizienten und Kosten sparenden Nutzung von bestehendem magistratsinternem Fachwissen geführt.

Dennoch sind im Entstehungskontext beider Strategiepläne Elemente des Governance zu finden:

- die Kooperation zwischen den einzelnen Dienststellen und Geschäftsgruppen des Magistrats, (aber auch betreffend der Zusammensetzung der Arbeitsgruppen des ersten Strategieplanes),
- die Regulation von Konflikten über die Moderation von Sitzungen (der Arbeitsgruppen und der Lenkungsgruppe),
- die Einbettung des Entwicklungsprozesses in die laufende Verwaltungsmodernisierung und
- die Querschnittsorientierung in der Bearbeitung des Textes. Dies wird einleitend noch einmal unterstrichen: „Der Strategieplan für Wien beruht auf einem integrativen Ansatz“ (MA18 2004: 19).

Im Text wird der Strategieplan 2004 selbst als ein „weiches Steuerungsinstrument“ dargestellt, das ganz im Sinne des Ideals vom kooperativen Staat den Rahmen für das zukünftige Handeln aller städtischen Akteurinnen und Akteure setzen soll. Dazu der Bürgermeister der Stadt Wien in seinem Vorwort:

„Der neue Strategieplan für Wien soll einen Rahmen für Dialog und Praxis aller gesellschaftlichen Gruppen bilden. Er ist eine Einladung zur kreativen Mitarbeit an der Entwicklung Wiens“ (MA18 2004: 7).

Von einem intervenierenden und regulierenden Staat wird im Text nicht gesprochen, vielmehr wird darauf verwiesen, dass die Umsetzung der einzelnen Ziele des Strategieplanes vor allem durch Kooperationen mit nicht-staatlichen Akteuren und Institutionen erfolgen sollte. Schließlich wurde im Text selbst und in Interviews die „Prozesshaftigkeit“ des Planes immer wieder betont. Es wurde davon gesprochen, dass der Strategieplan kein fertiges Produkt sei, sondern dass er offen für neue Entwicklungen und Anpassungen sein müsse:

„Wie die Verwaltungsmodernisierung ist auch der Strategieplan kein ‚fertiges Programm’ im konventionellen Verständnis. Beide bedürfen einer permanenten Optimierung. …. Dies erfordert auch, gemeinsam mit den Akteuren der Stadt, die permanente und nachhaltige Weiterentwicklung der Kommunikations- und Kooperationskultur“ (MA18 2004: 9).

Im Strategiefeld, in dem es um die Positionierung Wiens im europäischen Städtewettbewerb geht, findet sich die „Governance-Rhethorik“ wieder, da von der Bildung regionaler sowie grenzüberschreitender Kooperationen zwischen Städten und Verwaltungen gesprochen wird. Im Text wird häufiger die Bildung von Partnerschaften (etwa zwischen der EU, den Nationalstaaten, den Regionen und Städten, vgl. MA18 2004: 25), Netzwerken (etwa für die Durchsetzung von städtischen Interessen in Brüssel über EUROCITIES, vgl. MA18 2004: 26) und Kooperationen (etwa im Rahmen von CENTROPE) thematisiert. Die angeführten bestehenden Projekte sind durchwegs Netzwerke („Urban Technology Network“, oder etwa „Local Governments Network of Central and Eastern European Countries“) oder Kooperationen (z.B. EdGate oder ÖkobusinessPLan Wien-Györ, INTERREG-Sekretariate in Wien, oder das Stadt-Umland-Management Wien). Andere Elemente von Governance, wie etwa die Schaffung von Beteiligungsmöglichkeiten für Bürgerinnen und Bürger werden in diesem Kontext ausgeblendet. Dies wäre vor allem in den Punkten 1.1.8 „Nachhaltige Stadtentwicklung“ sowie 1.1.4 „Vielfalt und Miteinander von Kulturen und Lebensweisen“ zu erwarten gewesen. Generell wird der Eindruck vermittelt, dass die Adressaten dieses Strategiefeldes vor allem aus den Verwaltungen, der Politik und der Privatwirtschaft kommen.

Weitere Hinweise auf die Absicht der Etablierung von Governance-Strukturen gibt es auch im zweiten analysierten Strategiefeld:

- In der Leitidee wird erwähnt, dass für die Sicherung und Weiterentwicklung der hohen Lebens- und Umweltqualität sowohl regulierende Kräfte des Staates als auch selbstregulierende Kräfte der Gesellschaft zum Einsatz kommen müssen. Dies entspricht einer Governance-Diktion, in welcher es um die Einbindung nicht-staatlicher Akteure in die Erbringung öffentlicher Leistungen und um die Abgabe von ehemals staatlichen Aufgaben an nicht-staatliche Organisationen geht: „Dies stellt nicht nur neue Anforderungen an die öffentlichen Leistungen, sondern betrifft zunehmend auch den privaten Sektor. Diejenigen Strukturen innerhalb der Gesellschaft, die ein nachhaltiges Miteinander im Wirtschafts- und Lebensraum sicherstellen, müssen unterstützt und gestärkt werden“ (MA18 2004: 147).

- Die strategische Orientierung an der Verwaltungsmodernisierung wird zudem im Zusammenhang mit der Einrichtung der Diversitätspolitik hervorgehoben. Die Integrationsproblematik wird dabei als Managementproblem im Rahmen der Diversitätspolitik dargestellt, zu deren Unterstützung ganz in der Tradition des Government eine eigene Magistratsabteilung eingerichtet wurde.

- Passend dazu wird im Kapitel „Nachhaltige soziale Sicherheit“ Notwendigkeit zur Neustrukturierung der Gesundheits- und Sozialaufgaben der Stadt Wien betont. Die Zusammenführung von zwei Magistratsabteilungen ist ebenso im Sinne der Verwaltungsmodernisierung. Die strategische Regulierung dieses Bereiches soll allerdings in der Hand der Politik bleiben, während das operative Geschäft vermehrt von nicht-staatlichen „Kooperationspartnern“ durchgeführt werden soll.

- Schließlich ist auffällig, dass im Kapitel „Wohnbau, Wohnbauförderung und Wohnhaussanierung“, in welchem zentrale Aspekte der zukünftigen Stadtentwicklungspolitik angesprochen werden, bedeutsame strategische Ziele wie etwa die Förderung integrativen Wohnens oder die funktionale und soziale

Durchmischung in einer unkritischen Art aufgelistet werden.
In diesem Kontext fehlen wiederum konkrete Hinweise auf Beteiligungsmöglichkeiten für Bürgerinnen und Bürger im Rahmen des Neubaus und der Revitalisierung von Stadtgebieten sowie auf die zunehmende Bedeutung des Konfliktmanagements und des Stadtteilmanagements.

Auf der diskursiven Ebene wird also der Eindruck erweckt wird, dass in Wien der Übergang vom Government zum Governance bereits stattfindet bzw. angestrebt wird. Die im Text offensichtlich gemachte Reformstrategie bezieht sich jedoch vor allem auf die interne Modernisierung der Verwaltung; die Einbindung von Akteurinnen und Akteuren aus anderen politisch-administrativen Systemen, der Privatwirtschaft und des korporatistischen Systems wird in Ansätzen erwähnt.

5 FAZIT: GEPLANTE STRATEGIEN FÜR EINE „SANFTE MODERNISIERUNG“

Strategieorientierte Planungen werden nötig, um sich im zunehmenden Wettbewerb als Stadtregion zu positionieren (vgl. O. Frey 2005: 176). Sie sollen Orientierungsrahmen für das Handeln der Akteurinnen und Akteure aus dem politisch-administrativen System, aus der Privatwirtschaft und der Zivilgesellschaft sein. Sie verknüpfen daher zumeist Modernisierungsvisionen mit konkreten Handlungsprogrammen, versuchen durch die Einbindung einer Vielzahl von städtischen Akteuren und Institutionen die Legitimität der geplanten Strategien zu erhöhen, und geben Anhaltspunkte, wie mit gesellschaftlichen Widersprüchen umgegangen werden soll. Weiterhin sollen sie ein positives und engagiertes Klima im Hinblick auf die Bewältigung von gegenwärtigen und zukünftigen gesellschaftlichen Herausforderungen schaffen. Dabei entscheidet die Qualität des Entwicklungs-, Umsetzungs- und Adaptionsprozesses sowie die historisch gewachsenen politischen Strukturen und Kulturen über die Akzeptanz der Strategien, über den Grad der Identifikation mit diesen sowie über ihre Rolle als „Kommunikationsinstrument“.

Anhand der Analyse der Entstehung und der Diskursstrategien des Strategieplanes 2004 wurde deutlich gemacht, dass strategieorientierte Planung in Wien diesen Anforderungen gerecht werden will.

Die Entwicklung beider Strategiepläne ist vor allem im Zusammenhang mit dem Bestreben der Modernisierung der Verwaltung zu sehen. Sowohl die ersten Überlegungen zur Verwaltungsmodernisierung als auch die ersten Vorarbeiten zum Strategieplan 2000 erfolgten beinahe zeitgleich Ende der 1990er Jahre. Die für die Verwaltungsmodernisierung so kennzeichnende „Management-Rhetorik“ dominiert die inhaltliche Ausrichtung der Strategiefelder. Damit verbundene mögliche inhaltliche Widersprüche, z.B. zwischen der Ökonomisierung des Verwaltungshandelns und der Demokratieentwicklung, oder zwischen Nachhaltigkeit und Verwaltungsmodernisierung werden wiederum nicht erwähnt. Für die Wiener Strategiepläne gilt:

„Implizit oder explizit verknüpft mit ‚Verwaltungsmodernisierung’, dominiert in diesen Plänen und Programmen ein Leitbild oder Zielsystem, das mit Begriffen oder Topoi wie ‚innovation, Synergie, nachhaltige Entwicklung’ be- oder umschrieben werden kann. Es geht dabei weniger um unmittelbare ‚Problemlösungen’ oder neue sektorale Ziele, sondern um Erhaltung und weiteren Ausbau der urbanen und regionalen Gesamtqualitäten“ (G. Pirhofer 2005: 17).

Seine Funktion als Kommunikations- und Steuerungsinstrument erfüllt besonders der Strategieplan 2004 jedoch nur bedingt. Der neue Strategieplan ist eher ein Beispiel für eine lineare, geplante Strategieentwicklung, in welcher wenig Raum für offene Prozesse zur Verfügung gestellt wurde, die quasi „ungeplante“ Strategien erzeugen hätte können (und offene Prozesse sowie ungeplante Strategien sind wesentliche Bestandteile strategieorientierter Planung). Dies zeigt sich einerseits am Entstehungsprozess des Strategieplanes, der eher ein primär verwaltungsinterner, top-down-gesteuerter Prozess war. Das kollektive Lernen, das noch im ersten Strategieplan eine wichtige Rolle gespielt hat, blieb weitgehend ausgeblendet und dadurch wurde auch der im ersten Strategieplan angelegte Versuch der Etablierung konsistenter Handlungsmuster konterkariert. Andererseits zeigt sich das auch an der Art und Weise wie gesellschaftliche Widersprüche angesprochen werden. Falls diese überhaupt erwähnt werden, wird dann nicht thematisiert, wie mit diesen Widersprüchen und den unterschiedlichen Anforderungen, die heutzutage an die Planung herangetragen werden, umgegangen werden soll. Das Verschweigen von problematischen, möglicherweise konflikthaften Themen dient der Herstellung eines stadtweiten Konsenses, der die relevanten städtischen Akteuren sowie Institutionen in die zukünftige Entwicklung der Stadt einbinden soll. In einigen strategischen Feldern werden zwar Vorbehalte benannt (z.B. bezüglich der „Daseinsvorsorge“), allerdings werden diese

dann nicht ausgetragen. Diese Diskursstrategie entspricht ganz der Tradition der Konfliktvermeidung und der Kooptierung von widerständigen Akteurinnen und Akteuren, die bezeichnend für die Wiener politische Kultur sind.

Auch im Hinblick auf die Frage der Modernisierung des Staates (und damit hinsichtlich der Etablierung von Governance-Strukturen) zeigt sich in den Texten der Einfluss der tradierten Strukturen und Kulturen. Damit die strategischen Ziele erreicht werden können, setzt der lokale Staat weiterhin auf bewährte Regulierungen und auf die Signalwirkung der strategischen Projekte. Im Gegensatz zu anderen Formen der Urban Governance in Europa (z.B. in Großbritannien) bleibt die zentrale Steuerungsinstanz der lokale Staat, auch wenn es gleichzeitig Hinweise auf das Zulassen von Formen des Governance (z.B. die Bildung von Netzwerken und Kooperationen) gibt. Das Vertrauen in die Qualität der Prozesse und der Ergebnisse von Governance-Formen (etwa im Zusammenhang mit Partizipation) scheint seitens der Politik und Verwaltung gering zu sein. Berücksichtigt man weiterhin die Konzentration auf das Thema der Verwaltungsmodernisierung so ergibt sich für Wien ein governance-Typ, der eher nicht als kollaborativ und partizipativ bezeichnet werden kann (was auch als techno-korporatistische Governance-Form interpretiert wird; vgl. P. Healey 1997.)

Letztlich zeigt sich in den vorgeschlagenen Strategien der Modernisierung ein für Wien typisches Bild, nicht zuletzt auch in Bezug auf den Übergang vom „Government“ zum „Governance“. Die herausgearbeiteten Strategien sollen den Weg einer „sanften“ Modernisierung ermöglich. „Sanft“ verweist dabei auf die „konservativen“ bzw. bewahrenden Aspekte einer sozialdemokratischen Modernisierungsstrategie, die die Notwendigkeit einer Modernisierung anerkennt, allerdings auf den Erhalt von „urbanen“ Qualität und der Steuerungskraft eines am Gemeinwohl orientierten „Government“ baut. Diese konsequent durchgezogene „Sowohl-Als-Auch-Strategie“ birgt die Gefahr, dass im Endeffekt kein klares städtisches Profil erkennbar wird. Dies ist aber geradezu eine Voraussetzung, um im europäischen Städtewettbewerb, der Differenzierungen belohnt, reüssieren zu können. Letztendlich ist durch unklare strategische Positionierungen der Steuerungsgewinn des Planes in Frage zu stellen. Allerdings ist gerade die Verknüpfung zwischen Elementen des Government und des Governance, zwischen eher liberal ausgerichteten und gemeinwohlorientierten Strategien ein Weg, der im Vergleich zu Entwicklungsstrategien anderer europäischer Städte erfolgreich sein kann. Das für die Stadt Wien typische Profil besteht dann genau in der Verknüpfung unterschiedlicher Strategien und Regelsysteme.

6 LITERATUR

Altrock, Uwe (2004): Anzeichen für eine „Renaissance“ der strategischen Planung? In: Altrock et al. (2004): 221.238.
Altrock, Uwe/Güntner, Simon/Huning, Sandra/Deike, Peters (Hrsg.) (2004): Perspektiven der Planungstheorie. Berlin.
Antalovsky, Eugen/Dangschat, Jens S./Parkinson, Michael (eds.) (2005): European Metropolitan Governance. Cities in Europe – Europe in the Cities. Wien: Europaforum.
Bartik, Herbert/Wolffhardt, Alexander (2005): Cities and Services of General Interest – a Case Study in Deliberative European Governance. In: Antalovsky et al. (2005): 33-48.
Benz, Arthur (Hrsg.) (2004): Governance – Regieren in komplexen Regelsystemen. Wiesbaden: VS Verlag für Sozialwissenschaften.
Boyer, Robert/Hollingsworth, Rogers J. (Hrsg.) (1998): Contemporary Capitalism. The Embeddedness of Institutions. Cambridge: Cambridge University Press.
Breitfuss, Andrea/Dangschat, Jens. S./Frey, Oliver/Hamedinger, Alexander (2004): Städtestrategien gegen Armut und soziale Ausgrenzung. Wien: Arbeiterkammer Wien.
Campbell, Scott/Fainstein, Susan (eds.) (1996): Readings in Planning Theory. Malden/Oxford: Blackwell Publishers.
Fairclough, Norman (2001): Globaler Kapitalismus und kritisches Diskursbewußtsein. In: Keller et al. (2001): 335-352.
Faludi, Andreas/Salet, Willem (eds.) (2000): The Revival of Strategic Spatial Planning. Amsterdam.
Fassmann, Heinz: Eurometropolen – Gemeinsamkeiten und Unterschiede. In: Geographische Rundschau 10, 1999, 518-522.
Fassmann, Heinz/Stacher, I. (Hrsg.) (2002): Österreichischer Migrations- und Integrationsbericht. Klagenfurt: Drava Verlag.
Frey, Otto/Keller, Donald A./Klotz, Arnold/Koch, Michael/Selle, Klaus (2005): Zusammenfassung der Ergebnisse. In: Klotz/Frey (2005): 163-182.
Giffinger, Rudolf/Wimmer, Hannes (2002): Kleinräumige Segregation und Integration. In: Fassmann/Stacher (2002): 78-86.
Grunow, Dieter/Wollmann, Hellmut (Hrsg.) (1998): Lokale Verwaltungsreform in Aktion: Fortschritte und Fallstricke. Basel/Boston/Berlin: Birkhäuser.
Hamedinger, Alexander: Governance: „neue“ Technik des Regierens und die Herstellung von Sicherheit in Städten. In: dérive, Heft 24, 2006: 11-15.
Healey, Patsy (1997): Collaborative Planning. Shaping Places in Fragmented Societies. Houndmills/London: MacMillan Press Ltd.
Healey, Patsy/Khakee, Abdul/Motte, Alain/Needham, Barrie (eds.) (1997): Making Strategic Spatial Plans. London: UCL Press.
Heinelt, Hubert/Mayer, Margit (Hrsg.) (1997): Modernisierung der Kommunalpolitik. Opladen: Leske+Budrich.
Jäger, Siegfried (2001): Diskurs und Wissen. Theoretische und methodische Aspekte einer Kritischen Diskurs- und Dispositivanalyse. In: Keller et al. (2001): 81-112.

Jessop, Bob (2000): Governance Failure. In: Stoker (2000): 11-32.
Keller, Reiner (2004): Diskursforschung. Wiesbaden: VS Verlag für Sozialwissenschaften.
Keller, Reiner/ Hirseland, Andreas/Schneider, Werner/Viehöver, Willy (Hrsg.) (2001): Handbuch Sozialwissenschaftliche Diskursanalyse. Opladen: Leske+Budrich.
Klotz, Arnold (2005): Der Strategieplan für Wien – ein Beispiel für die Rückkehr der großen Pläne? In: Klotz/Frey (2005): 82-92.
Klotz, Arnold/Frey, Otto (Hrsg.) (2005): Verständigungsversuche zum Wandel der Stadtplanung. Wien/New York: Springer.
MA 18 (Magistrat der Stadt Wien) (2000): Strategieplan für Wien. Qualität verpflichtet – Innovationen für Wien. Wien.
MA 18 (Magistrat der Stadt Wien) (2004): Strategieplanwien im erweiterten Europa. Wien.
Magistrat der Stadt Wien (2005): Stadtentwicklungsplan 2005. Wien.
March, James G./Olsen, Johan P. (1989): Rediscovering Institutions. New York: The Free Press.
Mayerhofer, Peter (2002): Zweiter Bericht zur internationalen Wettbewerbsfähigkeit Wiens. Wien: WIFO.
Pierre, Jon (ed.) (2001): Debating Governance. Oxford: Oxford University Press.
Pirhofer, Gottfried (2005): Strategische Planung in europäischen Städten. In: Klotz/Frey (2005): 10-36.
Stoker, Gerry (ed.) (2000): The New Politics of British Local Governance. Houndmills/London: Macmillan Press Ltd.
Schwab-Trapp, Michael (2001): Diskurs als soziologisches Konzept. Bausteine für eine soziologisch orientierte Diskursanalyse. In: Keller et al. (2001): 261-284.
Voigt, Rüdiger (Hrsg.) (2005): Der kooperative Staat. Baden-Baden: Nomos.

🏆 *reviewed paper*

Öffentlich-private Kooperation bei der Stadtentwicklung: Aktuelle Erkenntnisse aus den Metropolregionen Rhein-Main und Rhein-Neckar

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1 EINLEITUNG

Seit Mitte der 1980er Jahre befindet sich die öffentliche Verwaltung in einem tief greifenden Transformationsprozess, der zum einen auf ordnungspolitischen Zielen („Mehr Markt" – „weniger Staat"), zum anderen auf der Krise der öffentlichen Finanzen beruht. Vor diesem Hintergrund sollen öffentlich-private Kooperationen dazu beitragen, Aufgaben der öffentlichen Hand gemeinsam mit privaten Partnern durchzuführen und privates Kapital einzubinden – so auch bei der städtischen Verkehrsinfrastruktur. Daher ist aus geographischer Sicht von besonderem Interesse, welche…

- Chancen und Risiken aus öffentlich-privaten Kooperationen im Bereich Stadtentwicklung resultieren,
- Erfahrungen bereits vorliegen und welche Erwartungen von kommunalen Planungsämtern zu öffentlich-privaten Kooperationen geäußert werden,
- verkehrsgeographischen Rahmenbedingungen zu beachten sind (Raum- und Verkehrsstruktur, soziale, planerische, verkehrliche und räumliche Auswirkungen der Kooperation) und
- wo bei öffentlich-privaten Kooperationen Optimierungspotenziale liegen bzw. welche Kooperationsmodelle sich für Projekte der Stadt- und Verkehrsplanung anbieten.

Eine funktionsfähige städtische Verkehrsinfrastruktur ist das Rückgrad städtischer Siedlungen. Die Planung, Errichtung und Instandhaltung entsprechender Angebote ist auch in Zukunft eine wichtige Aufgabe der räumlichen Planung. Im Kontext von öffentlich-privaten Kooperationen ist folglich von besonderem Interesse, wie die benannten Fragestellungen aus planerischer Sicht beurteilt werden. Dazu wurde eine Fallstudie unter Kommunen in der Metropolregion Rhein-Main und Rhein-Neckar durchgeführt.

2 RAHMENBEDINGUNGEN ÖFFENTLICH-PRIVATER KOOPERATION

Umfangreiche Baulandreserven im Bestand fördern die Innenentwicklung der Städte und ermöglichen eine intensivere Nutzung bereits vorhandener Infrastruktur. So liegt in Deutschland der Gesamtanteil der Baulandreserven im Bestand für Wohnbauland bei etwa 25% und für Gewerbeflächen bei etwa 47% (BUNDESMINISTERIUM FÜR VERKEHR, BAU UND WOHNUNGSWESEN 2004, S. 39). Damit einhergehend ist ein zunehmendes Interesse an zentralen, städtischen Lagen als Wohn- und Arbeitsort bei gleichzeitiger Stärkung suburbaner, multifunktionaler Zentren zu beobachten. Gleichzeitig besteht in deutschen Kommunen ein hoher kommunaler Investitionsbedarf, der sich für den Zeitraum von 2000 bis 2009 auf etwa 174 Mrd. EUR summiert, wovon etwa 28% für den Verkehr verwendet werden müssten (BUNDESMINISTERIUM FÜR WIRTSCHAFT UND ARBEIT 2003, S. 8). Dies stellt die Kommunen zunehmend vor neue Herausforderungen, da aufgrund der angespannten kommunalen Finanzsituation die nötigen Investitionen nicht mehr allein auf klassischem Wege geleistet werden können. Neben finanziellen Aspekten stehen öffentlich-private Kooperationen aber auch im Zusammenhang mit einem strukturellen Wandel der öffentlichen Verwaltung. Unter dem Begriff New Public Management erfolgt eine Umstrukturierung der Verwaltung, die auf einer Aufgabenkritik aufbauend Instrumente des Wettbewerbs sowie die Ausgliederung von Verwaltungsaufgaben durch Privatisierung und Kooperation mit der Privatwirtschaft zum Zuge kommen lässt (JANNING 1996, S. 42).

Öffentlich-private Kooperationen können bei verschiedenen Aufgaben und in unterschiedlichen Formen erfolgen. Das Spektrum umfasst Planungs-, Beratungs-, Betriebs und Finanzierungsleistungen. Die Rolle der Privatwirtschaft reicht vom Auftragnehmer, der die öffentliche Verwaltung unterstützt, bis hin zum gleichberechtigten Partner, der maßgeblich die weitere Stadtentwicklung prägt. Damit einhergehend wandelt sich das Verhältnis von Privatwirtschaft und öffentlicher Verwaltung im Sinne einer „kooperativen Stadtentwicklung". Es kommen verschiedene Kooperationsmodelle zum Einsatz, wobei neben gesellschaftspolitischen Aspekten (Daseinsvorsorge), planerischen Erfordernissen (Raum- Verkehrsstruktur),

rechtlichen Grundlagen (Legitimation) auch wirtschaftswissenschaftliche Erkenntnisse (Natürliches Monopol, Prinzipal-Agenten-Ansatz etc.) zu berücksichtigen sind.

Die Kooperation reicht von der Finanzierung und Errichtung von Infrastrukturen (z.B. Entlastungsstraßen, Tunnelbauwerken, Brücken etc.) über den Wettbewerb im ÖPNV (Ausschreibung von Bus- und Bahnverkehren), Verfahrensprivatisierungen (z.B. durch die Einbindung von privaten Planungsbüros bei der kommunalen Bauleitplanung), Städtebaulichen Verträgen (z.B. zur Finanzierung von kommunalen Planungs- und Folgekosten im Kontext der Innenentwicklung bzw. Nachverdichtung), Entwicklungsgesellschaften (z.B. zur öffentlich-privaten Reaktivierung von Brachflächen) bis hin zu Modellen der Quartierserneuerung (z.B. zur Aufwertung von Einzelhandelstandorten oder zur Adressbildung von Unternehmen etc.).

Abbildung 1: Privatisierungsformen (Eigene Darstellung)

3 METROPOLREGIONEN RHEIN-MAIN UND RHEIN-NECKAR

Zur Erkundung der Erfahrungen und Erwartungen in der planerischen Praxis wurde eine Fallstudie durchgeführt. Das Untersuchungsgebiet der Fallstudie setzt sich aus den beiden benachbarten Regionen Rhein-Main und Rhein-Neckar zusammen. Es erstreckt sich über eine Fläche von etwa 13.600 qkm und gehört mit rund 6,5 Millionen Einwohnern und einem jährlichen Bruttoinlandsprodukt von ca. 210 Milliarden EUR zu den wichtigsten Wirtschafts- und Ballungsräume Deutschlands (Eigene Berechnung nach: STATISTISCHE ÄMTER DES BUNDES UND DER LÄNDER 2004 (CD-ROM)). So leben in Deutschland lediglich in der Metropolregion Rhein-Ruhr (inklusive Düsseldorf, Köln und Bonn) mit etwa 11,1 Millionen Einwohnern mehr Menschen. Außerdem weist die Untersuchungsregion mit einem Bruttoinlandsprodukt von 32.500 EUR pro Kopf eine der höchsten Produktivitätsquoten in Deutschland auf. Ein höheres Bruttoinlandsprodukt wird lediglich in Stuttgart (35.000 EUR pro Kopf) und München (45.000 EUR pro Kopf) erwirtschaftet. Der bundesdeutsche Durchschnitt liegt hingegen bei rund 25.000 EUR pro Kopf (Eigene Berechnung nach: RAUMORDNUNGSVERBAND RHEIN-NECKAR 2005, S. 4 und STATISTISCHE ÄMTER DES BUNDES UND DER LÄNDER 2004 (CD-ROM)).

Die Untersuchungsregion zählt zum Kreis der europäischen Metropolregionen. Nach dem Beschluss der deutschen Ministerkonferenz für Raumordnung zum Raumordnungspolitischen Handlungsrahmen 1995 wird den Metropolregionen die Aufgabe zugeschrieben, als Motoren der gesellschaftlichen, wirtschaftlichen, sozialen und kulturellen Entwicklung die Leistungs- und Konkurrenzfähigkeit Deutschlands und Europas zu erhalten. Im Jahr 1997 hat die Ministerkonferenz für Raumordnung einen zusätzlichen Beschluss zur „Bedeutung der großen Metropolregionen Deutschlands für die Raumentwicklung in Deutschland und Europa“ gefasst. Darin wird es als erforderlich betrachtet, das Metropolenkonzept in das Europäische Raumentwicklungskonzept (EUREK) einzubringen (ADAM/GÖDDECKE-STELLMANN 2005, S. 515). Darüber hinaus hat der Europäische Wirtschafts- und Sozialausschuss darauf hingewiesen, dass die Metropolregionen letztlich primär zur Umsetzung der Lissabon-Strategie beitragen, die das Ziel verfolgt, die Europäische Union bis zum Jahr 2010 zum wettbewerbsfähigsten und dynamischsten wissensbasierten Wirtschaftsraum der Welt zu entwickeln (SONDERTAGUNG DES EUROPÄISCHEN RATES AM 23./24. MÄRZ 2000 IN LISSABON, SCHLUSSFOLGERUNGEN DES VORSITZES).

Abbildung 2: Untersuchungsregion (Eigene Darstellung 2006 nach BAYERISCHES LANDESVERMESSUNGSAMT 1998 (CD-ROM))

In der Region existieren mit den Städtepaaren Frankfurt-Offenbach im Norden, Mainz-Wiesbaden im Westen und Mannheim-Ludwigshafen-Heidelberg im Süden drei (groß-)städtische, eng verflochtene Zentren mit internationalem Bekanntheitsgrad. In der geographischen Mitte dieser tripolaren, polyzentrischen Siedlungsstruktur fungiert Darmstadt als regionaler Knotenpunkt.

Der größte Teil der Untersuchungsregion befindet sich innerhalb des näheren Einzugsgebietes der städtischen Zentren. Im suburbanen Bereich der Großstädte und innerhalb der Siedlungsbänder konnte sich seit der zweiten Hälfte des 20. Jahrhunderts eine Vielzahl von Mittelzentren herausbilden. Diese Mittelzentren stellen heute nicht nur beliebte Standorte für Wohnen dar. Vielmehr hat sich hier auch eine beachtliche Anzahl von Arbeitsplätzen angesiedelt, so dass der Suburbanisierung des Wohnens längst die des Arbeitens gefolgt ist.

In den Randbereichen und Mittelgebirgsräumen der Untersuchungsregion sind städtische Ballungen nur vereinzelt vorzufinden. Größere Siedlungsaktivitäten finden hier im Wesentlichen entlang der überregionalen Verkehrskorridore statt (vgl. Abbildung 3). Auf Grundlage des Realisierungsprogramms Rhein-Neckar-Takt 2010 sollen neben kleineren Netzergänzungen im Umland der beiden Zentren Mannheim/Ludwigshafen und Heidelberg die beiden S-Bahnsysteme bis zum Jahr 2010 miteinander verknüpft werden (ZWECKVERBAND VERKEHRSVERBUND RHEIN-NECKAR 2004). Somit ergeben sich in der Untersuchungsregion im städtischen und regionalen Kontext planerische Aufgaben mit deutlichem Fokus auf den Verkehr.

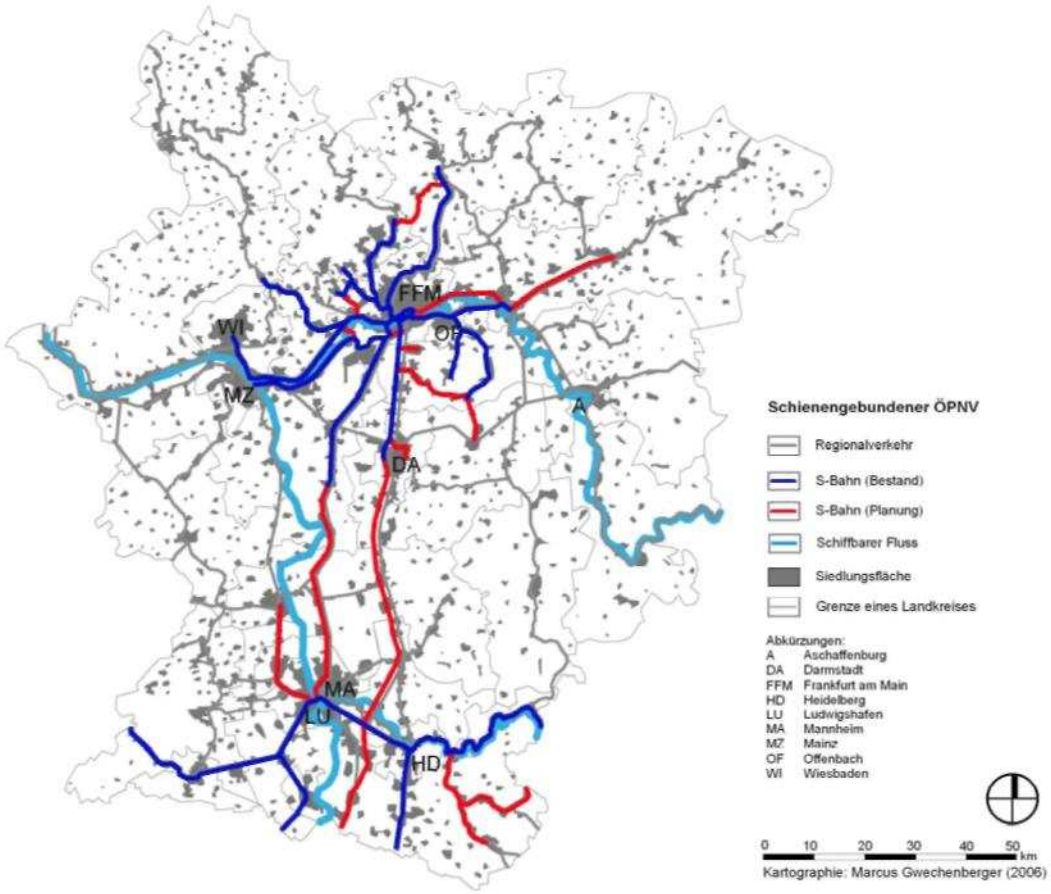

Abbildung 3: Bipolares Schiennetz (Eigene Darstellung nach REGIERUNGSPRÄSIDIUM DARMSTADT 2000, S. 40/ RHEIN-MAIN-VERKEHRSVERBUND GMBH (2003)/ ZWECKVERBAND VERKEHRSVERBUND RHEIN-NECKAR 2004, S. 2/ BAYERISCHES LANDESVERMESSUNGSAMT 1998 (CD-ROM)

4 AKTUELLE ERKENNTNISSE ZU ÖFFENTLICH-PRIVATEN KOOPERATIONEN

Public Private Partnerships sind im Zusammenhang mit der Stadt- und Regionalentwicklung zu gängigen Begriffen geworden. Dem steht das weitgehende Fehlen von Statistiken gegenüber, die Auskunft darüber geben, ob und inwieweit die häufige Verwendung des Begriffs eine reale Basis hat (GERSTLBERGER 2001, S. 70). Zwar liegt eine Untersuchung des DEUTSCHEN INSTITUT FÜR URBANISTIK vor. Dabei wurden aber ausschließlich projektbezogene und nicht langfristige Kooperationen zwischen öffentlichen und privaten Akteuren erfasst. Die Erhebung wurde nicht bei Planungsämtern, sondern bei Kämmereien bzw. Finanzdezernaten durchgeführt. Damit einhergehend ging diese Untersuchung hauptsächlich auf Finanzierungsfragen ein (DEUTSCHES INSTITUT FÜR URBANISTIK 2005, S. 13ff).

Die vorliegende Untersuchung erfolgte hingegen mit der Zielsetzung, die Erfahrungen und Erwartungen an öffentlich-private Kooperationen aus planerischer Sicht zu erfassen und zu analysieren. Der thematische Fokus liegt bei Aufgaben des kommunalen Verkehrs, zu dem unterschiedliche Kooperationsformen zwischen öffentlichen und privaten Akteuren erfasst wurden. Zur Ermittlung der spezifischen Vor- und Nachteile wurde in der Untersuchungsregion unter den Kommunen mit mehr als 10.000 Einwohnern eine schriftliche Befragung durchgeführt (Rücklaufquote: 50%). Dabei werden die kommunalen Erfahrungen und Potenziale bei Planungs- und Beratungsleistungen bzw. Finanzierungs- und Betriebsleistungen erörtert. Außerdem erfolgt eine Analyse zum Ablauf und zu räumlichen Auswirkungen von Kooperationen.

Es wurde ermittelt, dass die Entlastung des öffentlichen Haushaltes und der öffentlichen Verwaltung die wichtigsten Kooperationsziele sind. Im Hinblick auf bereits gesammelte Erfahrungen konnten unterschiedliche Ergebnisse erzielt werden. So verfügen die Kommunen bei Planungs- und Beratungsleistungen über durchweg hohe Erfahrungswerte. Planungs- und Beratungsleistungen werden aber überwiegend zeitweise bzw. projektbezogen von privaten Dienstleistungsunternehmen übernommen. Langfristige, projektübergreifende Kooperationen nehmen hingegen nur eine untergeordnete Bedeutung ein und sind in nennenswertem Umfang lediglich bei Planungsleistungen anzutreffen. Dieses hohe

Kooperationsniveau wird aus Sicht der Befragten auch künftig gehalten, wobei zeitweise bzw. projektbezogene Kooperationen überwiegen. Eine Ausnahme stellt hier lediglich das Aufgabenfeld „Stadtmarketing“ dar, wo aufgrund der mittel- bis langfristigen Projektstrukturen dauerhaften Kooperationen ebenfalls eine bedeutende Rolle zukommt. Darüber hinaus wird erwartet, dass kommunale Bauleitpläne sowie Verkehrsplanungen für einzelne Quartiere künftig in geringerem Umfang durch private Büros und vermehrt durch die Kommunen selbst bearbeitet werden.

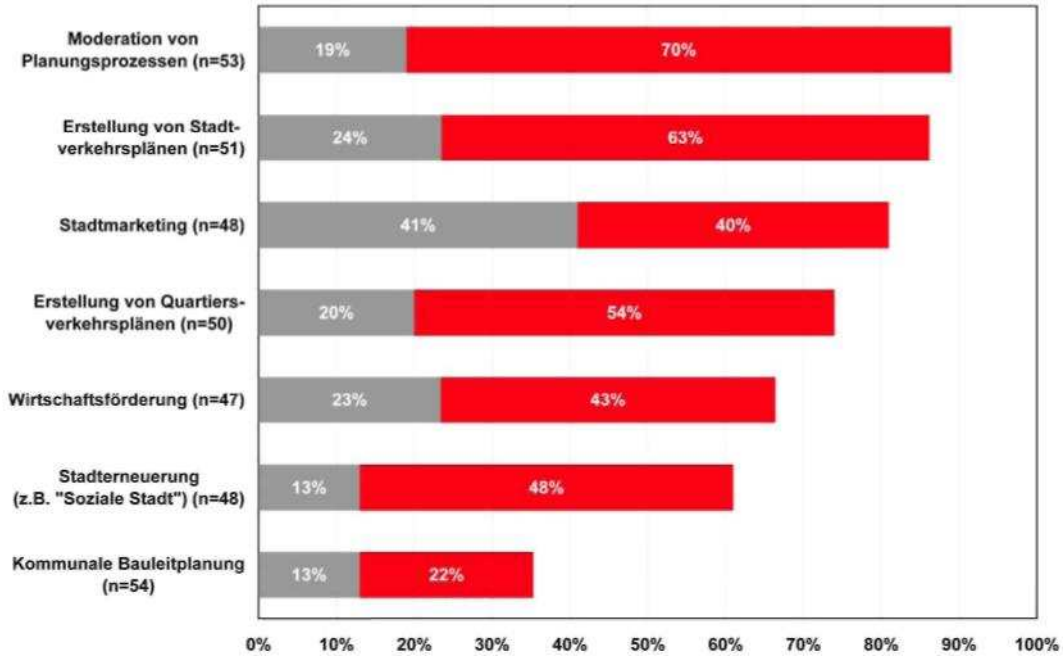

Abbildung 4: Kooperationspotenziale bei Planungs- und Beratungsleistungen.

Grau: Dauerhafte Kooperation; Rot: Zeitweise Kooperation (Eigene Erhebung) Bei Finanzierungs- und Betriebsleistungen gehen die Befragten von einem deutlichen Anstieg an Kooperationen aus, was auch auf das gegenwärtig niedrige Niveau zurückzuführen ist. Dabei wird deutlich, dass bei diesen Aufgaben aufgrund der spezifischen Strukturen langfristige bzw. dauerhafte Kooperationen überwiegen. Eine Ausnahme stellen hier lediglich die Erstellung und Finanzierung öffentlicher Gebäude sowie von Straßen dar. Hier sollen projektbezogene bzw. zeitweise Kooperationen einen Austausch der privaten Partner und damit dauerhaften Wettbewerb sichern.

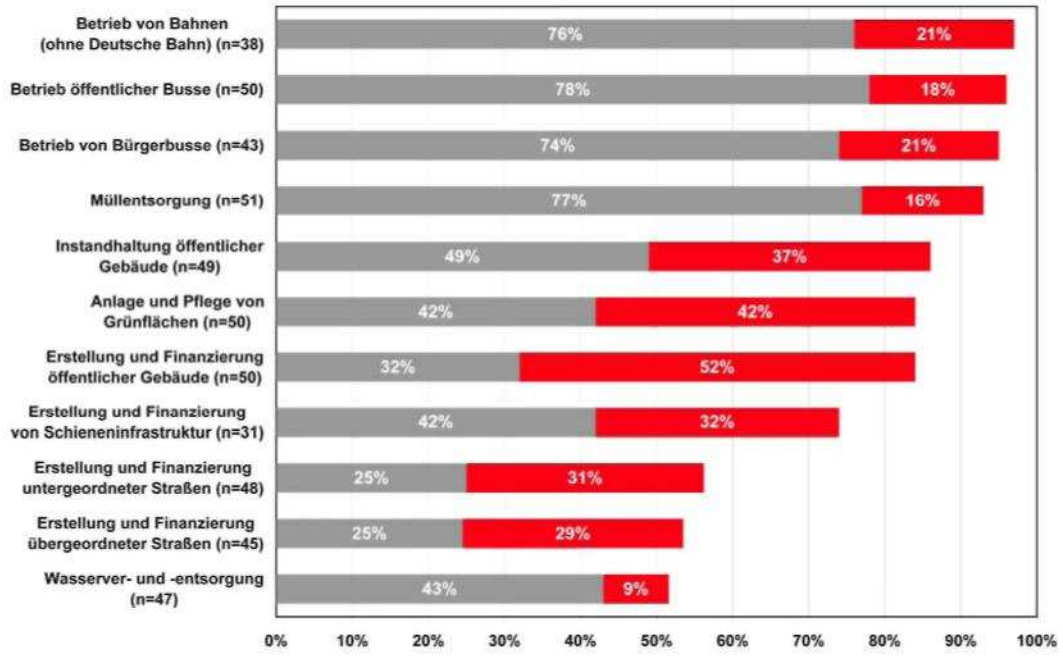

Abbildung 5: Kooperationspotenziale bei Finanzierungs- und Betriebsleistungen. Grau: Dauerhafte Kooperation; Rot: Zeitweise Kooperation (Eigene Erhebung)

Während die Kooperation mit privaten Partnern insgesamt an Bedeutung gewinnt, liegen zum heutigen Zeitpunkt vor allem in den größeren Kommunen mit mehr als 50.000 Einwohnern umfangreiche Erfahrungen vor. Das bedeutet, dass die höchsten Zuwächse in den kleineren Kommunen stattfinden. Außerdem wird von den Befragten darauf hingewiesen, dass Kooperationen überwiegend mit regionalen Partnern erfolgen sollten. So sei die bessere Erreichbarkeit (direkter Kontaktaustausch bei auftretenden Problemen) und die Stärkung der lokalen Wirtschaft bedeutend (Schaffung bzw. Sicherung von Arbeitsplätzen etc.). Von regionalen Unternehmen werden außerdem bessere Ortskenntnisse und eine größere Identifikation mit dem jeweiligen Projekt erwartet. Außerdem beeinflussen Kenntnisse der lokalen Verwaltungs- und Entscheidungsstrukturen maßgeblich den Projektverlauf und das Projektergebnis.

Es wird zugleich deutlich, dass wirtschaftliche Interessen künftig in stärkerem Umfang Planungen prägen und im Rahmen der Projektzusammenarbeit ein deutlicher Anstieg des Kontroll- und Steuerungsaufwands zu erwarten ist. Während durchschnittlich 78% der Befragten mit entsprechenden Tendenzen rechnen, nimmt in den Großstädten mit mehr als 100.000 Einwohnern jeder Befragte enstprechende Auswirkungen wahr. Daher liegen Optimierungspotenziale vor allem beim Projektmanagement (Zeitmanagement, Projektsteuerung), d.h. in einer Verbesserung projektinterner Arbeitsabläufe.

In räumlicher Hinsicht konnten ebenfalls Ergebnisse ermittelt werden, die für die planerische Praxis von hoher Bedeutung sind. So geht etwa jeder Dritte davon aus, dass künftig die Innenstadt bzw. der Ortskern von privaten Verkehrsunternehmen bedient wird, während dies für periphere Ortsteile und Vororte nur aus Sicht von jedem zehnten Befragten erfolgt. Bei einer Unterscheidung nach Lage der Kommune werden ebenfalls unterschiedliche Einschätzungen ersichtlich. So geht jeder zweite Befragte aus den peripher gelegenen Kommunen davon aus, dass sich privat erbrachte ÖPNV-Leistungen in den peripher gelegenen Kommunen lediglich auf die Innenstadt bzw. den Ortskern beschränken. Diese Strukturen gehen aber nicht ausschließlich auf die Rolle der privaten Akteure zurück. Sie sind vielmehr im Kontext kommunalpolitischer Weichenstellungen und den Inhalten der lokalen Nahverkehrspläne zu sehen, d.h. den Zielen und Rahmenvorgaben für das betriebliche Leistungsangebot, den Mindestanforderungen an Betriebszeiten, der Bedienungshäufigkeiten sowie Anschlussbeziehungen etc..

Daraus lassen sich für den ÖPNV zwei zentral-periphere Muster ableiten:

- Ein zentral-peripherer Gegensatz innerhalb der Kommunen, da zentral gelegene Quartiere tendenziell besser bedient werden.
- Ein zentral-peripherer Gegensatz innerhalb des Untersuchungsraums, da die Intensität des flächendeckenden Angebots zur Peripherie hin abnimmt.

Für die Straßeninfrastruktur konnte ebenfalls ein zentral-peripherer Gegensatz ermittelt werden. Zum einen sind periphere Lagen innerhalb der Kommunen insgesamt wenig attraktiv für private Investitionen. Das wird anhand der geringen Erfahrungen und Erwartungen deutlich, die für periphere Brachflächen und Erneuerungsmaßnahmen bei Straßen am Stadtrand ermittelt wurden. Gleichzeitig erfolgen aus Sicht der Befragten Investitionen in die vorhandene Infrastruktur und damit die Stärkung bereits existierender Stadt- und Verkehrsstrukturen primär in den zentral gelegenen Landkreisen der Untersuchungsregion. Somit wird deutlich, dass die Sicherung einer hohen Konnektivität (Verkehrsangebot), Abstimmungs- und Koordinierungsleistungen, die Definition von Mindeststandards und der Ausgleich räumlicher Disparitäten auch künftig wichtige planerische Aufgaben sind.

Aufgrund dieser Ergebnisse bietet es sich an, die in Kapitel 2 benannten Kooperationsmodelle anhand der Entlastungspotenziale für öffentliche Haushalte, der Projekteffizienz und des Maßes an öffentlicher Einflussnahme zu klassifizieren. Darüber hinaus besteht die Möglichkeit, eine Unterscheidung in räumlicher und zeitlicher Hinsicht vorzunehmen (Einzelprojekt, Stadtteil, Gesamtstadt bzw. kurz-, mittel-, langfristig). Bei kurzfristigen Projekten wird eine Laufzeit von bis zu fünf Jahren, bei mittelfristigen Projekten eine Laufzeit von fünf bis zehn Jahren und bei langfristigen Projekten eine Laufzeit von mehr als zehn Jahren angesetzt. Die Einstufung der einzelnen Modelle richtet sich nach dem Umfang, in dem private Partner Aufgaben übernehmen und in komplexe Prozesse eingebunden werden. Ob sich die verschiedenen Kooperationsmodelle eher für Einzelprojekte, Stadtteile oder für die Gesamtstadt eignen, wird danach beurteilt, welche strukturellen Rahmenbedingungen mit den jeweiligen Modellen verbunden sind.

Demnach werden Modelle, bei denen ein hohes Maß an öffentlicher Einflussnahme und eine kurzfristige Reaktion auf veränderte Rahmenbedingungen möglich sind, auf der Ebene der Gesamtstadt angesiedelt. Umgekehrt eignen sich diejenigen Kooperationsformen, die mit langen Vertragslaufzeiten verbunden und bei denen nur unter größerem Aufwand Änderungen möglich sind, für Einzelprojekte. Dazwischen sind Kooperationsmodelle für einzelne Stadtteile angeordnet, die in direktem räumlichem Bezug zum Plangebiet stehen.

Bei dieser Analyse wird deutlich, dass Kooperationsmodelle mit mittel- bis langfristigem Bezug überwiegen, während kurzfristige Kooperationen lediglich bei der Verfahrensprivatisierung und beim „Place making“ sinnvoll sind. Aufgrund des räumlichen und zeitlichen Bezugs der unterschiedlichen Kooperationsmodelle ist außerdem eine sorgfältige Vorbereitung und Begleitung der Projekte notwendig.

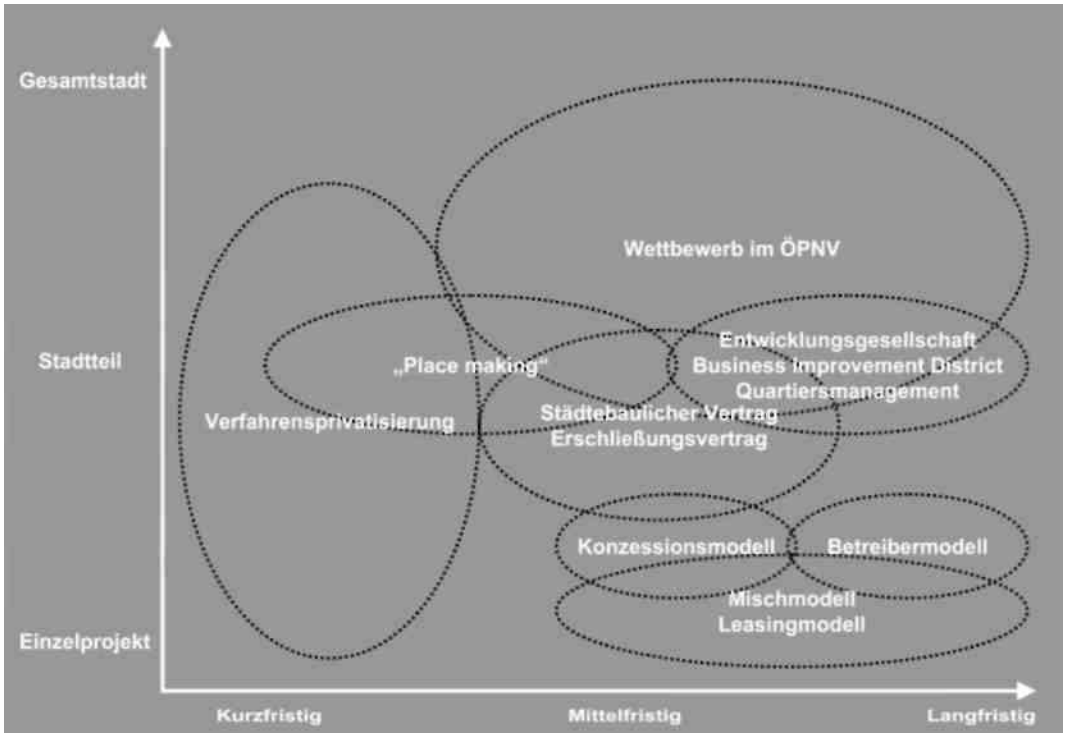

Abbildung 6: Räumliche und zeitliche Dimension der Kooperation (Eigene Darstellung)

5 HANDLUNGSEMPFEHLUNGEN

Die Ergebnisse der Fallstudie verdeutlichen, dass öffentlich-private Kooperationen künftig bei der Stadt- und Verkehrsplanung eine bedeutende Rolle einnehmen. Damit sind vielfältige Chancen, aber auch Risiken verbunden – was auf die unterschiedlichen Formen der Zusammenarbeit zurückzuführen ist.

Um die gewonnenen Erkenntnisse für die kommunale Planungspraxis aufzubereiten, erfolgt nun durch den Verfasser die Formulierung von Handlungsempfehlungen. Dazu werden Vorschläge für die Vorbereitung und Begleitung öffentlich-privater Kooperationen bei der Stadtentwicklung vorgestellt, deren Inhalte auf der Fallstudie aufbauen:

- Die Grundlagen für erfolgreiche öffentlich-private Kooperationen sollen zunächst durch eine Stadtkonzeption gelegt werden, bei der eine Definition der Handlungsfelder, inhaltlichen und personellen Schnittstellen sowie planerischen Rahmenbedingungen und Zielsetzungen erfolgt. Zur Legitimierung und Effizienzförderung ist diese Stadtkonzeption im Dialog mit verschiedenen öffentlichen und privaten Akteuren zu erarbeiten und durch politischen Beschluss zu bestätigen.
- Es wäre wünschenswert, wenn für die Regionen Rhein-Main und Rhein-Neckar jeweils grenzüberschreitende, regionale Kompetenzzentren aufgebaut würden. Diese müssten im engen Austausch mit den Kommunen stehen und insbesondere bei der Vorbereitung und Evaluierung von Kooperationen Unterstützung anbieten.
- Auf operativer Ebene müssten öffentlich-private Kooperationen durch ein eigenständiges ÖPNV-und Straßen-Infrastrukturmanagement begleitet werden. Das ÖPNV-Infrastrukturmanagement ist

Eigentümer des Netzes und Aufgabenträger für den Betrieb. Seine Aufgaben liegen darin, die Planungen mit den Ergebnissen der Stadtkonzeption abzustimmen und Ausschreibungen zur Vergabe von Verkehrsleistungen durchzuführen. Somit steuert es den Wettbewerb im ÖPNV. Zur Qualitätskontrolle sind begleitende Evaluierungen notwendig, auf deren Ergebnissen aufbauend die Vergütung der privaten Verkehrsunternehmen erfolgt.

- • Das Straßen-Infrastrukturmanagement setzt sich aus Vertretern unterschiedlicher Ämter zusammen und ist Träger der Straßenbaulast für alle in der Gemarkung der Kommune gelegenen Straßen (mit Ausnahme der Bundesfernstraßen). Damit werden die verkehrsrelevanten Aufgaben an einer Stelle gebündelt. Zur Sicherung der Leistungs- und Funktionsfähigkeit des städtischen Straßennetzes übernimmt es Koordinierungs- und Kontrollaufgaben.

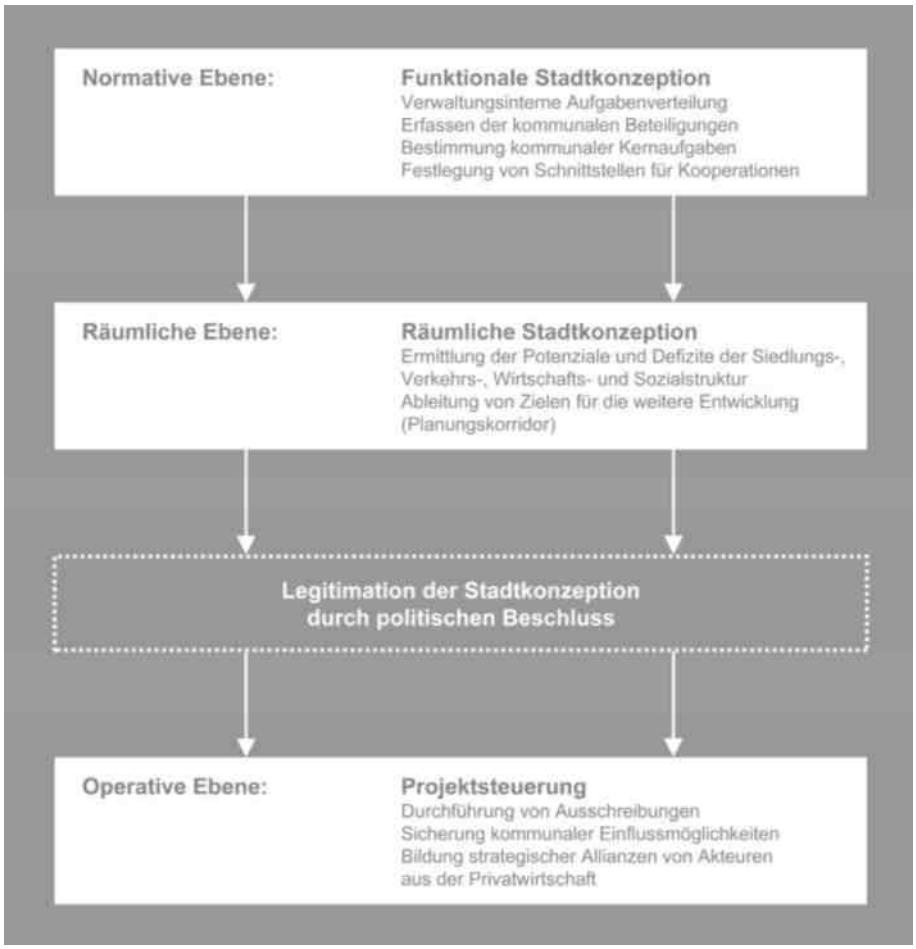

Abbildung 7: Stadtkonzeption (Eigene Darstellung)

6 AUSBLICK

Stadtentwicklung wird künftig vermehrt im Bestand erfolgen. Damit einhergehend gewinnt die kooperative Stadtentwicklung zunehmend an Bedeutung – mit folgenden Tendenzen:

- Je zentraler die Lage des Projekts, umso wahrscheinlicher erfolgt eine private Finanzierung.
- Je größer die Kommune, desto wichtiger ist die Definition von Schnittstellen.
- Je komplexer die Projektstruktur, umso bedeutender ist die Vorbereitung der Kooperation (Festlegung von Mindeststandards, Abstimmung mit kommunalen Leitbildern) sowie die zeitliche und räumliche Gliederung des Projekts (Reaktions- und Austauschmöglichkeiten).
- Kooperationen erfordern laufende Bestandserhebungen und -bewertungen sowie ein Verkehrsmanagement, um so verkehrsräumliche Disparitäten zu minimieren.
- Der Austausch zwischen öffentlichen und privaten Akteuren erfordert ein stabiles kommunikatives Umfeld sowie regionale Kompetenzzentren.

Damit einhergehend besteht der Bedarf, regionale und lokale Akteursnetzwerke aus Wirtschaft und Bürgerschaft möglichst frühzeitig zu identifizieren und zu analysieren. Darüber hinaus werden die behandelten Fragestellungen für die Stadt- und Verkehrsplanung eine zunehmend wichtige Bedeutung einnehmen – denn die Einbindung von privaten Akteuren wird bei der städtischen Entwicklung aufgrund der benannten Rahmenbedingungen künftig eine zentrale Rolle spielen. Dies ist als Chance für die künftige Raumentwicklung anzusehen, sofern die potenziellen Risiken frühzeitig berücksichtigt und minimiert werden. Die Herausforderungen und Chancen der Zukunft liegen folglich in einer „kooperativen Stadtentwicklung“, die in planungstheoretischer Hinsicht auf der Nachhaltigen Stadtentwicklung aufbaut, jedoch neben der ökologischen bzw. sozialen die ökonomische Dimension der Nachhaltigkeit stärker in den Fokus rückt.

7 LITERATUR

ADAM, B./ GÖDDECKE-STELLMANN, J. (2002): Metropolregionen – Konzepte, Definitionen und Herausforderungen. In: Informationen zur Raumentwicklung, Heft 7/2005. S. 417-430. BUNDESMINISTERIUM FÜR WIRTSCHAFT UND ARBEIT (2003): Public Private Partnership. Ein Leitfaden für öffentliche Verwaltung und Unternehmer. Berlin. BUNDESMINISTERIUM FÜR VERKEHR, BAU UND WOHNUNGSWESEN (2004)(Hrsg.): Dokumentation zum II. Nationalen Städtebaukongress am 10./11. Mai 2004 in Berlin. Berlin. DEUTSCHES INSTITUT FÜR URBANISTIK (2005): Public Private Partnership Projekte. Eine aktuelle Bestandsaufnahme in Bund, Ländern und Kommunen. Berlin. GEBHARDT, H. (1998): Europa im Globalisierungsprozess von Wirtschaft und Gesellschaft. In: GEBHARDT, H./ HEINRITZ, G./ WIESSNER, R. (Hrsg.): Europa im Globalisierungsprozess von Wirtschaft und Gesellschaft. Stuttgart. S. 23-27. GERSTLBERGER, W. (2001): Public-Private-Partnership – neue Betätigungsfelder für öffentliche Unternehmen? Das Beispiel öffentlich-privater Projektgesellschaften in der Stadtregion Kassel. In: EDDELING, T./ JANN, W./ REICHARD, C. (Hrsg.): Öffentliche Unternehmen. Entstaatlichung und Privatisierung? Opladen. S. 203-222. GWECHENBERGER, M. (2006): Öffentlich-private Kooperation bei der Stadtentwicklung. Analysen und Perspektiven zur kommunalen Verkehrsplanung in den Metropolregionen Rhein-Main und Rhein-Neckar. Heidelberg. (PDF-Download: http://dispatch.opac.d-nb.de/DB=4.1/SET=1/TTL=1/REL?PPN=132426706) JANNING, H. (1996): Voraussetzungen eines kommunalen PPP-Managements – Ansätze aus der Sicht eines Kreises. In: WALCHA, H./ HERMANNS K. (Hrsg.): Partnerschaftliche Stadtentwicklung: Privatisierung kommunaler Aufgaben und Leistungen. Köln. S. 40-58. KOHL, J. (1985): Staatsausgaben in Westeuropa: Analysen zur langfristigen Entwicklung der öffentlichen Finanzen. Frankfurt. MIKUS, W. (1966): Verkehrszellen. Beiträge zur verkehrsräumlichen Gliederung am Beispiel des Güterverkehrs der Großindustrie ausgewählter EG-Länder. Paderborn. RAUMORDNUNGSVERBAND RHEIN-NECKAR (2005): Das Rhein-Neckar-Dreieck auf dem Weg zur Europäischen Metropolregion. Symposium am 22. Februar 2005 in Mannheim. Dokumentation. Mannheim. STATISTISCHE ÄMTER DES BUNDES UND DER LÄNDER (2004): Statistik regional. Daten für die Kreise und kreisfreien Städte Deutschlands. Ausgabe 2003. Wiesbaden. (CD-ROM) ZWECKVERBAND VERKEHRSVERBUND RHEIN-NECKAR (2004): Realisierungsprogramm Rhein-Neckar-Takt 2010 –Liniennetz, Ausbaukosten, Realisierungsschritte. Mannheim.

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Augmented Reality und immersive Szenarien in der Stadtplanung

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1 EINLEITUNG

Die Stadtplanung ist von einem grundlegenden Wandel der Rahmenbedingungen in Gesellschaft und Staat betroffen. Hinzu kommen neue fachliche und rechtliche Anforderungen, woraus für die Stadtplanung in der Konsequenz inhaltliche, methodische sowie verfahrensbezogene Erweiterungen ihres Aufgabenspektrums resultieren [Steinebach / Müller (2006)]. Klassische Entscheidungs- und Bewertungsmethoden können vor dem Hintergrund des angeführten Wandels nur bedingt umfassende, transparente und für alle beteiligten Akteure nachvollziehbare Entscheidungsgrundlagen erzeugen. Da in der Stadtplanung naturgemäß klassische Laborversuche nicht möglich sind, gilt es alternative Wege zu finden, um qualifizierte Grundlagen als Basis für Entscheidungssituationen zu generieren. Wesentliche Probleme hierbei stellen die quantitative und qualitative Darstellung von Daten und Informationen, sowie die davon abhängige individuelle und akteursabhängige Interpretation dieser dar. Ein diesbezüglich weiterführender Ansatz ist im Einsatz der Augmented Reality-Technik sowie von immersiven Szenarien aus dem Bereich der grafischen Daten- und Informationsvisualisierung zu sehen.

2 BEWERTUNGS- UND ENTSCHEIDUNGSMETHODEN IN DER STADTPLANUNG

2.1 Klassische Entscheidungs- und Bewertungsmethoden in der Stadtplanung

In der Stadtplanung sind sehr unterschiedliche raumrelevante Aspekte in Einklang zu bringen. In der Ausgangslage konkurrieren naturgemäß unterschiedliche Raumnutzungsansprüche. Um auftretende Konfliktsituationen zu lösen, existiert im Sinne einer vorausschauenden, umfassenden und koordinierenden Planung systemimmanent dabei nicht ein einziger Lösungsweg, sondern eine Vielzahl an potenziellen Lösungsvarianten. Um den weiter zu verfolgenden Ansatz zu ermitteln, ist eine Reihe von Abwägungen und Entscheidungen notwendig.

Nach FÜRST und SCHOLLES liegen im Bereich der Stadtplanung, die immer im Zusammenhang mit politischen Rahmenbedingungen und normativen Zielsetzungen gesehen werden muss, überwiegend semi- oder unstrukturierte Problemlagen vor [Fürst / Scholles (2001), S.28]. Unter dieser Prämisse sind hinsichtlich stadtplanerischer Entscheidungen, die sich auf zukünftige Entwicklungen und Zustände des Raumes beziehen, der Einsatz von differenzierten quantitativen und qualitativen Entscheidungs- und Bewertungsmethoden zur Bildung einer Entscheidungsgrundlage unabdingbar. Entsprechend den allgemeinen Anforderungen an Methoden sind Nachvollziehbarkeit und Transparenz von Entscheidungsgrundlagen von maßgeblicher Bedeutung [Scholles (2005), S. 96]. Auf der einen Seite sind Bewertungs- und Entscheidungsmethoden zur Legitimation von Entscheidungen gefordert, um einer potenziellen Willkür entgegenzuwirken und Rechtssicherheit zu erzeugen, auf der anderen Seite dienen sie der Entscheidungsfindung nur unter gewissen Unsicherheitsprämissen, denn im Gegensatz zur Naturwissenschaft können getroffene Aussagen nur bedingt mathematisch abschließend abgebildet oder belegt werden. In der Konsequenz kommt der Darstellung und der Vermittlung sowohl der Ergebnisse im Sinne der Entscheidungsgrundlage, als auch der Methoden selbst ein hohes Maß an Bedeutung zu [Wietzel (2007)]. SCHOLLES hat einen Vergleich hinsichtlich der Eignung der in der räumlichen Planung üblichen Entscheidungs- und Bewertungsmethoden anhand der formalen Anforderungen an zweckdienliche Bewertungsmethoden durchgeführt. Besonders auffällig ist die Eignungseinstufung bezüglich der Transparenz und der Nachvollziehbarkeit der Methoden. Bis auf die Raumempfindlichkeitsuntersuchung wird dieses Kriterium bei allen quantitativen Methoden als fraglich bis sehr fraglich eingestuft. In der Konsequenz bedeutet dies, dass sich Entscheidungsträger auf Entscheidungsgrundlagen stützen müssen, deren Herleitung sowie die daraus abgeleiteten Aussagen sie nur bedingt beziehungsweise gar nicht nachvollziehen können. Abgesehen von der Komplexität der Methoden stellt dies unter anderem die Eignung von Textwerken, Tabellen und Kartenwerken als klassische Darstellungsformen zur Vermittlung der Ergebnisse und Erläuterung der Methoden in Frage [Wietzel (2007)].

2.2 Sich wandelende Rahmenbedingungen und abgeleitete Konsequenzen für Entscheidungsgrundlagen

Seit einigen Jahren wandeln sich die Rahmenbedingungen der räumlichen Planung erheblich. Ursachen hierfür liegen in staats- und gesellschaftsbezogenen Veränderungsprozessen sowie in neuen fachlichen und rechtlichen Anforderungen. Nach STEINEBACH und MÜLLER ergeben sich die zunehmende Komplexität sowie die damit verbundenen Herausforderungen im Wesentlichen aus drei Aspekten:

- Die Anzahl der zu beteiligenden Akteure mit unterschiedlichen Interessen, Bedürfnissen und Werthaltungen nimmt zu.
- Die Anzahl der zu berücksichtigenden Variablen sowie Verflechtungen und Wechselbeziehungen zwischen den unterschiedlichen Aspekten der räumlichen Entwicklung wächst.
- Die gesellschaftliche Zukunftsorientierung fordert eine Vielzahl alternativer Entwicklungsoptionen und deren flexible Offenhaltung [Steinebach / Müller (2006), S. 1].
- Des Weiteren sind hinsichtlich der sich im Wandel befindlichen Rahmenbedingungen für Bewertungs- und Entscheidungsmethoden noch folgende Aspekte anzuführen:
- Die zur Verfügung stehenden Datengrundlagen nehmen ständig zu.
- Die Entwicklungen im Bereich der Informations- und Kommunikationstechniken bieten neue Möglichkeiten und Formen der Entscheidungsunterstützung.

Aufgrund der angeführten Sachverhalte steht die räumliche Planung unter dem Druck, Planungs- und Entscheidungsabläufe zu beschleunigen. Diese sind in Deutschland noch zu langwierig und häufig zu starr, um den angeführten dynamischen Anforderungen Rechnung zu tragen. [Steinebach / Müller (2006), S.2]. Damit steigen die Anforderungen an den Entscheidungsprozess. Von besonderer Bedeutung ist hierbei die Entwicklung neuer Darstellungsformen und –methoden, die geeignet sind, komplexe Sachverhalte, Wechselwirkungen und Informationen als Entscheidungsgrundlagen für alle beteiligten Akteure nachvollziehbar abzubilden [Scholles (2005), S.102].

2.3 Exkurs zur menschlichen Wahrnehmung

Die Welt, die den Menschen umgibt, ist in ihrer räumlichen Ausprägung eine dreidimensionale Welt. Der Mensch ist es gewohnt, in dieser dreidimensionalen Welt auf natürlicher Art zu agieren und adaptiert das räumliche Charakteristikum bis auf die Ebene der Informationsverarbeitung. Die Dreidimensionalität erleichtert dem Menschen durch die Tiefenwahrnehmung die Orientierung im Raum sowie die Identifikation von Objekten und Standorten [Gibson (1973), S. 244 und S.333f]. Dabei beschränkt sich die Wahrnehmung der Dreidimensionalität nicht ausschließlich auf den visuellen Sinneskanal. Mittels der Akustik und des Vestibularapparates können ebenfalls Orientierung und Lokalisierung im Raum stattfinden [Rodel (1981), S.5]. BERKLEY beschreibt bereist im Jahr 1709 in „New Theory of Vision“ die Kausalität von der visuell wahrnehmbaren Umwelt und der Verifizierung durch Berührung der Objekte. Die Haptik ist somit eine unterstützende Komponente im Wahrnehmungsprozess sowie rückgekoppelt im Verhalten des Menschen im Raum [Berkley (1709)]. Basis für die Wahrnehmung von Objekten und den umgebenden Raum ist zunächst die Tatsache der Existenz von Empfindungen. Diese Empfindungen bilden das Rohmaterial des menschlichen Erlebens, die Wahrnehmung wird als Verarbeitungsergebnis der Empfindungen angesehen. Somit ist die Wahrnehmung ein Prozess der Aufnahme, Weiterleitung, Selektion, Interpretation und Assoziation von sensorischen Informationen. Diese setzt sich entsprechend den Sinnen des Menschen aus visuellen, akustischen, kinästhetischen, olfaktorischen, gustatorischen und vestibulären Sinneswahrnehmungen zusammen [Gibson (1973), S.32]. Ist der Mensch dabei in der Lage, das Wahrgenommene mit bekannten mentalen Mustern oder Modellen zu assoziieren, so vermag er am ehesten intuitiv darauf zu reagieren [Hering (2006)].

Das anteilige Zusammenwirken der einzelnen Sinneseindrücke und deren Relevanz beim Wahrnehmungsprozess lassen sich bislang nicht abschließend verifizieren. WEIDENBACH greift auf Untersuchungsergebnisse des US Departments of Agriculture and Forest Service Northern Region zurück, die die täglichen sinnesbezogenen Anteile der Wahrnehmung des Menschen wie folgt darlegen: Sehsinn 87%, Hörsinn 7%, Geruchssinn 3,5%, Tastsinn 1,5%, Geschmackssinn 1,0% [Weidenbach (1999), S.42]. Dieses unterstreicht die einhellige wissenschaftliche Auffassung, dass die visuellen Eindrücke maßgeblich

die räumliche und damit die Umgebungswahrnehmung bestimmen [Ritter (1987), S.7]. In der Konsequenz bedingt eine Reduktion der Dreidimensionalität der Umgebung durch reine verbale Beschreibungen oder zweidimensionale Abbildung immer eine vorgeschaltete Informationsreduzierung. Dieser Informationsverlust erfordert beim Rezipienten eine mentale Rekonstruktion, da das intuitive, durch eine dreidimensionale Welt geprägte Verhalten entsprechend angepasst werden muss. Die mentale Rekonstruktion erfolgt wiederum durch Muster- oder Modellassoziationen. Einhergehende Abweichungen zwischen Originalobjekt und mental Rekonstruiertem, beispielsweise in räumlicher Dimension oder Lage, sind hierbei systemimmanent und unvermeidbar [Wietzel (2007)].

Im Hinblick auf die Stadtplanung ist an dieser Stelle anzumerken, dass die mentale Rekonstruktion eines Betrachtungsgegenstandes, in Abhängigkeit vom Informationsreduzierungsgrad, zu individuell differierenden Ergebnissen führt. Je höher die Ansprüche an die mentale Rekonstruktion sind, desto größer sind die individuellen Abweichungen des rekonstruierten Ergebnisses. Dies ist in Bezug auf planerische Entscheidungssituationen, an denen eine steigende Zahl von Akteuren mit unterschiedlicher Wissensbasis, unterschiedlichen Bildungsniveaus und Betroffenheitsgraden beteiligt sind sowie hinsichtlich der qualitativen Anforderungen an Entscheidungsgrundlagen von maßgeblicher Bedeutung [Wietzel (2007)].

2.4 Darstellungsformen und –möglichkeiten in der Stadtplanung

In der Stadtplanung kommen unterschiedliche Darstellungsformen und –möglichkeiten zum Einsatz, um Informationen zu vermitteln, Sachverhalte zu verdeutlichen und Entscheidungsgrundlagen zu liefern. Traditionell fallen hierunter sowohl Textwerke inklusive tabellarischer Abbildungen, als auch Planwerke oder physische Modelle. Darüber hinaus werden seit einigen Jahren auch digitale Darstellungsformen und –möglichkeiten eingesetzt. Die Eignung der Darstellungsform richtet sich jeweils nach dem zu vermittelnden Inhalt und den Adressaten. In der Regel werden in der Stadtplanung zur Informationsvermittlung Kombinationen unterschiedlicher Darstellungsarten gewählt. Die Darstellungsform trägt maßgeblich zur Nachvollziehbarkeit von Planungen inklusive der Ergebnisse von Bewertungsmethoden bei, entsprechend hoch ist der Stellenwert im Entscheidungsprozess.

Bezugnehmend auf die räumliche Wahrnehmung des Menschen muss festgehalten werden, dass nicht jeder stadtplanerische Planungsanlass einer dreidimensionalen Darstellung zur Informationsvermittlung bedarf. Allerdings gewinnt beim Übergang von der flächen- zu einer baustrukturell bezogenen Betrachtung die dritte Dimension jedoch an Bedeutung im Hinblick auf die planerische Gestaltung der bebauten und unbebauten Umwelt. Beispielsweise betrifft dies raumplanerische Fragestellungen bezüglich der Bebauungsdichte von Gebieten, Gestaltqualität von Quartieren und Stadtteilen, Verschattungen von Gebäuden und Freiflächen oder Lärmreduzierung durch Baustrukturen. Da in der Stadtplanung, analog zur Architektur, bauliche Maßnahmen nicht im Maßstab 1:1 entworfen werden (können), bedient man sich der Abstraktion und Verkleinerung in verschiedenen Maßstabsstufen und Visualisierungstechniken. Damit einhergehend ist zwangsweise eine Informationsreduzierung verbunden. Im Umkehrschluss bedeutet dies, dass vom Adressaten eine mentale Rekonstruktion des Dargestellten vorgenommen werden muss. Analoge Karten oder Pläne weisen darüber hinaus die Nachteile auf, dass sie keine echte dreidimensionale Darstellung ermöglichen und jeweils auf fixierte Ausschnitte und Ansichten festgelegt sind. Somit ist eine flexible Änderung des Blickwinkels oder des Maßstabs nicht möglich. Die Ansprüche an die mentale Rekonstruktion sind entsprechend hoch. Das physische Modell, als echte dreidimensionale Darstellungsform, lässt zwar individuell wähl-, und veränderbare Betrachtungswinkel zu, sowohl der Maßstab als auch der damit verbundene Detaillierungsgrad sind allerdings auch hier jeweils festgelegt. Durch den Einsatz von digitalen Darstellungsformen und –möglichkeiten können einige der vorstehenden Nachteile behoben werden. Beispielsweise ermöglichen virtuelle 3D Stadtmodelle flexibel und frei wählbar die Visualisierung von perspektivischen Stadtbildern oder animierter Filmsequenzen. Auch die freie Begehbarkeit (walk through) dieser Modelle ist mittlerweile in Echtzeit möglich. Darüber hinaus nehmen virtuelle 3D-Stadtmodelle zunehmend eine größere Rolle im Bereich der Simulationen ein. Zum einen dienen sie als Berechnungsgrundlage, beispielsweise bei Lärmrasterkartierungen, zum anderen können auch gestalterische Neuplanungen und Maßnahmen sowie deren Auswirkungen simuliert werden. Abgesehen von diversen Schnittstellenkompatibilitätsproblemen sowie Defiziten in der benutzerspezifischen Anpassung der Konstruktions-, Modellierungs- und Visualisierungssoftware sind die Anzeigemedien als größtes Manko der digitalen Darstellungsformen und –möglichkeiten anzusehen. Aufgrund der Größe des Displays eines

Arbeitsplatzrechners können entweder durch Hineinzoomen nur Teilausschnitte betrachtet oder durch Hinauszoomen, einhergehend mit einem erheblich Informationsverlust, ein Gesamtüberblick gewährleistet werden. Multiscreenlösungen mit vier oder mehr horizontal und vertikal angeordneten Displays sind für Arbeitsplätze zurzeit noch recht kostenintensiv. Durch die jeweils angrenzenden Monitorrahmen entstehen bei diesen Lösungen Gittereffekte, die die Wahrnehmung des Gesamtbildes beeinflussen. Die Einsatzmöglichkeit von Projektoren wird durch die native Bildauflösung begrenzt. Weiterhin ist anzuführen, dass ohne den Einsatz spezieller Hard- und Software eine räumliche Darstellung faktisch zweidimensional bleibt. Dies bedingt grundsätzlich ein Informationsverlust sowie ein gewisses Maß an kognitiven Fähigkeiten zur mentalen Rekonstruktion. Das Gehirn des Betrachters versucht hierbei eine zweidimensionale Darstellung durch Mustererkennung, wie z.B. Größenverhältnisse, Überlagerungen und Bewegungen in dreidimensionale Eindrücke zu transformieren.

Die Schlussfolgerung hieraus ist, dass es zur Nutzung aller Vorteile eines dreidimensionalen Raumes, wie beispielsweise Orientierung, Identifikation, intuitives Agieren und volle Informationsbreite, unabdingbar ist, eine virtuelle oder augmentierte Planungsumgebung zu schaffen, die ohne mentale Rekonstruktion dreidimensional erfassbar ist [Wietzel (2007)].

3 AUGMENTED REALITY-TECHNIK

Um den Zusammenhang von Realität und Virtualität abzubilden, entwarf MILGRAM 1994 ein Modell, in dem er ein Kontinuum von realer bis virtueller Umgebung definierte. Zwischen den beiden Realitätsebenen existiert nach seinem Modell die Mixed Reality mit verschiedenen Intensitätsgraden der Überlagerung des Realen und des Virtuellen [Milgram / Kishino (1994), S.1321ff].

Abbildung 1: Kontinuum der Realität und Virtualität angepasst an [Milgram / Kishino (1994)].

Unter Augmented Virtuality (erweiterte Virtualität) ist die Überlagerung des virtuellen Raumes mit einzelnen Elementen der realen Umgebung zu verstehen. Virtuelle Nachrichtenstudios mit eingeblendeten realen Nachrichtensprechern sind hierfür bekannte Beispiele aus dem Bereich des Fernsehens.

Augmented Reality (erweiterte Realität) hingegen bedeutet, dass die reale Umgebung durch virtuelle Elemente überlagert bzw. ergänzt (augmentiert) wird. Dies setzt einen digitalen Datenschatten der Umgebung sowie der zu überlagernden realen Gegenstände voraus. Dieser Datenschatten beinhaltet Angaben zur Geometrie und die Verortung des Objekts in einem Koordinatensystem. Darüber hinaus können Informationen, beispielsweise über Material, Alter und Aussehen in einem modifizierten Zustand, in diesem Datenschatten abgelegt sein. Durch die Augmented Reality-Technik werden einzelne Objekte der Virtual Reality als Zusatzelemente in die reale Umgebung eingeblendet, sodass eine scheinbare, visuelle wahrnehmbare Koexistenz zwischen realen und virtuellen Objekten entsteht [Azuma (1997)]. Zurzeit existieren bereits zahlreiche Augmented Reality-Anwendungen, vornehmlich aus den Bereichen: Medizin, Militär, Luft- und Raumfahrt, Forschung und Entwicklung, Produktion, Fertigung und Montage sowie Service und Wartung [Abawai (2005)]. Die meisten Anwendungen befinden sich allerdings noch im Prototypenstadium.

Nach AZUMA wird ein Augmented Reality-System mit drei Haupteigenschaften charakterisiert:

- Kombination realer und virtueller Objekte in realer Umgebung,
- Interaktivität und Echtzeitcharakter sowie
- Registrierung realer und virtueller Objekte sowie Ausrichtung zueinander [Azuma (1997)].

Durch den Einsatz der Augmented Reality ist nicht nur die klassische Ergänzung durch virtuelle Objekte möglich, sondern durch geschickte Überlagerungen können reale Objekte aus der wahrgenommenen Umgebung scheinbar extrahiert werden. So ist es beispielsweise möglich, ein real existierendes Gebäude zu überdecken und somit aus der wahrgenommenen Szene scheinbar zu entfernen. Abbildung 2 stellt den Grundaufbau eines Augmented Reality-Systems mit den einzelnen Systemkomponenten dar.

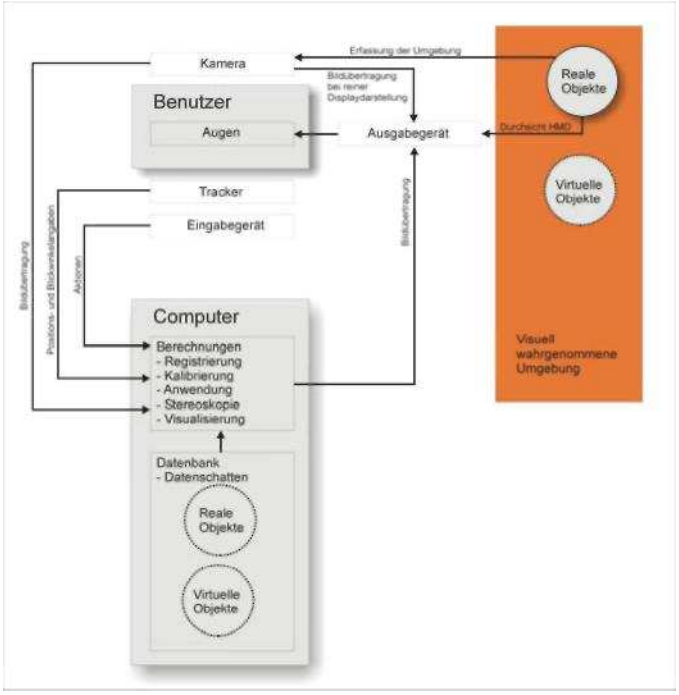

Abbildung 2: Grundaufbau eines Augmented Realty – Systems [Wietzel (2007)]

4 IMMERSIVE SZENARIEN

Die Möglichkeiten, mittels EDV-gestützter Systeme Daten und Informationen zu visualisieren, haben in den letzten Jahren durch Forschung und Entwicklung im Hard- und Softwaresektor stark zugenommen. In Abbildung 3 sind die Meilensteine der Entwicklung in einem aufeinander aufbauenden System aufgezeigt, angefangen von der darstellenden Geometrie bis hin zur Augmented Reality, die gegenwärtig die höchste Entwicklungsstufe darstellt [Hagen (2006)].

Die Frage, die sich stellt ist: welche Entwicklung wird der Augmented Reality, als Ausprägung der Mixed Reality, folgen? Aufbauend auf Augmented und Virtual Reality-Systemen stellt der nächste Schritt die Entwicklung von Systemen dar, die es dem Benutzer ermöglichen, eine virtuelle Umgebung oder eine mit virtuellen Objekten angereicherte Umgebung so wahrzunehmen und zu erfahren, dass er nicht mehr zwischen realer und virtueller beziehungsweise augmentierter Umgebung unterscheiden kann [Hagen (2006)]. Dieser Vorgang des Eintauchens wird als Immersion bezeichnet. Mittels intuitiver Interaktion mit virtuellen Objekten werden diese scheinbar zu Bestandteilen der Realität. Der Benutzer agiert frei und intuitiv in einer von ihm oder durch Vorgaben gestalteten virtuellen oder augmentierten Umgebung. Ist dieser Zustand erreicht, befindet sich der Benutzer in einem immersiven Szenario [Wietzel (2007)].

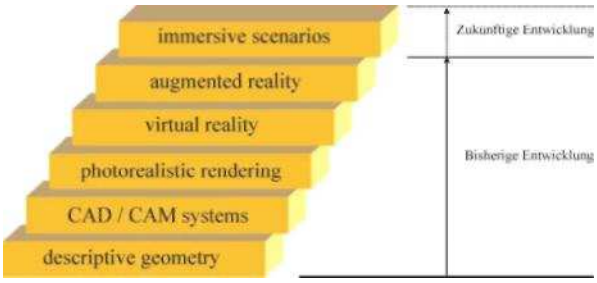

Abbildung 3: Meilensteine in der Entwicklung der grafischen Daten- und Informationsdarstellung nach HAGEN [http://www.uni-kl.de/Stadtplanung/sites/download/Vortrag%20Prof.%20Dr.%20Hans%20Hagen_IuK.pdf und Wietzel (2007)]

Die Immersion setzt sich sowohl aus motorischen und sensorischen Anteilen der Darstellung, als auch der Interaktionsmöglichkeit des Benutzers in einer virtuellen Umgebung zusammen. Erzeugt wird die Immersion durch das vollständige Ausblenden oder teilweise Überblenden der realen Umgebung, die Anzahl der angesprochenen Sinnesreizungen und die Lebendigkeit der virtuellen Umgebung [Heers (2005), S.49]. Maßgeblich bestimmt wird der Grad der Immersion durch die mediale Qualität des immersionserzeugenden Systems (immersive Umgebung), das von außen auf einen Benutzer einwirkt [Wietzel (2007)]. Die

gesteuerte Stimulation aller Sinnesmodalitäten ist das maximale Leistungsziel eines immersionserzeugenden Systems. Je nach Anwendungsintention kann es ausreichen, nur bestimmte Aspekte, beispielsweise die visuelle oder die akustische Wahrnehmung immersiv erfahrbar zu gestalten. Grundsätzlich ist allerdings festzuhalten: sobald Sinnesreize fehlen nimmt der Immersionsgrad ab und eine absolute Immersion findet nicht statt. Vom Grundverständnis der Immersion ausgehend wird der Immersionsgrad eines Szenarios von drei wesentlichen Faktoren bestimmt:

- von den kognitiven Fähigkeiten des Benutzers,
- von dem Detaillierungsgrad des Szenarios sowie
- von den Interaktionsmöglichkeiten des Benutzers [Wietzel (2007)].

Der Benutzer kann im Sinne der Interaktion auf das dargestellte Szenario einwirken sowie das Szenario im Ursache-Wirkungs-Prinzip wiederum auf den Benutzer. Im Idealfall kann der Benutzer stufenlos und ohne bewusste Wahrnehmung zwischen Realität, augmentierter Realität und virtueller Realität wechseln. In Anlehnung an die bereits angeführten Kriterien von AZUMA sind folgende Anforderungen zu gewährleisten, um aufbauend auf ein Augmented oder Virtual Reality-System ein immersives Szenario erzeugen zu können:

- Nutzung der Dreidimensionalität,
- Stimulation möglichst vieler Sinnesmodalitäten sowie
- Gewährleistung des intuitiven Agierens [Wietzel (2007)].

Festzuhalten ist an dieser Stelle, dass es sich bei diesem umfassenden Ansatz um ein junges Forschungsfeld in der grafischen Daten- und Informationsvisualisierung handelt. Bislang sind die Überlegungen, abgeleitet aus Entwicklungstrends der Human Computer Interaction, eher theoretischer Natur, da die technischen Möglichkeiten zur gezielten Stimulation der unterschiedlichen Sinnesmodalitäten (abgesehen vom visuellen und auditiven Sinneskanal) bislang noch keinen entsprechenden Reifegrad erreicht haben oder schlichtweg noch nicht existieren. Innovative Techniken und Methoden zur intuitiven Interaktion mit virtuellen Objekten werden allerdings bereits seit geraumer Zeit erforscht.

5 EINSATZMÖGLICHKEITEN DER AUGMENTED REALITY-TECHNIK UND IMMERSIVER SZENARIEN IN DER STADTPLANUNG

5.1 Grundlegende Abgrenzung der Einsatzgebiete von Augmented Reality-Technik und immersiven Szenarien

Zunächst ist die Frage zu klären, für welche Zwecke die Augmented Reality-Technik als eine Form der Daten- und Informationsvisualisierung, sowie immersive Szenarien als eine Form der intuitiv veränderbaren Situationsdarstellung, grundsätzlich in Anbetracht der erzielbaren Ergebnisse für einen sinnvollen Einsatz in der Stadtplanung geeignet sind.

5.1.1 Der Einsatz der Augmented Reality-Technik und immersiver Szenarien zur Ergebnisvisualisierung

Bislang dienen Augmented Reality-Anwendungen in der Regel zur reinen visuellen Darstellung von sachbezogenen Informationen im Sinne der Präsentation von Ergebnissen. Echte Interaktionsmöglichkeiten in Augmented Reality-Anwendungen sind bislang meist nur rudimentär vorhanden. Festzuhalten ist, dass diese in einigen Einsatzgebieten, beispielsweise bei der reinen Informationsvermittlung zur Willensbildung, auch nicht zwingend notwendig sind.

Die Visualisierung von Informationen in der realen, dem Benutzer vertrauten oder bekannten Umgebung ist hinsichtlich der Überzeugungsfähigkeit von maßgeblicher Bedeutung, da Bezüge zur Umgebung direkt assoziiert werden können [Hagen (2006)]. Die bereits angeführte mentale Rekonstruktion im Sinne der räumlichen Transformation ist nicht mehr notwendig und die damit verbundene potenzielle Gefahr der Fehlinterpretationen ist nicht gegeben. Dadurch unterscheiden sich Ergebnisvisualisierungen mittels der Augmented Reality-Technik von herkömmlichen Darstellungsmöglichkeiten und –formen bezüglich ihrer Anschaulichkeit und Nachvollziehbarkeit erheblich. Entsprechend hoch ist das Einsatzpotenzial der Augmented Reality-Technik in der räumlichen Planung einzuschätzen. Wie eingangs geschildert, ist der Planungsprozess unter anderem durch eine Vielzahl an Entscheidungssituationen geprägt, welche für die

unterschiedlichen Akteure unter den angeführten Rahmenbedingungen immer komplexer und undurchsichtiger werden. Der Einsatz der Augmented Reality-Technik bei Entscheidungsprozessen eröffnet die Möglichkeit, die baulichen und gestalterischen Auswirkungen von Vorhaben und Maßnahmen im realen Raum realistischer einzuordnen und abzuschätzen als bei bisherigen Darstellungsmöglichkeiten. Konträr zu klassischen Darstellungsformen, wie beispielsweise Plänen und physischen Modellen, ist hiermit eine maßstabsgetreue und gegebenenfalls fotorealistische Simulation der baulichen und gestalterischen Vorhaben und Maßnahmen, bezogen auf die visuell wahrnehmbaren Ausprägungen, möglich.

Da immersive Szenarien unter anderem auf die Augmented Reality-Technik aufsetzen, sind sie grundsätzlich ebenfalls im Bereich der Ergebnisvisualisierung einsetzbar. Der theoretische Ansatz der immersiven Szenarien ist es jedoch, die darzustellenden Ergebnisse durch die Stimulation mehrerer Sinnesmodalitäten erlebbar abzubilden [Wietzel (2007)].

5.1.2 Der Einsatz von immersiven Szenarien zur Erzeugung von immersiven Situationsdarstellungen

Den Benutzern von immersiven Szenarien sollen nicht nur die Ergebnisse eines Vorhabens dargestellt, sondern auch die damit verbundenen Konsequenzen erfahrbar verdeutlicht werden. Die intuitive Interaktionsfähigkeit sowie das Wahrnehmungsempfinden bilden hierbei Schlüsselkriterien. Der Benutzer, der sich in einem computergestützten immersiven Szenario befindet, ist in der Lage, sowohl mit realen, als auch mit virtuellen Objekten gleichermaßen intuitiv zu interagieren. Veränderungen innerhalb des Szenarios führen zu einer vom Benutzer direkt wahrnehmbaren Rückkopplung. Die Funktion der virtuellen Objekte wandelt sich von reinen Betrachtungs- zu Nutzgegenständen. Zurzeit findet die Konstruktion virtueller Objekte fast ausschließlich an klassischen 2D Arbeitsplätzen statt, das Ergebnis kann anschließend mittels der Augmented Reality-Technik in der realen Umgebung visuell eingefügt werden. Nach dem Verständnisansatz der immersiven Szenarien könnten Objektmodellierung sowie Objektattributierung jedoch innerhalb des Szenarios intuitiv erfolgen. Denkbar wäre beispielsweise ein Modellierungsverfahren, das (inklusiver haptischer Rückmeldung) an das Formen von Ton oder sonstigen leicht formbaren Materialien angelehnt ist. Die Attributierung wäre mittels der Berührung der Objekte und Spracheingabe denkbar.

Die Stadtplanung könnte in verschiedenen Schritten innerhalb des Planungsprozesses von einer erlebbaren Situationsdarstellung profitieren. Über den Einsatz im Bereich der Entscheidungsvorbereitungen hinaus erscheint auch eine immersive Planer-Arbeitsumgebung als sinnvoll. Hierbei steht weniger das immersive Wahrnehmen von Vorhaben und deren Konsequenzen im Vordergrund, sondern vielmehr das intuitive Interagieren vor Ort. Als Beispiel sei eine digitale Bestandsaufnahme bei der Begehung eines Untersuchungsraums angeführt. Die Gegenstände der Bestandsaufnahme könnten mittels intuitiver Handlungen, beispielsweise durch Drag and Drop von vordefinierten Attributen oder Spracheingabe, direkt in eine digitale Plangrundlage aufgenommen werden. Ebenfalls denkbar ist die Unterstützung des klassischen Entwerfens im Sinne der Entwicklung von Bau- und Raumstrukturen durch immersive Szenarien. Das Entwerfen von Strukturen würde nicht mehr ausschließlich an klassischen 2D Arbeitsplätzen erfolgen, sondern wäre zusätzlich durch intuitive Interaktionsmöglichkeiten mit virtuellen Objekten vor Ort möglich. Damit bietet sich die Möglichkeit, die Dreidimensionalität des Planungsraumes sowie die Originalmaßstäblichkeit für eine direkte visuelle Rückkopplung bereits im Entwurfsstadium zu nutzen. Kontextsensitiv wären dadurch Defizite, beispielsweise in der Gestaltwirkung oder auch Potenziale frühzeitig erfassbar. Durch immersive Szenarien wäre es möglich, im Entwurfsprozess sämtliche raumrelevanten Aspekte unterstützend einzublenden, sowie Simulationen in Echtzeit vor Ort durchzuführen. Die Ergebnisse könnten im Umkehrschluss wiederum zu neuen Planungsalternativen und -varianten führen. Durch den Einsatz von immersiven Szenarien im Sinne einer Arbeitsumgebung in der Stadtplanung wäre eine Optimierung der Planungsalternativen im Vorfeld und damit eine Qualifizierung von Entscheidungsgrundlagen möglich. Darüber hinaus könnte eine neue Form des kooperativen Arbeitens und Zusammenwirkens unterschiedlicher Akteure entstehen, in der mehrere Beteiligte direkt vor Ort auf unterschiedliche Planungsvarianten einwirken.

Bezogen auf die grundlegenden Ablaufschritte von Planungs- und Entscheidungsprozessen nach JACOBY und KISTENMACHER lässt sich eine grobe Abschätzung der möglichen Einsatzgebiete der Augmented Reality-Technik und immersiver Szenarien in den einzelnen Planungsschritten vornehmen. Dies ist schematisch in Abbildung 4 dargestellt. Da es sich um grundsätzliche Überlegungen handelt, erfolgt weder eine Wertung hinsichtlich des Aufwandes noch bezüglich der Effektivität.

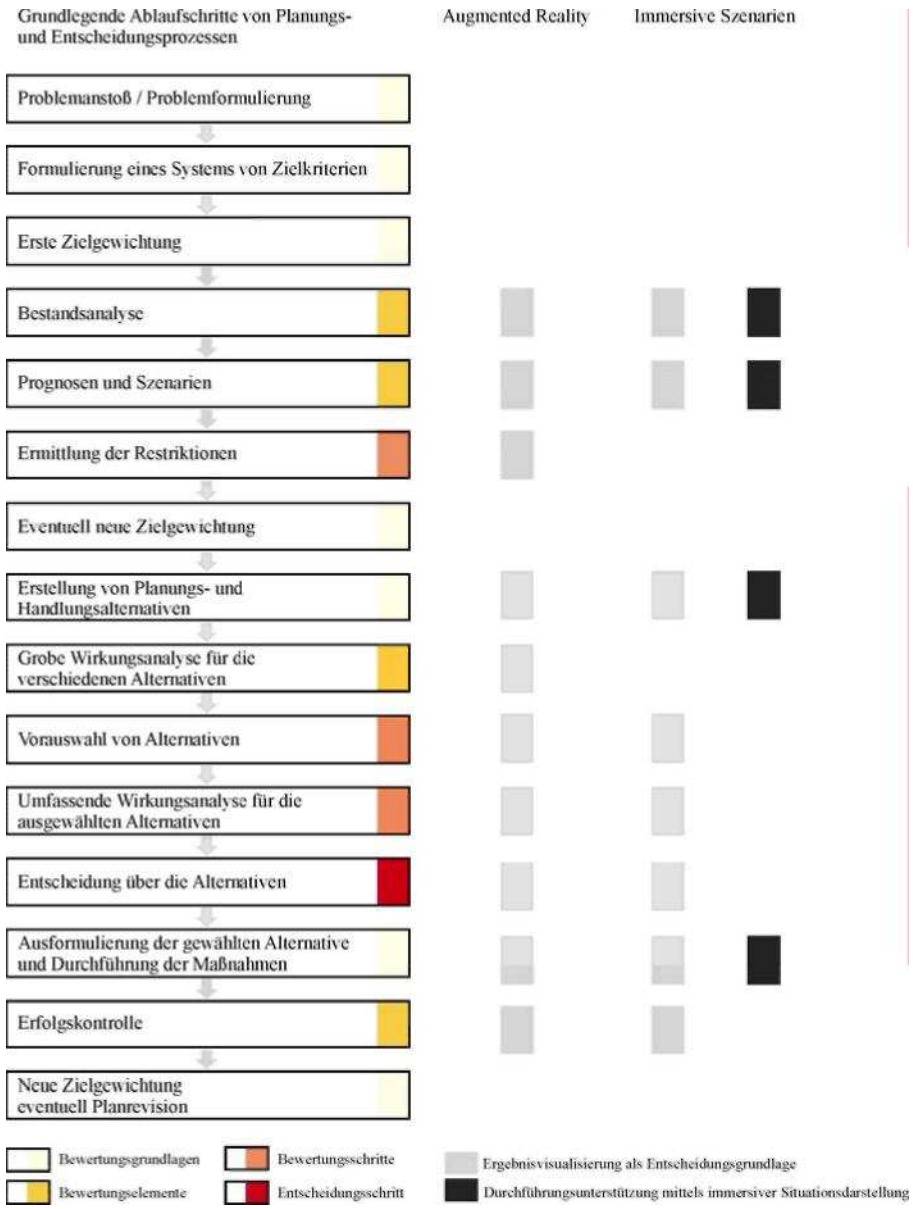

Abbildung 4: Einsatzgebiete der Augmented Reality-Technik und immersiver Szenarien in den grundlegenden Ablaufschritten von Planungs- und Entwurfsprozessen [Wietzel (2007)] auf Grundlage von [Jacoby / Kistenmacher (1998), S.149].

Grundsätzlich kann festgehalten werden, dass das eigentliche Potenzial der Augmented Reality-Technik bei Planungsgegenständen und Betrachtungsräumen liegt,

- die einen unmittelbaren Bezug zum Aspekt der Dreidimensionalität des Raumes aufweisen und
- deren Nachvollziehbarkeit bei Entscheidungssituationen durch die visuelle Darstellung der Entscheidungsgrundlagen in der realen Umgebung für die Akteure eine Qualifizierung erfährt.

Hierauf basierend und aufbauend sind immersive Szenarien zur Qualifizierung von Entscheidungsgrundlagen einsetzbar, wenn

- komplexe Wirkungsgefüge nicht durch reine visuelle Darstellungen für alle Akteure nachvollziehbar abgebildet werden können und
- die Planungssituation ein hohes Maß an Interaktion in Entwurfs- oder Beteiligungssituationen erfordert [Wietzel (2007)].

5.2 Klassifizierung der virtuellen Ergänzungen in der Stadtplanung

Über die Einsatzgebiete der Augmented Reality-Technik und von immersiven Szenarien im Planungsprozess der Stadtplanung hinaus ist die Frage zu klären, welche Arten der inhaltlichen Ergänzung grundsätzlich

klassifiziert werden können. Wie bereits dargelegt, nimmt das Sehen beim menschlichen Wahrnehmungsprozess den höchsten Stellenwert ein. Dementsprechend stellt die Visualisierung von originär visuell wahrnehmbaren und originär nicht visuell wahrnehmbaren Informationen das wesentliche Unterscheidungsmerkmal zur Klassifizierung dar. Dadurch lassen sich drei Hauptklassen von Informationsergänzungen inhaltlich abgrenzen.

5.2.1 Die Ergänzung durch originär visuell wahrnehmbare Informationen

Wie bereits angeführt, ist es grundsätzlich möglich, mittels der Augmented Reality-Technik und immersiver Szenarien geplante Vorhaben oder Projekte mit einer visuell wahrnehmbaren Ausprägung vorab im Maßstab 1:1 in einer realen Umgebung zu visualisieren. Dies ist bereits als eine einfache Form der Simulation zu bezeichnen, da die zukünftige physische Präsenz eines Vorhabens im realen Raum visualisiert wird.

Im Bereich der Stadtplanung oder auch der Architektur betrifft diese Form der Simulation beispielsweise die Darstellung der visuell wahrnehmbaren Ergebnisse von Bau- oder Gestaltungsvorhaben. Dies kann übertragen als eine digitale und flexibel erweiterbare Fortentwicklung der in der Schweiz praktizierten Methode der Errichtung von Baugespannen zur Verdeutlichung von Bauvorhaben bezeichnet werden [Wietzel (2007)].

5.2.2 Die kontextsensitive Reduzierung von originär visuell wahrnehmbaren Informationen

Hinsichtlich eines zu betrachtenden Objektmerkmals kann es zweckdienlich sein, Informationen, die nicht im direkten Zusammenhang mit dem eigentlich zu betrachtenden Merkmal stehen, auszublenden. Eine weitere Möglichkeit besteht darin, das zu betrachtende Merkmal gegenüber anderen markant visuell hervorzuheben. Beide Vorgehensweisen sind mittels der Augmented Reality-Technik und immersiver Szenarien umsetzbar. Die Reduzierung der wahrnehmbaren Umgebungsinformationen scheint zunächst diametral zum Ziel der Informationsanreichung der Umgebung durch die Augmented Reality-Technik und immersiven Szenarien zu stehen, es ist jedoch festzuhalten, dass die computergestützte, visuelle Informationsreduzierung technisch nur durch Überblendung der realen Umgebung mit virtuellen Objekten vollzogen werden kann.

In der Stadtplanung können bei einer fokussierten Betrachtung von Einzelaspekten zu viele flankierende oder zusätzliche Informationen kontraproduktiv bezüglich einer analytischen Aussage wirken. Ist dies der Fall, muss eine kontextsensitive und durch den Benutzer selektierte Informationsreduzierung oder eine visuelle Überhöhung der relevanten Informationen stattfinden. Durch die Augmented Reality-Technik und immersive Szenarien ist die Möglichkeit gegeben, mittels Überblendung verschiedene Teilbereiche der realen räumlichen Umgebung auszublenden oder auch markanter hervorzuheben. Ein denkbares Beispiel hierfür ist die visuelle Hervorhebung sämtlicher Gebäudekanten in einem definierten Gebiet sowie die Überblendung komplex strukturierter Gebäudefassaden mittels einfacher geometrischer Flächen, um Rückschlüsse auf die grundlegende Gestalt- und Raumwirkung der Gebäude im umgebenden Raum zu ziehen [Wietzel (2007)].

5.2.3 Die Ergänzung durch originär nicht visuell wahrnehmbare Informationen

Durch die Augmented Reality-Technik können Objektinformationen visualisiert werden, die in der realen Umgebung nicht originär visuell wahrnehmbar sind. Im einfachsten Falle geschieht dies durch Einblendungen in textlicher Form. Darüber hinaus ist es möglich, komplexe Wirkungsgefüge zu visualisieren, die in der Realität nicht visuell wahrnehmbar sind. Voraussetzung hierfür ist die Erstellung von Wirkungsmodellen. Auf Basis dieser Modelle ist es möglich, Wirkungsgefüge der Ist-Situation und des Soll-Zustandes zu simulieren sowie die Ergebnisse wiederum in visuell wahrnehmbare Informationen zu transformieren. In der Regel ist hierzu eine Zuordnung der betrachteten Attribute, Ausprägungen, Parameter, Messeinheiten etc. zu Symbolen oder Farbwerten notwendig.

Über die Darstellung der visuellen Komponenten eines Gestaltungs- oder Bauvorhabens hinaus ist es möglich, originär nicht sichtbare, stadtplanerisch relevante Aspekte zu visualisieren. Im einfachsten Falle wäre dies beispielsweise die zusätzliche textliche Einblendung von Gebäudedaten, bei Bestandsgebäuden beispielsweise Alter, Besitzverhältnisse oder Angaben hinsichtlich der Gebäudenutzungen, bei Neuplanungen beispielsweise Angaben zur Bruttogeschossfläche oder zum Bebauungsplan. Weiterhin ist es theoretisch möglich, auch komplexere Wirkungsgefüge wie beispielsweise Einzugsgebiete, Kaltluftströme, Schadstoffeinträge oder Lärmbelastungen zu visualisieren. Die Visualisierung von originär nicht sichtbaren

Aspekten kann sowohl bezogen auf den Ist-Zustand, als auch mittels Simulationen auf Planungsalternativen erfolgen.

Immersive Szenarien verfolgen vom Grundverständnis ausgehend einen umfassenderen Ansatz. Prinzipiell ist es auch hierbei möglich, originär nicht visuell wahrnehmbare Informationen in visuell wahrnehmbare zu überführen, allerdings wirkt sich dies kontraproduktiv auf den Immersionsgrad aus. Je nach Leistungsfähigkeit des immersionserzeugenden Systems, sind die Sinnesmodalitäten des Menschen originär und separat anzusprechen. Ein Anwendungsbeispiel soll den Unterschied verdeutlichen: Um die zu erwartende Lärmbelastung auf einem Grundstück durch eine geplante Änderung der anliegenden Verkehrsführung zu beurteilen, können klassische Lärmberechnungen durch bekannte und normierte Schallausbreitungsmodelle durchgeführt werden. Da Lärm nicht visuell wahrgenommen werden kann, ist beim Einsatz der Augmented Reality-Technik eine Überführung in visuell wahrnehmbare Informationen notwendig. Bezogen auf den jeweiligen Standpunkt vor Ort kann die simulierte Lärmeinwirkung durch Farbskalen in der Fläche oder im Raum visuell abgebildet werden. Darüber hinaus ist es möglich, Vergleichsreferenzen durch Symbole einzublenden, beispielsweise ob eine ungestörte Unterhaltung in normaler Lautstärke nach Umsetzung der Maßnahmen weiterhin möglich ist. Beim Einsatz eines immersiven Szenarios wäre der auditive Sinneskanal direkt anzusprechen. Dies kann beispielsweise durch die Einspielung von kalibrierten Referenzlärmbelastungen oder durch die akustische Simulation der Lärmbelastung auf Basis modellierter Geräuschquellen sowie Schallausbreitungsmodellen geschehen.

Die theoretischen Einsatzmöglichkeiten von immersiven Szenarien sind sowohl hinsichtlich einer immersiven Arbeitsumgebung des Planers, als auch im Sinne einer qualifizierten Entscheidungsgrundlage mannigfaltig. Denkbar wären Simulationen, in denen beispielsweise Erschütterungen durch Ausführung geplanter Baumaßnahmen oder Gerüche durch geplante Industrie- oder Gewerbebetriebe mittels gesteuerter Stimulation der betreffenden Sinnesmodalitäten erfahrbar sind [Wietzel (2007)].

6 FAZIT UND AUSBLICK

Durch die sich abzeichnenden Trends werden die Anforderungen an qualifizierte Entscheidungsgrundlagen weiter steigen. Eine Herausforderung hierbei wird es sein, die Menge an Daten und Informationen den beteiligten Akteuren in einer Form zu vermitteln, die die Abweichungen der individuellen mentalen Interpretation und Rekonstruktion möglichst minimiert. Sowohl die Augmented Reality-Technik als auch immersive Szenarien können hierzu einen wesentlichen Beitrag leisten, da sie Planungssituationen und -alternativen in einer, durch die natürlich menschliche Wahrnehmung erfahrbaren, Form abbilden, ohne dass ein Höchstmaß an Hintergrund- und Fachwissen vorhanden sein muss.

Die Augmented Reality-Anwendungen der Gegenwart befinden sich weitgehend noch im Prototypenstadium. Bis zu einer kommerziellen Einführung sind noch Forschungs- und Entwicklungsleistungen, im Wesentlichen in den Bereichen der Hardwareminiaturisierung, der Trackingverfahren sowie der Middle- und Anwendungssoftware, notwendig. Immersive Szenarien stellen den darauf aufbauenden Entwicklungsschritt dar. Erste Forschungsprojekte diesbezüglich werden bereits durchgeführt, stellvertretend ist das @Visor Projekt des Deutschen Forschungsinstitut für Künstliche Intelligenz (DFKI, Standort Kaiserslautern) anzuführen. Die Entwicklung von immersiven Szenarien bedarf der interdisziplinären Forschung aus den Bereichen der Informations- und Datenvisualisierung, der Wahrnehmungspsychologie und der Human Computer Interaction.

Es ist davon auszugehen, dass die treibenden Entwicklungskräfte der Augmented Reality-Technik sowie der immersiven Szenarien weiterhin die Bereiche Militär, Medizin sowie Fertigung und Produktion sein werden. Um einer langen Anpassungsphase von Augmented Reality-Systemen sowie von Systemen, die zur Erzeugung von immersiven Szenarien notwendig sind, an die Bedürfnisse der Stadtplanung vorzubeugen, sind frühzeitig Bedarfsanforderungen zu formulieren und in den interdisziplinären Forschungskontext von Stadtplanung und Informatik einzubringen.

7 QUELLENVERZEICHNIS

Abawai (2005): Abawi, D. F. (2005): Analyse und Bewertung von Erstellungssystemen für Augmented Reality Anwendungen, Frankfurter Informatik-Bereichte Nr. 4/05, JW. Goethe-Universität Frankfurt.

Azuma (1997): Azuma, R. T. (1997): A Survey of Augmented Reality. Presence: Teleoperators and Virtual Environments.

Berkley (1709): Berkley, G. (1709): An Essay towards a New Theory of Vision. Übersetzt von Schmidt, R.(1912): Versuch einer neuen Theorie der Gesichtswahrnehmung. Leipzig.

Campenhausen (1981): Campenhausen, C. v. (1981): Die Sinne des Menschen. Band 1: Einführung in die Psychophysik der Wahrnehmung, Georg Thieme Verlag, Stuttgart.
Fürst / Scholles (2001): Fürst, D. / Scholles, F. (Hrsg.) (2001): Handbuch Theorien+Methoden der Raum- und Umweltplanung. Dortmunder Vertrieb für Bau- und Planungsliteratur, Dortmund.
Gibson (1973): Gibson, J. J. (1973): Die Wahrnehmung der visuellen Welt. Aus dem Amerikanischen übertragen von Vera Schumann, Belz Verlag, Weinheim und Basel.
Hagen (2006): Hagen, H. (2006): Ergebnisse der Diskussionen und Gespräche im Rahmen der wöchentlichen Jourfix
Veranstaltungen des von der DFG geförderten Internationalen Graduiertenkollegs (International Research Training Group, IRTG): Visualization of Large and Unstructured Data Sets Applications in Geospatial Planning, Modeling, and Engineering.
Heers (2005): Heers, R. (2005): „Being There" Untersuchungen zum Wissenserwerb in virtuellen Umgebungen. Dissertation der Fakultät für Informations- und Kognitionswissenschaften der Eberhard-Karls-Universität Tübingen, Tübingen.
Hering (2006): Hering, N. (2006): Wie wahr ist das, was wir wahrnehmen? http://www.medical-tribune.ch/deutsch/mensch_und_technik/2006/wahrnehmung2.php, Zugriff 14.11.2006.
Jacoby / Kistenmacher (1998): Jacoby, C. / Kistenmacher, H. (1998): Bewertungs- und Entscheidungsmethoden. In: Akademie für Raumforschung und Landesplanung: Methoden und Instrumente räumlicher Planung. Hannover.
Milgram / Kishino (1994): Milgram, P. / Kishino, F. (1994): „A Taxonomy of Mixed Reality Visual Displays". IEICE Trans. Information Systems, vol. E77-D, no. 12.
Ritter (1987): Ritter, M. (1987): Einführung: In: Wahrnehmung und visuelles System. Spektum-der-Wissenschaft-Verlagsgesellschaft, Heidelberg.
Rodel (1981): Rodel, M. (1981): Perzeptiv- räumliche Fähigkeiten bei hirngesunden und hirngeschädigten Personen. Dissertation an der Philosophischen Fakultät I der Universität Zürich, Universität Zürich, Zentralstelle der Studentenschaft.
Scholles (2005): Scholles, F.: Bewertungs- und Entscheidungsmethoden. In: Akademie für Raumforschung und Landesplanung (2005): Handwörterbuch der Raumordnung. Hannover.
Steinebach / Müller (2006): Steinebach, G. / Müller, P. (2006): Dynamisierung von Planverfahren der Stadtplanung durch Informations- und Kommunikationssysteme. In: Schriften zur Stadtplanung Band 4, Technische Universität Kaiserslautern.
Weidenbach (1999): Weidenbach M. (1999): Geographische Informationssysteme und neue Digitale Medien in der
Landschaftsplanung. Dissertation an der Forstwissenschaftlichen Fakultät der Ludwig- Maximilians-Universität München. Berlin, Logos-Verlag.
Wietzel (2007): Wietzel, I. (2007): Vorläufige Ergebnisse des laufenden Forschungsprojektes „Computergestützte Immersion in der Stadtplanung", Lehrstuhl Stadtplanung, Technische Universität Kaiserslautern.
Zwimpfer (1994): Zwimpfer, M. (1994): 2D Visuelle Wahrnehmung, visual perception, Basel, Niggli.

Kabelwerk: Genese eines Stadtteils

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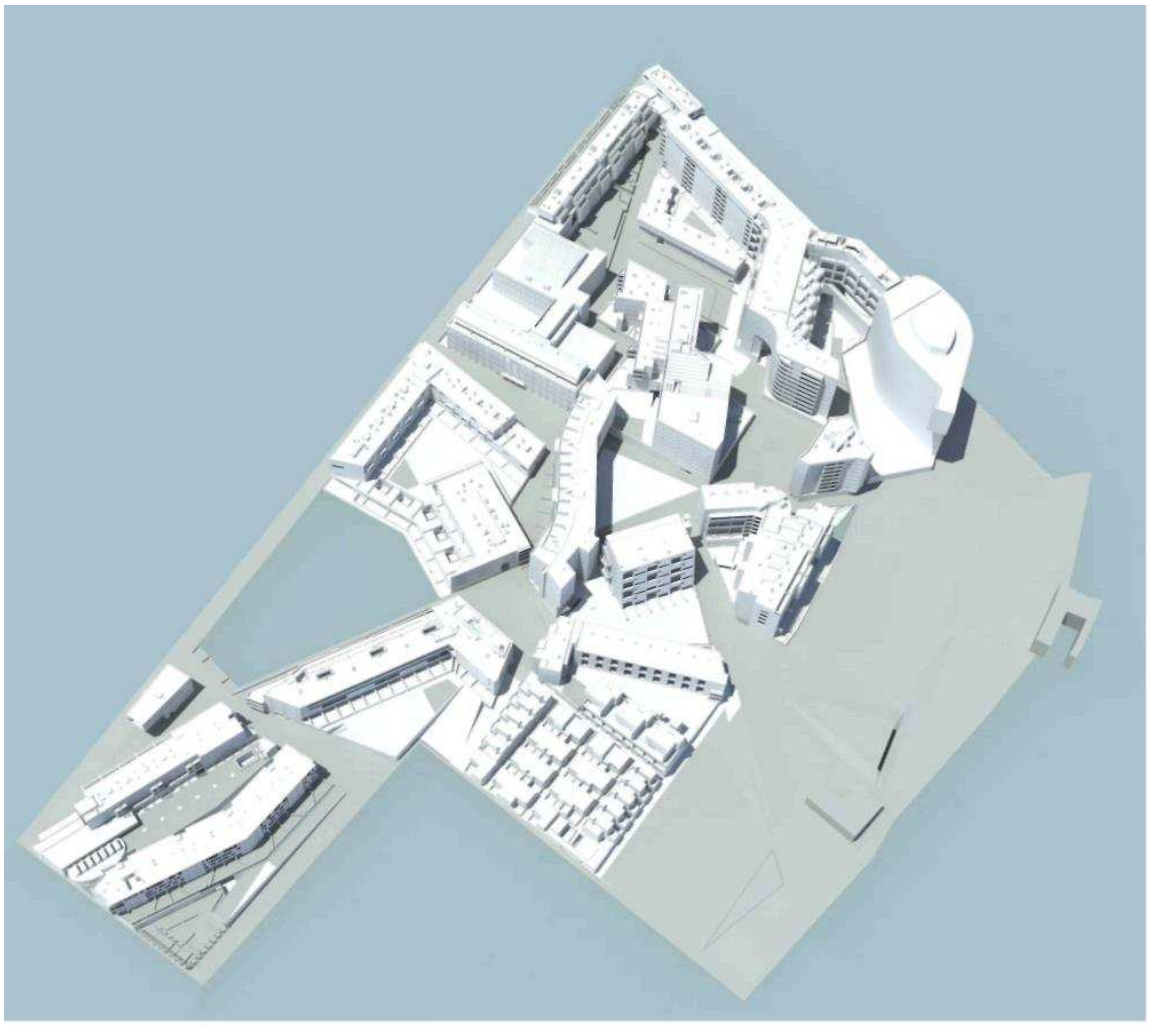
1 KABELWERK: EIN STÄDTEBAULICHES MODELL

Bürgerbeteiligung, kooperativer Planungsprozess und neue städtebauliche Instrumente machten den Prozess zum Experiment. Das Experiment ist gelungen und Kabelwerk als realisiertes Projekt ist ein Modellfall für künftige Planungen.



2 BACKGROUND WIEN

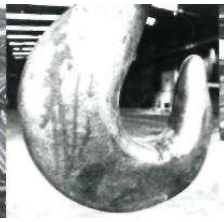
- Sozialer Wohnbau in Wien: Das Kabelwerk kann nur innerhalb der Tradition des sozialen Wohnbaus in Wien verstanden werden. Der soziale Wohnbau in Wien versteht sich, anders als in anderen Städten, nicht nur als Stützung wirtschaftlich Schwacher sondern als kulturelles Anliegen. Er gibt Anreize für die heutige Gesellschaft adäquate Wohn- und Siedlungsmodelle höchsten Standards zu entwickeln. Jedes Projekt, das gefördert werden soll, wird vom Grundstücksbeirat als Basis des "best practice" Prinzips beurteilt und so Jahr für Jahr die Qualität des Wohnbaus in Ökonomie, Ökologie und Architektur gesteigert. Neu ist beim Projekt Kabelwerk, dass über das Objekt hinaus, die

öffentlichen Räume und der gesamte Stadtteil einer solchen Qualitätssteigerung zugeführt werden sollte. Dazu mussten neue Instrumente der Planung erdacht und ausprobiert erdacht werden.

- Städtebauliche Instrumente in Wien:
  Im Spiel zwischen der flexiblen Stadt der vielen Möglichkeiten versus die festgesetzte unveränderbare, bis ins Detail vorgeschriebenen Stadt, tendieren städtebauliche Instrumente auf Grund übertriebener Vorsicht bezüglich Rechtssicherheit, zur Erstarrung der Stadt beizutragen. Daher müssen diese von Zeit zu Zeit auf Funktionstüchtigkeit überprüft und neu definiert werden.
- Anforderungen an zukünftige städtebauliche Instrumente:
  Im Vorfeld des Projekts Kabelwerk wurde im so genannten Millenniumsworkshop das bestehende Regelwerk der Planung untersucht und Anforderungen an zukünftige Instrumente definiert. Mit dem Stichwort "Flexibilisierung" wurde der Wunsch nach "mehr Freiheit innerhalb eines gegebenen Rahmens" laut. Freiheiten in Bezug auf Baukörper und Nutzungen.
  Das Schlagwort "Durchmischung" zielt auf einen stärkeren Nutzungsmix und auf eine größere Durchmischung der Bewohnerstrukturen ab.
  Mit dem Schlagwort "Bonuspunkte" wird die Entwicklung städtebaulicher Instrumente, welche eine Qualitätssteigerung fördern, umrissen.

3 BACKGROUND KABELWERKE

- Lage in Wien
  Das Projekt Kabelwerk ist auf einem ehemaligen Fabrikgelände , im südlichen Meidling situiert, Das Stadtzentrum ist mit der U-Bahn in 10 Minuten erreichbar.. Die umliegenden Strukturen sind äußerst heterogen - von zweigeschossigen Reihenhäusern bis zu Gemeindebauten und frei stehenden Einfamilienhäusern.
- Geschichte des Kabelwerks
  Das Kabelwerk wurde nach exakt 100 Jahren Bestand im Dezember 1997 geschlossen. Errichtet außerhalb des Linienwalles auf der sprichwörtlichen leeren Wiese, war es ein starker Magnet und Auslöser für die Bebauung und Siedlungsentwicklung rund um das Kabelwerk. Als Zentrum der Umgebung, nicht nur örtlich sondern auch als Ort der Arbeit und der Geldbeschaffung, war und ist das Kabelwerk ein starker Identitätsgeber für seine Umgebung.

4 PROJEKTENTWICKLUNG KABELWERKE

Die fünf Säulen des Projektes

1. Bürgerbeteiligung
2. Zwischennutzung
3. Kooperativer Planungsprozess
4. Neue städtebauliche Instrumente
5. Gebietsmanagement

4.1 Bürgermitbeteiligung

Eine schon im Vorfeld der Planung beginnende und nach Besiedelung noch immer gepflegte Bürgerbeteiligung ist der Grundpfeiler des Erfolgs von Kabelwerk. Ideen der Bewohner der Umgebung flossen in das Projekt ein, laufend wurden und werden die Bewohner von Planungen informiert und es findet ein steter Gedankenaustausch statt. Dies führte zu einer äußerst positiven Einstellung der Anrainer zu einem doch in seiner Entstehungszeit belastenden Bauvorhaben. Der Standard titelte im August 2005: "Das Wunder

von Wien" und schreibt: "einige hunderttausend Quadratmeter Nutzfläche werden hier innerhalb von 2 – 3 Jahren gebaut, aber kein einziger Anrainer protestiert. Wie so etwas möglich ist, wollten neuerdings sogar die Chinesen von den Projektbetreuern vor Ort wissen."

4.2 Zwischennutzung

Entgegengesetzt der herkömmlichen Praxis bei großen Bauvorhaben die Fläche zuerst von sämtlichem Bestand zu räumen, dann zu umzäunen und bis zum Anrollen der Baufahrzeuge brach liegen zu lassen, ging man beim Kabelwerk einen anderen Weg.

Die Backsteinziegelgebäude, die kulturell und von ihrer Substanz als erhaltenswert angesehen wurden, wurden einer kulturellen Zwischennutzung übergeben. Die äußerst engagierte Kulturarbeit der Gruppe IG Kabelwerke umfasste Theaterproduktionen, Musikhappenings, eine Graffiti-Akademie etc. Die umliegende Bevölkerung übernahm überraschend großen Anteil auch durch eigene Aktivitäten und nahm dadurch direkt an der Aneignung und Belebung des neuen Gebiets teil. 500.000 (!) Besucher konnten innerhalb von 5 Jahren von der IG Kultur begrüßt werden.

Auch der Bauträger profitierte:

a) Mit der kulturellen Bespielung des Areals hörte schlagartig der Vandalismus auf und Sicherheitsdienste konnten eingespart werden.

b). Die überall promoteten kulturellen Aktivitäten machten das Kabelwerk in der gesamten Stadt und darüber hinaus bekannt. Eine neue Art von Standortmarketing. Die kulturelle Zwischennutzung wurde ein so großer Erfolg, dass sie zu einem bestimmenden Element in den Planungsüberlegungen wurde und daher die Stadt Wien zusagte, einen permanenten Kulturbetrieb zu fördern

4.3 Kooperativer Planungsprozess

Um die von der Stadt Wien geforderten urbanen Qualitäten zu erreichen, musste ein völlig neuer Weg der Planung beschritten werden.

Die komplexen Anforderungen an das Projekt Kabelwerk - neue Stadtteilidentität, urbane Vernetzung, Raum-und Freiraumqualität, Nutzungssynthese, Verkehrserschließung, Zwischennutzung, Bürgerbeteiligung – wie auch die Forderung nach einem neuen Denkansatz, einer neuen Dimension in der Planung, machten von Anfang an notwendig, bislang übliche Handlungsabläufe zu verändern. Daher waren Kooperation und Interaktion der Beteiligten kein Lippenbekenntnis sondern ein zentrales Anliegen dieses Planungsansatzes.

Zwei Foren wurden für diese Aufgaben installiert, die Arbeitsgruppe und die städtebauliche Begleitgruppe

a) die Arbeitsgruppe in 14 tägigen Treffen fungierte die Arbeitsgruppe als das zentrale Informations-, Diskussions- und Stadterneuerungsinstrument der Planung. Sie vernetzte alle wesentlichen Akteure wie Vertreter der Stadt, des Bezirks, verschiedenste Konsulenten verschiedenster Fachgebiete, Planer, Bauherrn und Anrainer. Die Arbeitsgruppe entwickelte verschiedenste Lösungsansätze, stellte sie ins Forum, diskutierte sie und versuchte einen Konsens zu finden. Es bildete sich ein Raum des Vertrauens und der gegenseitigen Achtung, der eine konstruktive Arbeit an noch nicht erprobten Strukturen zuließ. Eine wesentliche Rolle innerhalb des Prozesses spielten die so genannten "Testprojekte". Jeweils mindestens 2 Architektenteams entwickelten auf Grund vorgegebener Regeln eines Bebauungsplans Testprojekte, um zu testen ob diese Regeln zu den gewünschten hohen Anforderungen führten. Die Testprojekte minimierten die Risken des Experiments.

b) die städtebauliche Begleitgruppe Als begleitendes, übergeordnetes Forum wurde eine Plattform geschaffen, welche die von der Arbeitsgruppe entwickelten Lösungen diskutierte und einerseits als Korrektiv und andererseits als Impulsgeber der Arbeitsgruppe diente. Die Bedeutung der städtebaulichen Begleitgruppe

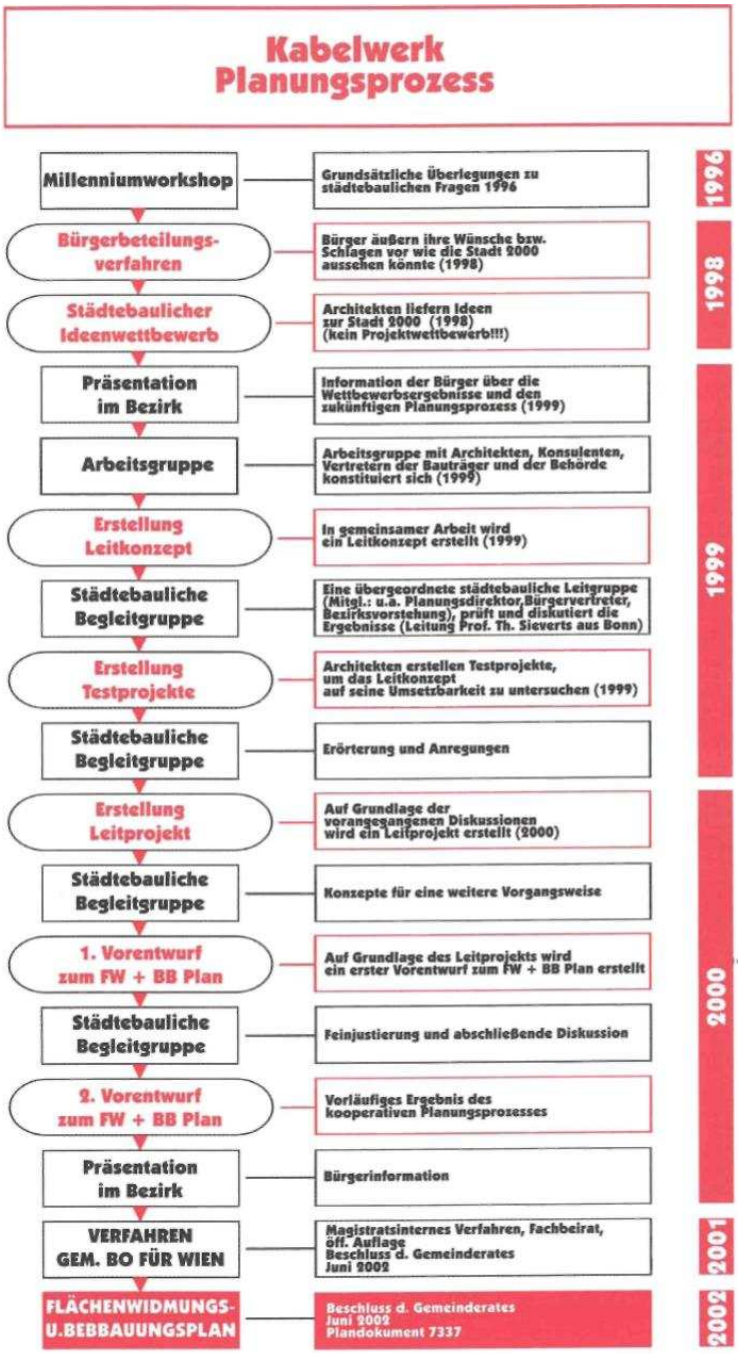
als Mediator war ein wesentlicher. Turbulenzen und Gegensätze, die sich während der Diskussionen in den Arbeitsgruppen aufgebaut hatten, wurden in den Sitzungen der städtebaulichen Begleitgruppe diskutiert und im Hinblick auf die nächsten Schritte entschieden. Schließlich dienten die Termine an denen die Begleitgruppe tagte, auch als wichtige Etappenziele und waren somit für die Umsetzung des geplanten Zeithorizonts von eminenter Bedeutung. Darüber hinaus fungierte die Begleitgruppe als Forum, um Lösungsansätze der Bevölkerung vorzustellen, mit dieser zu diskutieren und eventuelle Einwände entgegenzunehmen.

4.4 Neue städtebauliche Instrumente – Erläuterung siehe Punkt C – der Bebauungsplan

4.5 Gebietsmanagement

Da über einen Flächenwidmungs- und Bebauungsplan niemals alle Intentionen des Planungsprozesses transportiert werden, geschweige denn in diesem festgeschrieben werden können, entschloss man sich zur Schaffung eines Gebietsmanagements, mittels dessen man die Umsetzung der Vorstellungen garantieren sollte. Im Gebietsmanagement wirken die Vertreter der Bauträger, Vertreter der für den Flächenwidmungs- und Bebauungsplan verantwortlichen Magistratsdienststelle, der Bürgerbeirat und ein Vertreter des Bezirks. In regelmäßigen Zusammenkünften wurde über den Planungsfortschritt (jetzt über den Baufortschritt) diskutiert und bei auftretenden Problemen, sofort nach einer praktikablen, für alle Beteiligten zufrieden stellenden Lösung, gesucht. Das Gebietsmanagement kann grundsätzlich als Qualitätsmanagement gesehen werden. Durch die schnelle Reaktion auf auftretende Probleme konnten und können Friktionen zwischen allen Beteiligten (Anrainer – Bauträger, Bauträger – Architekten, Bauträger – Behörde etc.) rasch und unbürokratisch erledigt werden. Der Verzicht auf klar umrissene Kompetenzbereiche, das unausgesprochenen Bekenntnis zu einer gewollten Unschärfe an den Trennlinien zwischen Bauträger – Architekt – Bürger – Politik macht ein Miteinander einfacher, da quasi jeder versucht sich in die „andere“ Seite hineinzudenken und dementsprechend auch mitzudenken. Dies wäre aber ohne den vorangegangenen Prozess und das damit aufgebaute Vertrauen nur schwer möglich. Es ist geplant, das Gebietsmanagement bis zur vollständigen Besiedlung des Areals beizubehalten.

5 STRUKTUR DES PLANUNGSPROZESSES



6 DER BEBAUUNGSPLAN

Neue Instrumente, strategische Vorgaben

1) Freiräume

Kabelwerk als Teil einer Stadt wird durch seine Freiräume definiert. Wesentliche Ansätze zur Entwicklung der

Freiräume waren:

- Fortsetzung bestehender Straßen- und Gassenzüge,
- Aufnehmen der historischen Stüber-Günther Gasse (im Fabrikgelände nicht mehr existent) als neues Rückgrat des Kabelwerkes
- eine Serie verschiedener Außenräume/Plätze, verteilt über das Gebiet mit unterschiedlichen Qualitäten

- ein Vorherrschen städtisch urbaner harter Außenräume und, dem gegenüber gesetzt, weiche Naturräume.
- eine vielfache Durchwegung mit einer klaren Wegehierarchie
- das Freihalten des Zentrums von jeglichem fließenden Verkehr

2) Anbaupflicht, wraparound architecture Wesentlicher Ausgangspunkt des Projekts Kabelwerk war, die Außenräume festzulegen und Bebauungen nach diesen Außenräumen zu richten. Um diese städtischen Außenräume entstehen zu lassen, wurde das Instrument der Anbaupflicht installiert, d.h. sämtliche Bauplätze haben Fassaden an öffentlichen Plätzen zu errichten und dürfen davon nicht abrücken.

3) Kubatur / Bonuskubatur Für jeden Bauplatz wurde eine ausnützbare Kubatur festgeschrieben und darüber hinaus eine so genannte Bonuskubatur (ca.20 %). Diese Bonuskubatur kann verbaut werden, aber nur dann, wenn sie folgenden Kriterien dient.

- größere Raumhöhen
- mehr Gemeinschaftsanlagen
- vergrößerte Erschließungsflächen

Das heißt, die Bonuskubatur dient dazu, Raumqualitäten zu erhöhen und Gemeinschaftsflächen zu maximieren, nicht aber einen verwertbaren Nutzflächengewinn.

4) Das Sockelgeschoß

Jedem Bauplatz wurde eine zu errichtende Geländehöhe so vorgeschrieben, dass an dem sanft nach Süden fallenden Hang pro Bauplatz Sockeln, die deutlich aus der Umgebung ragen, entstehen. Oberhalb dieses Sockels kann die vorgeschriebene Kubatur errichtet werden. Die Höhe der Sockelgeschosse wurde so festgelegt, dass innerhalb des Sockels Räume errichtet werden konnten. Allerdings wurde die Verwendung als Wohnung (außer aus Gründen einer sozialen Kontrolle von internen Verbindungswegen) ausgeschlossen. Die Sockelzonen stellen so quasi das Grundgerüst der städtebaulichen Ordnung im Kabelwerk dar, und fungieren darüber hinaus als Aktiv- und Reserveflächen. Aktivflächen insofern als hier Kleingewerbe, Kleinbüros, Werkstätten und Gemeinschaftsräume angesiedelt werden können. Reserveflächen insofern als die Sockel sehr groß sind und wahrscheinlich bis zur Fertigstellung nicht voll besiedelt werden und daher für spätere oder später aufkommende Erfordernisse zur Verfügung stehen.

5) Nutzungsverteilung.

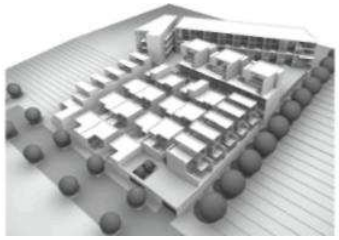
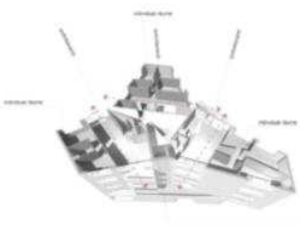
Im Bebauungsplan wurde sowohl für den nördlichen wie für den südlichen Teil eine Nutzungsverteilung vorgeschrieben, welche die prozentuellen Anteile von Nicht-Wohnen vorschreibt. Hiermit soll eine starke Durchmischung der Funktionen gewährleistet werden.

6) Der Bebauungsplan legt die Position möglicher Garagen fest. Er setzt weiters den zentralen Teil als quasi „autofreie Zone“ fest.

7) Weiters legt der Bebauungsplan die zu erhaltenden Altbauten und deren Nutzungen fest.

Anhand des Bebauungsplanes wurden die Einzelplanungen durchgeführt, besonderes Augenmerk auf die Bauplatz übergreifenden Freiflächen gelegt.



7 RESÜMEE:

Alleine das Interesse, das dem Kabelwerk entgegen gebracht wird, sagt viel über die Einzigartigkeit dieses Projekts aus. Der Bekanntheitsgrad in Fachkreisen (China, Japan, USA, vielen Ländern der EU und Norwegen) ist enorm. Viele Anfragen von Schulen, Fachhochschulen und Universitäten zeigen, dass hier ein

Modellfall geschaffen wurde. Es gibt zwar nichts, was es vielleicht nicht schon in anderen Projekten gegeben hat, aber, wie es aussieht ist es hier erstmals gelungen, alle nach dem heutigen Stand der Stadtplanung wichtigen Kriterien in einem Projekt zusammenzuführen.

Natürlich wurden nicht alle Ziele, die im Laufe des Planungsprozesses von den verschiedenen Beteiligten angestrebt wurden, erreicht. Dennoch war es möglich, einen Kompromiss zu finden, der alle Mitwirkenden grundsätzlich zufrieden stellt. Die Kabelwerke mögen vielleicht ein Modell darstellen, niemals aber ein Rezept. Eine Kabelwerkplanung ist nicht direkt auf andere Projekte umzulegen, erlaubt es aber verschiedene Mechanismen aufzugreifen und entsprechend zu adaptieren.

Die wichtigste Erkenntnis mag dabei sein, dass – abseits von stadt- und objektplanerischen Faktoren - vorab eine grundsätzliche Kenntnis über einen Planungsprozess vonnöten ist, wobei gleichzeitig der Freiraum gegeben sein muss, innerhalb dieses Prozesses flexibel zu sein, um rasch auf wechselnde Bedingungen reagieren zu können. Dies ist aber nur möglich, wenn es unter allen Beteiligten eine Bereitschaft zur Flexibilität, zum Verlassen gewohnter Denkbahnen und eine kritische Masse an Enthusiasmus gibt – kurz gesagt, es hängt ausschließlich von den handelnden Personen ab.

8 STATISTIK:

- Plangebietsgröße: ca. 6,5 ha ohne Parkflächen 8Ha inclusive Bahnpark
- Geschossflächenzahl (GFZ): 2,0 (1,2 im Süden bis 3,9 im Norden) aufs Nettobauland
- Nutzungen: Wohnen, Boardinghouse, Kulturzentrum, Hotel, Seminarzentrum, Ärztezentrum,
- Apotheke, Restaurants, Cafe, Nahversorgung, Kindergarten, Geriatrie, Gemeinschaftsräume
- Planer:
- Sieger des städtebaulichen Wettbewerbs: ARGE dyn@mosphäre Rainer Pirker architexture team und The Poor Boys Enterprise
- Fachplanung, Flächenwidmungs- und Bebauungsplan: Herbert Buchner, MA 21 B Volkmar Pamer, MA 21 B, Tel. 01-4000 88142, pav@m21abb.magwien.gv.at
- Architekten: Architektengruppe Kabelwerk:
- Mascha & Seethaler Tel. 01-587 2924, E-Mail: office@architects.co.at
- Hermann & Valentiny pool Architektur DI Martin Wurnig Schwalm-Theiss & Gressenbauer Werkstatt Wien
- Verkehrsplanung: DI. Rosinak
- Außenanlagenplanung: Heike Langenbach und Anna Detzlhofer
- Lichtplanung: Zoufal Andreas
- Bauherr: „Kabelwerk Bauträger“ GmbH, Oswaldgasse 33, 1120 Wien

9 CHRONOLOGIE DES PROJEKTES:

- Schließung der Kabel und Drahtwerke AG am 19.Dezember 1997
- Bürgerbeteiligungsverfahren 1998
- Städtebaulicher Ideenwettbewerb 1998, Jury im Dezember Sieger: ARGE dyn@mosphäre Rainer Pirker architexture team und The Poor Boys Enterprise
- Konstituierung der Arbeitsgruppe KDAG: Frühjahr 1999 1. Sitzung 17.05.1999 und in der Folge weitere 20 Sitzungen und zahlreiche kleinere Besprechungen mit thematischen Schwerpunkten bis Ende 1999
- Kooperative Diskussion und Erarbeitung des Leitkonzepts in der Arbeitsgruppe KDAG auf der Basis der Ausarbeitungen von Haydn und Pirker (Juni bis Oktober 1999)
- Untersuchung zur Erhaltung und künftigen Nutzung von Teilen des Altbestandes KDAG (August/September 1999)

- Laufende Ausarbeitungen zu Verkehr, Grünraum und Leitkonzept
- Vorlage und Diskussion des Entwurfs zum Leitkonzept KDAG in der 1. Sitzung der städtebaulichen Begleitgruppe am 4.Oktober 1999
- Beauftragung (durch die Bauträger) zur Ausarbeitung von 5 Testprojekten, die in Bebauungsstudien die Anwendbarkeit des im Leitkonzept vorgeschlagenen Regelwerks überprüfen sollten (November 1999)
- Präsentation der Zwischenergebnisse der Testprojekte in der zweiten Sitzung der städtebaulichen Begleitgruppe am 14. und 15. Dezember 1999 mit Empfehlungen zur Überarbeitung
- Vorlage des Leitprojekts durch die ARGE dyn@mosphäre als Bebauungsstudie der Preisträger und Überarbeitung der Testprojekte entsprechend den Vorschlägen der zweiten Sitzung der städtebaulichen Begleitgruppe
- Dritte Sitzung der städtebaulichen Begleitgruppe im März 2000 und Abklärung offener Fragen in Bezug auf die zukünftige Widmung
- Vierte Sitzung der städtebaulichen Begleitgruppe Ende Juni 2000. Erste Entwurfsskizzen zum Flächenwidmungs-und Bebauungsplan als Diskussionsgrundlage und zur detaillierteren Abklärung der rechtlichen Gegebenheiten
- Vorentwurf des Flächenwidmungs- und Bebauungsplanes durch Haydn/Pirker im Spätsommer 2000
- Allgemein verständliche Aufbereitung des Planungsergebnisses (Pläne, Modell) und Präsentation im Bezirk im Herbst 2000
- Einleitung des Verfahrens zur Festsetzung des Flächenwidmungs- und Bebauungsplans (Herbst 2000)
- Präsentation des Entwurfs vor dem Fachbeirat für Stadtplanung und Stadtgestaltung am 10.Juli 2001
- Beschluss der Bezirksvertretung (einstimmig) am 2.Dezember 2001
- Abstimmungsgespräche und Nachjustierung einzelner Punkte (erstes Halbjahr 2002)
- Beschlussfassung durch den Gemeinderat im Juni 2002
- Gründung der Kabelwerk Bauträger GmbH im Juli 2002 durch die Bauträger
- Installierung des Gebietsmanagements im Sommer 2002
- Beginn der Abbrucharbeiten im Juli 2002 und Abtransport des Abbruchmaterials mit der Bahn
- Sicherung der Verlängerung der sozialen und kulturellen Zwischennutzung für weitere zwei Jahre während der Bauzeit im August 2002
- Erfolgreicher Abschluss der Bauverhandlungen im November 2003
- Baubeginn Herbst 2004
- Besiedelung Bauplatz A 2005
- Fertigstellung Kabelwerke Sommer 2008

🏆 *reviewed paper*

Webbasierte Erreichbarkeitsanalyse – Vorschläge zur Definition eines Accessibility Analysis Service (AAS) auf Basis des OpenLS Route Service

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1 ZUSAMMENFASSUNG

Im Rahmen des Kooperationsprojektes "Ein Web-SDSS (Spatial Decision Support System) zur Automatisierung der multikriteriellen Modellbildung für nutzerspezifische regionalisierte Wohnungsmarktanalysen in Rheinland Pfalz" zusammen mit der IRP RLP haben wir einen Erreichbarkeitsanalyse-Webdienst als eines der ersten Analysemodule spezifiziert und implementiert. Die Implementierung nutzt OGC Standard-konforme Dienste wie SLD, WMS und WFS und insbesondere auch den OGC OpenLS Route Service. Letzterer wurde zuvor implementiert (Neis 2006) und in mehreren Projekten eingesetzt (Weiser et al 2007, Neis et al 2007). In diesem Beitrag diskutieren wir das Konzept und die Realisierung des Dienstes, beschreiben seine an OGC OpenLS angelehnten Schnittstelle und stellen die Nutzung im Rahmen unseres Projektes vor. Umgesetzt wurde ein Verfahren zur Berechnung und mehrere Verfahren zur Darstellung des Erreichbarkeits-Gebietes. Diese und mögliche Erweiterungen werden ebenfalls vorgestellt und diskutiert. Im Ausblick werden alternative Nutzungsmöglichkeiten des Erreichbarkeitsanalyse-Dienstes in verschiedenen Anwendungsgebieten betrachtet. Neben klassischer Standortanalyse sind das z.B. Katastrophenmanagement (www.ok-gis.de, vgl. Weiser et al 2006) und Vorschläge personalisierter Besichtigungstouren für Touristen (vgl. Roether und Zipf 2002).

2 RAUMBEZOGENE ENTSCHEIDUNGSUNTERSTÜTZUNG BEI DER IMMOBILEN-MARKTBEWERTUNG

Zielsetzung des Projektes ist die Entwicklung eines Web-SDSS (Spatial Decision Support System) zur Automatisierung der multikriteriellen Modellbildung für nutzerspezifische regionalisierte Wohnungsmarktanalysen in Rheinland Pfalz. Um die Akteure und Entscheider aus Politik, Wirtschaft und Verwaltung bei der Einschätzung und Bewertung des regionalen und lokalen Wohnungsmarktes hinreichend zu unterstützen, soll ein über die begrenzte Leistungsfähigkeit bisheriger Wohnungsmarktbeobachtungsysteme weit hinausgehendes online-basiertes multifunktionales Online-Analyse- und Informationssystem geschaffen werden. Um das Ziel einer bedarfsgerechten Entscheidungsunterstützung zu erreichen, ist die Entwicklung eines EDV-Auswertungstools notwendig, welches den Nutzern nicht nur einen schnellen Zugriff auf alle relevanten Wohnungsmarktinformationen bietet, sondern gleichzeitig ein möglichst flexibles Auswertungs- und Analyseinstrumentarium bereitstellt. Mit der Durchführung des Projektes WebSDSS RLP soll eine Reihe von Zielen erreicht werden. Hierzu zählen u.a.:

- Situation auf dem regionalen Wohnungsmarkt in RLP analysieren und beschreiben
- Räumliche Abgrenzung der Wohnungsteilmärkte vornehmen
- Orientierung nicht alleine an Gemeinde-, Landes- und Bundesgrenzen
- Die Bildung der Teilmärkte soll wissenschaftlich abgesichert werden
- Prognose der künftigen Entwicklung im rheinland-pfälzischen Wohnungsmarkt
- Regelmäßige Fortschreibung der regionalisierten Wohnungsmarktbeobachtung

Zu den wesentlichen Anforderungen an die durchgeführten Analysen gehören u.a. Zeitvergleiche und

Teilmarktvergleiche (z.B. Gemeinden gleichen Siedlungsstrukturtyps). In einem ersten Schritt wurde eine Datenbank konzipiert und erstellt, in der alle relevanten verfügbaren Informationen zum Wohnungsmarkt in Rheinland-Pfalz zentral gesammelt und sowohl nach inhaltlichen als auch räumlichen Kriterien abgelegt werden können (Kehl 2005, Helsper et al 2005). Sie ist um weitere Daten erweiterbar, sobald diese vorliegen. Zusätzlich ist eine Ergänzung durch primärstatistische Daten vorgesehen. Dabei sind sowohl die Einschätzung von Experten (Trendmonitor) wie auch Wohnwünsche und Standortentscheidungen der Bevölkerung (Motivforschung) als wesentliche Bausteine einer geplanten Prognose anzusehen. Ein Web-Portal bietet autorisierten Nutzern die Möglichkeit, online Abfragen an die Datenbank zu stellen bzw.

bestimmte Funktionalitäten des GIS zu nutzen. In einer ersten Auswertungsstufe besteht die Möglichkeit, vorgegebene räumliche Strukturen (Verbandsgemeinde, Kreis, Land, etc.) auszuwählen.

Ziel des Projekts ist es, ein durch den Einsatz freier Software kostengünstiges, verallgemeinerungsfähiges SDSS zur Analyse des Wohnungs- und Immobilienmarktes in Rheinland-Pfalz zu entwickeln, das auch auf weitere Projekte (und natürlich auch Regionen) erweiterbar und anwendbar ist. Dazu sollen die einzelnen Komponenten so weit wie möglich wieder verwendbar sein und Standards wie die der OGC (Open GeoSpatial Consortium) und des W3C (World Wide Web Consortium) eingesetzt werden. Durch die Einbeziehung von GIS-Funktionalität können räumliche Analysen durchgeführt und die Ergebnisse in Form von thematischen Karten präsentiert werden. Eine wesentliche Anforderung besteht dabei in einer größtmöglichen Unabhängigkeit von vorgegebenen Administrations- und Aggregationsebenen.

3 DER ACCESSIBILITY ANALYSIS SERVICE (AAS)

Als ersten Webdienst, der eine für unser Szenario typische und in vielen Planungs- und Standortanalyse relevante GIS Analyse durchführt, wurde ein Dienst implementiert, der die Erreichbarkeit von Regionen von einer vorzugebenden Location (Standort) aus berechnet. Aktuell ist der Dienst als Webservice mit XML-Schema für die Anfrage und Antwortparameter spezifiziert und in seiner ersten Version in Java implementiert. Wir nennen den Dienst Accessibility Analysis Service (AAS). Die in diesem Dienst realisierte Erreichbarkeitsanalyse bestimmt ein Gebiet als Polygon, das von einem als Parameter zu übergebenden Ort (z.B. einer Stadt oder einem Point of Interest, oder zukünftig auch einer Adresse) auf Basis eines attributierten Strassengraphens diejenige Orte und Strassenabschnitte ermittelt, die innerhalb einer vorgegebenen Zeit oder einer metrischen Distanz erreicht werden können. Hieraus wird dann mittels mehrerer unterschiedlicher Verfahren eine Fläche berechnet. Die drei zur Zeit vorgesehenen Alternativen zur Berechnung dieser Fläche (Isolinien, Buffer, Konvexe Hülle) werden hier vorgestellt und diskutiert. Das Besondere des hier vorgestellten AAS ist aber, dass mit dem AAS nicht nur Gebiete der Erreichbarkeit ermittelt werden können, sondern auch Zeiten und Entfernungen, z.B. der Orte und Städte die sich innerhalb des möglichen Gebietes befinden. Zugleich können Karten mit unterschiedlichen Darstellungsformen des Erreichbarkeitsgebietes erstellt werden. Wir werden uns zunächst auf die Spezifikation des Dienstes konzentrieren und die vorgeschlagenen Requests und Response Parameter zur Nutzung des Webdienstes diskutieren. Da die Erreichbarkeitsanalyse hier als Netzwerkanalyse auf einem Straßengraphen realisiert ist, und für Routenplanung im Rahmen des Open Geospatial Consortiums OGC eine Spezifikation der OpenLS (Open Location Services) Initative vorliegt, haben wir uns bei der Definierung der XML-Schema für den AAS stark an diejenige der OpenLS Spezifikationen angelehnt. In unserer ersten Implementierung wird aufgrund der Performancegewinnung ein OpenLS Route Service intern genutzt. Es wäre aber auch möglich einen ferngelegenen OGC OpenLS konformen Route Service für die Netzwerkanalyse zu nutzen. Zur Zeit wird im OGC die Spezifikation des sogenannten Web Processing Service (WPS) vorangetrieben (vgl. Heier et al 2006, Kiehle et al. 2006, Stollberg 2006). Gegen Ende des Jahres kann zwar mit einer Version 1.0 der Spezifikation gerechnet werden, jedoch ist diese noch so allgemein gehalten, dass wir zunächst die Definition eines eigenständigen Dienstes für sinnvoller erachtet haben – insbesondere, da es sich um so einen sehr grundlegende GIS-Analysetypus handelt und die einfließenden Parameter recht vielfältig sein können. Nach einer zukünftig geplanten Evaluierung der dann stabilen WPS-Spezifikation ist eine Anpassung an diese immer noch möglich – insbesondere, da hierzu ebenfalls XML-Schema genutzt werden.

4 ERREICHBARKEITSANALYSEN

Erreichbarkeitsanalysen haben in der GI Forschung eine lange Geschichte (vgl. Juliao 1998, Miller 1999, De Jong et al. 2001) und sind mit Interaktionsmodellierung verwandt (vgl. Wilson 1971). Hierzu bestehen eine Reihe verscheidener Definitionen. Außerdem sind diverse mehr oder weniger komplexe Modelle verfügbar. In unserem ersten Szenario wird kein besonders komplexes Erreichbarkeitsmodell (z.B. im Sinne einer Interaktionsmodellierung) benötigt. Es soll lediglich ermittelt werden welche Gebiete innerhalb einer gegebenen Zeit von einem bestimmten Ort aus erreichbar sind. D.h. im Rahmen des Projektes und des hier vorgestellten Erreichbarkeitsdienstes nutzen wir diese vereinfachte Definition von Erreichbarkeit. Diese ist von der Funktion her sehr ähnlich zu dem bekannten GIS-Werkzeug “Find Service Area” (vgl. Zipf & Röther 2000 für eine Erläuterung und Anwendung) der “Network Analyst” Extension von ESRI ArcGIS. Als “Service Areas” werden hier polygonale Gebiete bezeichnet, die alle von einem oder mehreren Orten (z.B.

Geschäftsfilialen) in einer vorgegebenen Zeit erreichbaren Strassenabschnitten und Orten liegen. Als Impedanz (Widerstandswert einer Kante) wird hier die vom Strassentyp und Fortbewegungsart (Verkehrsmodalität) abhängige Zeitdistanz verwendet. Mit Hilfe einer Erreichbarkeitsanalyse kann also für einen Standort ein Gebiet ermittelt werden, welches innerhalb einer vorgegeben Zeit erreichbar ist.

5 ARCHITEKTUR DES AAS

Der AAS ist ein Java Servlet. Er ist ausschließlich über HTTP-POST und XML ansprechbar. Die für Requests und Responses benötigten XML-Dateien werden anhand von XML-Schema-Dateien erstellt. Für die graphische Darstellung wird ein SLD1.1.0-fähiger Web Map Service (WMS) genutzt. SLD (Styled Layer Descriptor) ist eine OGC Spezifikation für das Format von Visualisierungsvorschriften für Karten (gedacht als Ergänzung zu WMS und WFS). Mit Hilfe des in Version 1.1.0 verfügbaren SLD Inline-Features wird das Polygon der Erreichbarkeit im Request als GML kodiert an den WMS übertragen. Somit müssen keine Layer oder Features nach der Berechnung neu auf einem WFS fest gespeichert werden, sondern es kann die Übergabe des berechneten Erreichbarkeitspolygons an den WMS dynamisch erfolgen.

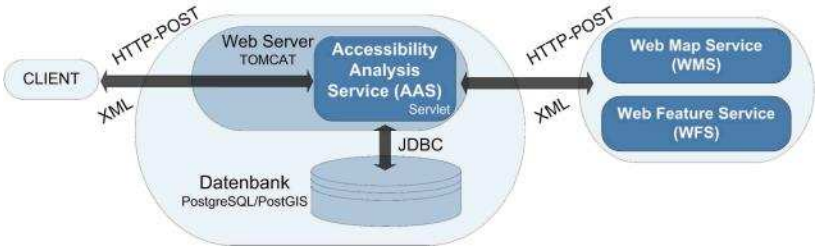

Abbildung 1: Architektur des Accessibility Analyse Service (AAS)

Das Straßennetz, um den Graphen zu erstellen auf dem geroutet werden soll, ist in einer PostgreSQL / PostGIS Datenbank gespeichert. Der Graph wird beim Initialisieren des Servlets erstellt. Bei Ermitteln der Fahrzeiten wird der Dijktra-Shortest-Path-Algorithmus (Dijkstra 1956) verwendet. Eine XML-basierte Konfigurationsdatei enthält die Parameter für die Herstellung der Datenbankanbindungen.

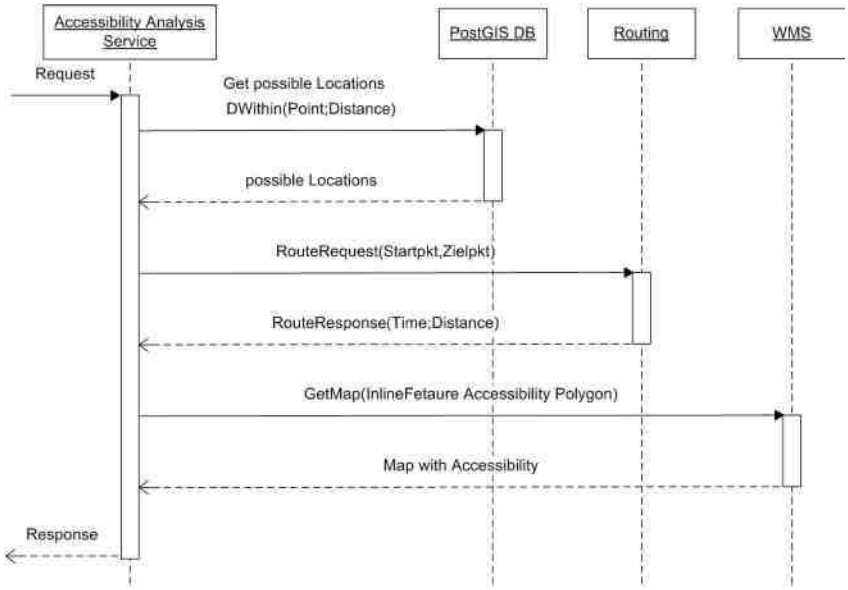

Abbildung 2: UML Sequenz-Diagramm des AAS im Zusammenspiel mit anderen OWS

Um Erreichbarkeitsanalysen durchführen zu können, werden verschiedene Daten benötigt: Detaillierte und routing-fähige Straßen- und Wegenetze incl. deren Attribute, wie Fahrbahntyp oder Zeit sind die Wichtigsten.

Name:	edgeid	strname	oneway	strtyp	the_geom
Datentyp:	Integer	String	String	Integer	Geometry
Inhalt:	28	Am Stollenbach	TF	1	MULTILINESTRING(…)

Tabelle 1: Aufbau der Tabelle für den Graphen

oneway Eigenschaft		
ft – from > to , in Digitalisierungsrichtung	TF – To > From , gegen die Digitalisierungsrichtung	" " – beide Richtungen erlaubt

Tabelle 2: oneway Eigenschaft

In seiner ersten Version wurde der AAS so implementiert, daß er die Erreichbarkeiten von verschiedenen Standorten (Orte und Städte) zum angegeben Standort ermittelt. Diese Tabelle könnte aber auch durch einen andere, z.B. eine Tabelle mit Point-Of-Interests (POI) ausgetauscht werden. Im Moment wird zudem der OpenLS Geocoder-Dienst implementiert, so dass in Kürze auch eine Nutzung von Adressen auf diese standardisierte Weise erfolgen kann.

6 BERECHNUNG DES ERREICHBARKEITS-GEBIETES

Die Berechnung des Errreichbarkeits-Gebietes erfolgt über die Bildung und Verschneidung eines Geländemodells. Als erstes wird eine 3D-Punktwolke erstellt. Jeder 3D-Punkte erhält dabei die Lagekoordinate der Location (Ort/Stadt). Der Zeitwert, in welcher die Location zu erreichen ist, wird jedem 3D-Punkt zusätzlich als Höheninformation zugewiesen. Diese 3D-Punktwolke wird anschließend mit Hilfe der Delaunay Triangulation vermascht und somit entsteht ein Geländemodell. Der niedrigste Punkte im Gelände ist der Standort von der aus das Erreichbarkeits-Gebiet ermittelt werden soll. Er erhält die Höhe null. Die anderen Punkte besitzen eine immer größere Höheninformation umso weiter sie vom Standort entfernt sind. Somit kann man sich das Geländemodell als eine Art Trichter vorstellen.

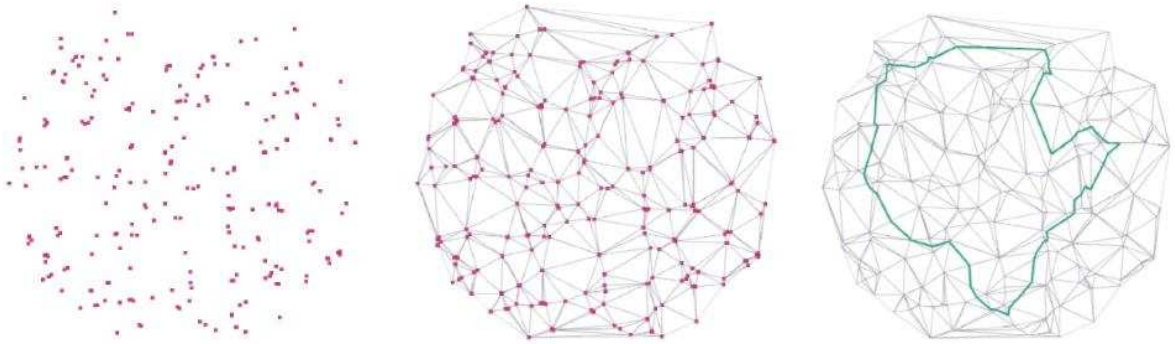

Abbildung 3: a) Punktwolke b) vermaschte Punktwolke c) Höhenlinie (Polygon) im Geländemodell

Aus dem erstellten Geländemodell können anschließend Höhenlinien ermittelt werden. Dabei wird eine Art Schnitt durch das Gelände berechnet. Die Höhe der resultierenden Höhenlinie entspricht dabei der Zeit in der das Gebiet, das durch die Höhenlinie gebildet wird, zu erreichen ist. Die Genauigkeit bei dieser Berechnung kann zusätzlich noch erhöht werden, wenn die Knoten des Straßennetzen noch in die Punktwolke mit aufgenommen werden. Allerdings darf dabei nicht der Mehraufwand vernachlässigt werden, der benötigt wird, um die dichtere Punktwolke zu vermaschen und die Höhenlinie zu berechnen.

7 REQUEST UND RESPONSE PARAMETER DES AAS

Im Folgenden wir die Schnittstelle des Web-Dienstes vorgestellt. Es handet sich dabei um ein XML-Schema (.xsd), das in unserem Projekt in Anlehnung an die entsprechenden XML-Schemata der OpenLS Spezifikation entwickelt wurde. So können dem RequestHeader-Element verschiedene Attribute angegeben werden, die z.B. für die Autorisierung oder Gebührenerhebung wichtig sein können. Der DetermineAccessibilityRequest (Abbildung 4) beinhaltet die eigentliche Anfrage an den Erreichbarkeitsdienst:

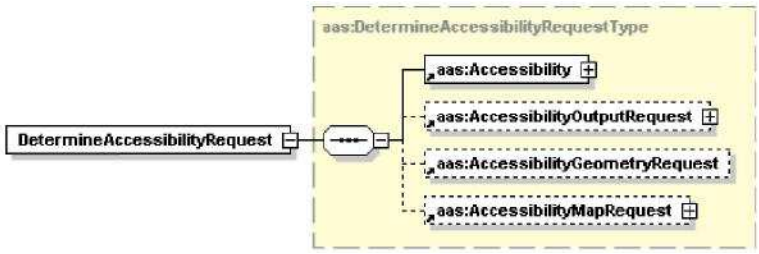

Abbildung 4: Schematische Darstellung des DetermineAccessibilityRequest-Schemas

Das Element Accessibility enthält die wesentlichen Parameter für die Erreichbarkeitsanlyse. Mit dem optionalen Element AccessibilityOutputRequest können detailierte Informationen zur Erreichbarkeitsanalyse angefordert werden. Mittels des optionalen Elements AccessibilityGeometryRequest wird die Geometrie des Polygons (DetailedPolygon oder ConvexPolygon) oder die der betroffenen Straßen (StreetsGeom), für welche die Erreichbarkeit ermittelt wurde, zurückgegeben. Schließlich können mit AccessibilityMapRequest Karten, die das Ergebnis der Erreichbarkeitsanlyse beinhalten, angefordert werden.

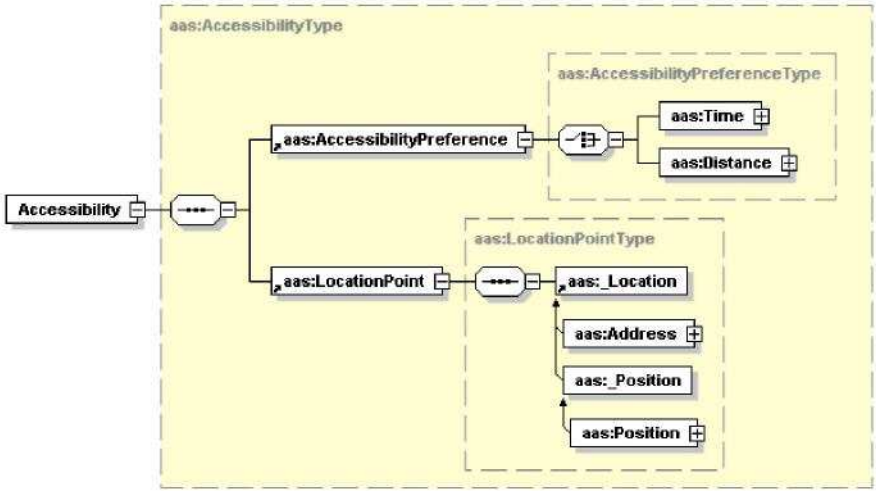

Abbildung 5: Schematische Darstellung des Accessibility-Schemas

Das Accessibilty-Element (Abbildung 5) enthält die Parameter AccessibilityPreference und LocationPoint. Ersteres (Abbildung 6) definiert das Maß auf Basis dessen die Erreichbarkeiten berechnet werden sollen: z.Zt. stehen „Zeit“ oder „Entfernung“ zur Auswahl. LocationPoint ist die Angabe des Standorts, von welchem die Erreichbarkeiten ermittelt werden sollen. Es bestehen zur Zeit zwei Möglichkeiten: Address oder Position. Denkbar wäre zusätzlich noch ein Point of Interest (POI).

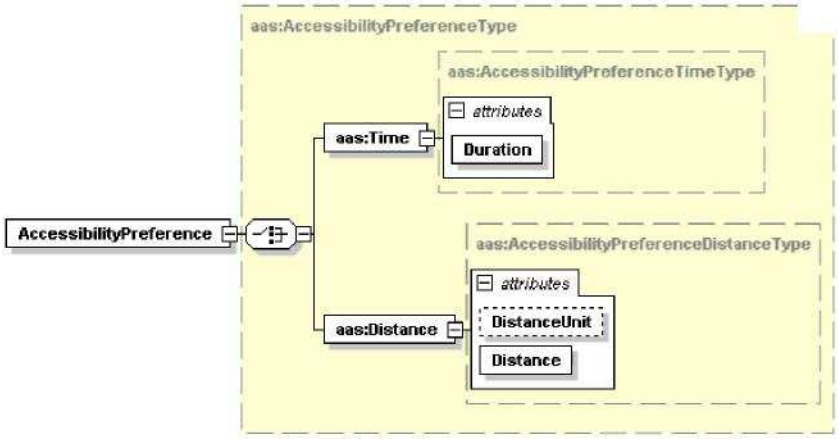

Abbildung 6: Schematische Darstellung des AccessibilityPreference-Schemas

Im AccessibilityOutputRequest-Element (Abbildung 7) können mehrere Angaben gemacht werden welche Informationen nach Beendigung der Analyse zurückgegeben werden: Wenn das Attribut Name=“true“ ist, wird der Name der Location zurückgegeben. Falls Time=“true“ und/oder Distance=“true“, wird die Zeit und/oder die Strecke in der die Location erreichbar ist, zurückgegeben. DistanceUnit bestimmt die

Längeneinheit in der Response erfolgen soll. Standard ist „M“ für Meter. Andere Möglichkeiten sind: „KM“, „DM“, „MI“, „YD“ oder „FT“. Mit Coordinate=“true“ wird die Koordinate der Location zurückgegeben.

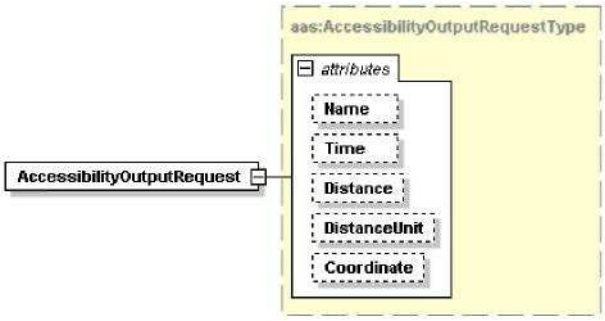

Abbildung 7: Schematische Darstellung des AccessibilityOutputRequest-Schemas

Das AccessibilityMapRequest-Element (Abbildung 8) enthält mindestens eins oder mehrere Output-Elemente. Dieses steht jeweils für die Anfordererung einer Karte mit der Darstellung des Erreichbarkeits-Gebietes. Die Attribute die in dem Element angegeben werden können, sind ähnlich wie bei einem GetMap-Request an einem Web Mapping Service (WMS). Eine Besonderheit ist das Attribut AccessibilityMapPreference. Über dieses Attribut kann angegeben werden wie das Erreichbarkeits-Gebiet in der Karte dargestellt werden soll. Es gibt drei Möglichkeiten: ConvexPolygon, DetailedPolygon oder StreetsBuffer. Des Weiteren kann eine BBox für die Karte im Output-Element angegeben werden.

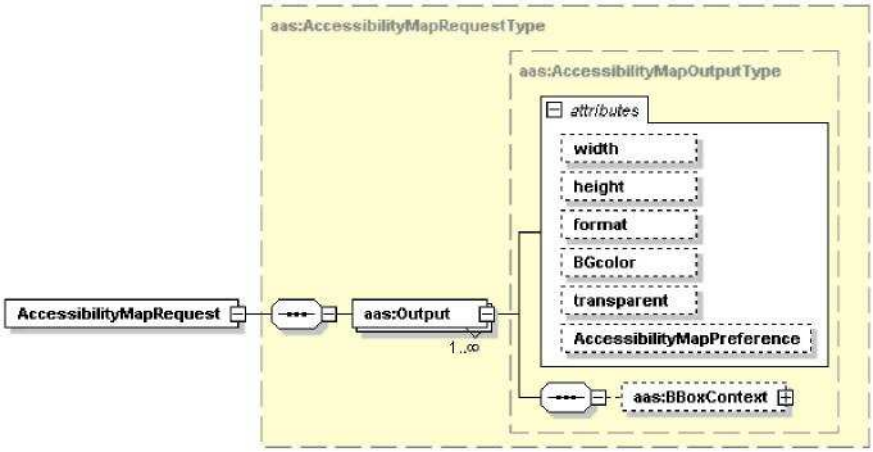

Abbildung 8: Schematische Darstellung des AccessibilityMapRequest-Schemas

7.1 Die Antwort des AAS – die Response Parameter

In der AccessibilityResponse (Abbildung 9) befinden sich schließlich die Ergebnisse der Berechnung.

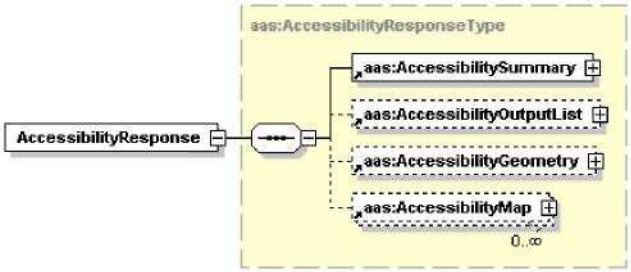

Abbildung 9: Schematische Darstellung des AccessibilityResponse-Schemas

Das Element AccessibilitySummary beinhaltet die Anzahl der Locations, die sich im Polygon befinden und die rechteckige Hülle des Ergebnispolygons der Erreichbarkeitsanalyse (als BoundingBox). In dem optionalen Element AccessibilityGeometry befindet sich die Geometrie des Gebiets der Erreichbarkeitsanalyse als GML-Polygon oder als GML-LineStrings der betroffenen Straßen. Die AccessibilityMap beinhaltet Informationen wie z.B. Breite, Höhe und Format der Karte - insbesondere aber die URL unter der die Karte gefunden werden kann. In der optionalen AccessibilityOutputList (Abbildung 9

& 10) finden sich Informationen zu den in der vorgegebenen Zeit erreichbaren Locations. Es werden dabei optional ID, Name, Distanz, Zeit und die Koordinaten der erreichbaren Location ausgegeben.

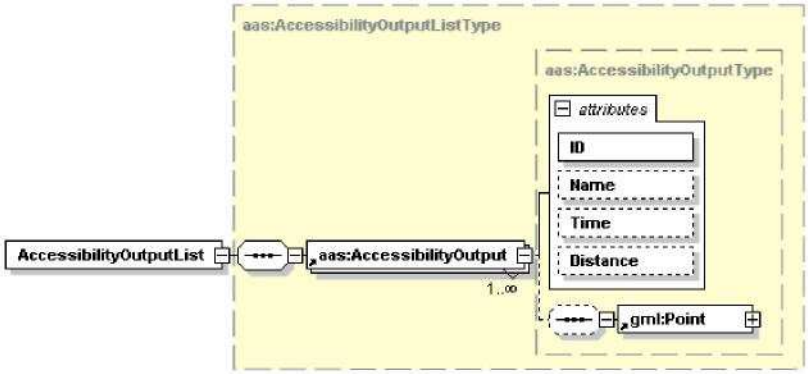

Abbildung 10: Schematische Darstellung des AccessibilityOutputList-Schemas

8 PROTOTYP DER WEB-OBERFLÄCHEN FÜR DEN AAS

In den folgenden beiden Abbildungen ist der erste Prototyp der Test-Nutzeroberfläche dargestellt. Im Moment wird der Dienst in das Immobilienbeobachtungsportal für Rheinland-Pfalz REWOB (www.rewob.de) integriert. Erste Benutzertests werden dann erfolgen.

Abbildung 11: Prototyp der Web-Oberfläche für den AAS (Request)

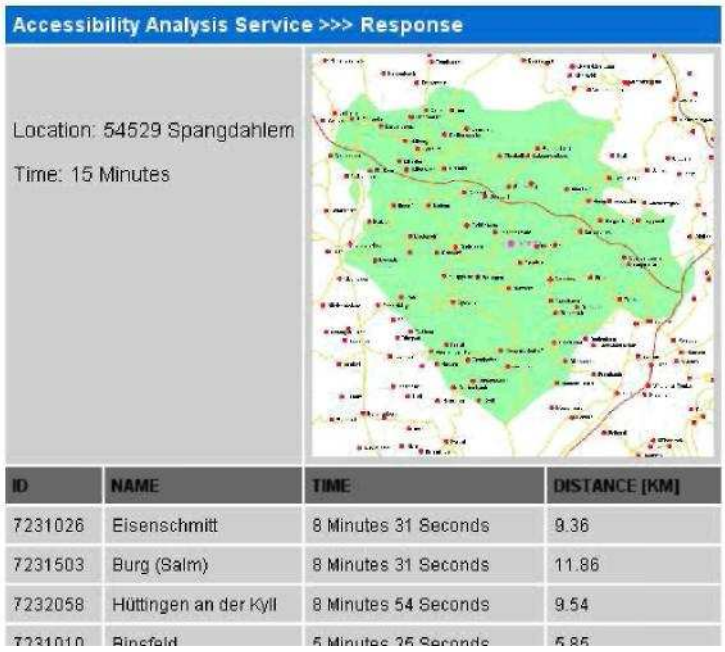

Abbildung 12: Prototyp der Web-Oberfläche für den AAS (Response)

9 BEISPIELE FÜR ANFRAGE UND ANTWORT

Im Folgenden werden zwei Beispiele für jeweils eine Anfrage an und eine Antwort vom AAS dargestellt. AAS Request mit Zeit als Accessibility Preference und einer Koordinate als LocationPoint:

```
<?xml version="1.0" encoding="UTF-8"?>
<aas:AAS xmlns:aas="http://www.geoinform.fh-mainz.de/aas" xmlns:sch="http://www.ascc.net/xml/schematron"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.geoinform.fh-mainz.de/aas AccessibilityService.xsd" version="1.1">
 <aas:RequestHeader/>
 <aas:Request methodName="AccessibilityRequest" requestID="123456789" version="1.0">
  <aas:DetermineAccessibilityRequest>
   <aas:Accessibility>
    <aas:AccessibilityPreference>
        <aas:Time Duration="PT0H5M00S"></aas:Time>
    </aas:AccessibilityPreference>
    <aas:LocationPoint>
        <aas:Position>
          <gml:Point srsName="EPSG:31466"><gml:pos>2550071.41 5538142.639</gml:pos></gml:Point>
        </aas:Position>
    </aas:LocationPoint>
   </aas:Accessibility>
   <aas:AccessibilityOutputRequest Coordinate="true" Distance="true"  DistanceUnit="KM" Name="true" Time="true"/>
   <aas:AccessibilityGeometryRequest>
        <aas:PolygonPreference>Detailed</aas:PolygonPreference>
   </aas:AccessibilityGeometryRequest>
   <aas:AccessibilityMapRequest>
        <aas:Output format="png" height="400" width="400" AccessibilityMapPreference="ConvexPolygon"></aas:Output>
   </aas:AccessibilityMapRequest>
  </aas:DetermineAccessibilityRequest>
 </aas:Request>
</aas:AAS>
```

AAS Response (vereinfacht):

```
<?xml version="1.0" encoding="UTF-8"?>
<aas:AAS xmlns:aas="http://www.geoinform.fh-mainz.de/aas" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gml="http://www.opengis.net/gml" version="1.0" xsi:schemaLocation="http://www.geoinform.fh-mainz.de/aas AccessibilityService.xsd">
 <aas:ResponseHeader xsi:type="aas:ResponseHeaderType"/>
 <aas:Response xsi:type="aas:ResponseType" requestID="123456789" version="1.0">
  <aas:AccessibilityResponse xsi:type="aas:AccessibilityResponseType">
   <aas:AccessibilitySummary>
    <aas:NumberOfLocations>3</aas:NumberOfLocations>
    <aas:BoundingBox srsName="EPSG:31466">
     <gml:pos>2546502.199 5535618.498</gml:pos><gml:pos>2550036.034 5541698.434</gml:pos>
    </aas:BoundingBox>
   </aas:AccessibilitySummary>
   <aas:AccessibilityOutputList>
    <aas:AccessibilityOutput ID="7232228" Name="Gelsdorf" Time="PT4M23S" Distance="3.49">
     <gml:Point srsName="EPSG:31466"><gml:pos>2547899.87 5541698.43</gml:pos></gml:Point>
    </aas:AccessibilityOutput>
    <aas:AccessibilityOutput ID="7232311" Name="Spangdahlem" Time="PT1M44S" Distance="1.19">
     <gml:Point srsName="EPSG:31466"><gml:pos>2548800.57 5538987.74</gml:pos></gml:Point>
    </aas:AccessibilityOutput>
   </aas:AccessibilityOutputList>
   <aas:AccessibilityGeometry>
    <gml:Polygon srsName="EPSG:31466">
     <gml:exterior>
      <gml:LinearRing xsi:type="gml:LinearRingType">
       <gml:pos>2548946.25 5535618.50</gml:pos>
       <gml:pos>2546576.97 5536922.90</gml:pos>
          .....
       <gml:pos>2550036.03 5540042.90</gml:pos>
       <gml:pos>2548946.25 5535618.50</gml:pos>
      </gml:LinearRing>
     </gml:exterior>
    </gml:Polygon>
   </aas:AccessibilityGeometry>
   <aas:AccessibilityMap description="MapNumber: 1 - DetailedPolygon">
    <aas:Map>
     <aas:Content format="png" height="400" width="400">
      <aas:URL>http://localhost:8080/accessibility/maps/1168953483796_1.png</aas:URL>
     </aas:Content>
     <aas:BBoxContext srsName="EPSG:31466">
      <gml:pos>2546502.199 5535618.498</gml:pos><gml:pos>2550036.034 5541698.434</gml:pos>
     </aas:BBoxContext>
    </aas:Map>
   </aas:AccessibilityMap>
  </aas:AccessibilityResponse>
 </aas:Response>
</aas:AAS>
```

10 BERECHNUNG DES ERREICHBARKEITS-POLYGONS

Die Berechnung der Erreichbarkeits-Gebietes geschieht stets liber die Isolinienberechnung. Die Ergebnisse können in einer Karte angezeigt werden und/oder als Geometrie zuriickgegeben werden. Falls die betroffene Strafiengeometrie abgefragt wird, so erfolgt eine Verschneidung zwischen dem Erreichbarkeits-Polygon und

dem StraBennetz. Falls eine konvexe gefordert ist, wird aus dem Erreichbarkeits-Polygon, von der Isolinienberechnung, eine konvexe Hiille berechnet. Die folgenden Abbildungen zeigen die unterschiedlichen Varianten, mit denen das Erreichbarkeits-Gebiet in einer Karte dargestellt werden kann.

Abbildung 13: Beispiele für 3 Ergebniskarten mit unterschiedlichen Verfahren zur Darstellung des Erreichbarkeitspolygons a.) gepufferte Strassengeometrie, b.) Isolinienberechnung c.) konvexe Hülle

11 ZUSAMMENFASSUNG UND AUSBLICK

Mit dieser Arbeit wird ein bisher vernachlässigtes Kapitel der Geoinformatik berührt: die Definiton, Umsetzung und nachfolgende Standardisierung von Webdiensten für typische GIS-Analysen wie Erreichbarkeitsanalysen basierend auf Strassennetzen. Gerade diese sind aus vielen GIS-Anwendungen kaum wegzudenken. Bisher liegt jedoch kein entsprechender Standard (z.B. beim OGC) vor. Aktuell wird der Dienst in das Immobilienbewertungsportal für Rheinland Pfalz (www.rewob.de) integriert. Zusammenfassend kann man sagen, dass WebGIS erst mit den nun so langsam entstehenden Analysefunktionen sein volles Potential entfaltet und mehr ist als nur Webmapping. Zukünftig wäre zu prüfen ob diese Funktionlität auch über Web Processing Service (WPS) Schnittstelle des OGC sinnvoll abgebidet werden kann. Im Moment erscheint uns die WPS Schnittstelle als noch zu unausgereift, da sie als generischer Wrapper für beliebige Dienste fungiert. Dies widerspricht unserer Vorstellung eines speziellen GIS-Analyse-Dienstes. Allerdings ist dieser Mangel der WPS-Spezifikation erkannt, so dass zukünftige Versionen sicherlich bessere Kandidaten für eine Umsetzung darstellen. Allerdings übersteigt dies den Zeithorizont des hier vorgestellten Projektes. Die Ergebnisse des implementierten AAS hängen natürlich stark von den eingesetzten Daten ab. Zu Testzwecken wurden Daten von verschiedenen Herstellern getestet. Generalisierte oder nicht vorhandene Straßen ergaben dabei natürlich unterschiedliche Ergebnisse. Diese spiegelten sich in der Zeit und Entfernung, in der die Location erreichbar sind und im berechneten Erreichbarkeits-Polygon nieder. Im Folgenden werden einige aktuelle und zukünftige Anwendungsfälle des realisierten Erreichbarkeitsanalysedienstes vorgestellt. Sie zeigen, dass neben der urspünglichen Aufgabe im Rahmen der skizzierten Wohnungsmarktanalyse allein schon im Rahmen unserer eigenen bestehenden Projekte zahlreiche Einsatzszenarien Sinn machen. Daneben gibt es natürlich eine Vielzahl weiterer Nutzungsmöglichkeiten in den unterschiedlichsten Domänen.

11.1 Einbindung in die Regionalisierte Wohungsmarktbeobachtung RLP (REWOB)

Der AAS soll unter www.rewob.de (vsgl. Helsper et al 2005) verschiedenentlich zum Einsatz kommen1[163]: zum einem als ein eigenständiges Werkzeug, um die Erreichbarkeit um einen Standort zu ermitteln und sie zu visualisieren, andererseits um mit dem Ergebnis der Erreichbarkeitsanalyse weitere Analysen durchführen zu können. Beispielsweise können mit dem resultieren Erreichbarkeits-Polygon und der Liste der ereichbaren Orte (Locations, incl. deren Attribute in welcher sie zu erreichen und wie weit sie weg liegen) weitere Suchbedingungen oder Folgeanalysen angewandt werden.

11.2 Verwendung des AAS im Bereich Katastrophenmanagement

Im Bereich des Katastrophenmanagements (www.okgis.de) kann der AAS zur Berechnung von Erreichbarkeiten in verschiedener Weise zum Einsatz kommen. Zum Beispiel könnte er zur Prävention genutzt werden, um die Verfügbarkeit von Einsatzkräften auf ein vorhandenes Gebiet abschätzen zu können. Konkrete Sze-

[163] Die Umsetzung der Einbindung wird im Moment durchgeführt. Erste Resultate sollten diesbzgl. bis zur Konferenz vorliegen

narien hierzu werden erarbeitet und sollen im Laufe des Projektes OK-GIS umgesetzt werden. Wird dabei zusätzlich ein Emergency Route Service (ERS) (Neis 2006) im AAS zum Einsatz kommen, können Einsatzkräfte ihr Erreichbarkeits-Gebiet zudem unter Berücksichtigung aktuell gesperrter Gefahrengebiete und gesperrter Straßen ermitteln lassen.

11.3 Berechnung individualisierter Tourenvorschläge für Besichtigungstouren

Im Rahmen des Projektes DEEP MAP (Malaka & Zipf 2000) wurden personalisierte ortsbezogene Anwendungen für ein Touristeninformationssystem entwickelt. Hierzu zählte insbesondere die innovative Idee, mittels GIS Vorschläge für individuelle Besichtigungstouren auf Basis der persönlichen Interessen und Vorlieben der Touristen und der verfügbaren Zeit berechnen zu lassen. Zipf und Röther stellen 2000 eine Realisierung auf Basis eines Desktop GIS vor. Hierbei werden ebenfalls ERreichbarkeitsanalysen als ein Baustein im Gesamtalgorithmus verwendet. Touristen können sich dabei den in der gegebenen Zeitspanne überhaupt erreichbaren Gebiete und darin die ihn interessierdenden POIs anzeigen lassen. Aus diesem Zwischenergebnis werden wiederum die Besichtigungstour erstellt. Das Verfahren wird später Durch Schilling & Jöst mittels einer eigenen Implementierung eines Proce-Collecting Travelling Salesman Algorithmus verfeinert. Die Version von Roether und Zipf kann mittels der nun vorliegenden AAS Implementierung für die Erreichbarkeitsanalyse in Kombination mit OGC Diensten wie WFS, WMS und insbesondere dem OpenLS Route Service statt mittels Desktop GIS auch als weitestgehend OGC konforme Webanwendung umgesetzt werden. Da zusätzlich in einem aktuellen Projekt zu 3D Geodateninfrastrukturen (www.3d-gdi.de) am Beispiel von Heidelberg auch 3D-Stadtmodelle OGC-konform über einen Web 3D Service (Schilling et al 2007) angeboten werden und der OpenLS Route Service hierzu zusätzlich zu einem 3D Route Service (Neis et al 2007) erweitert wurde, der die Route auf ein DGM abbilden kann, kann dieses Szenario auch in die dritte Dimension erreicht werden. Das Resultat wäre eine personalisierte 3D Besichtigungstour (vgl. Malaka und Zipf 1999) – allerdings auf Basis OGC konformer Dienste.

12 DANKSAGUNG

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13 LITERATUR

Dijkstra, E. W.: A note on two problems in connexion with graphs. In: Numerische Mathematik. 1 (1959), S. 269271. 1959.

Heier, C. und Kiehle, C.: "Automatisierte Liegenschaftsauskunft mittels OGC Web Processing Service", erschienen in: GIS, Ausgabe 07/2006, ABC Verlag, Heidelberg, S. 12-16

Helsper, R., Kehl, A., Mayer, T., Röss, W., Zipf, A. (2005): Ein GIS-basiertes Web-Portal für die regionalisierte Wohnungsmarktbeobachtung in Rheinland-Pfalz als Basis für ein Spatial Decision Support System (SDSS). AGIT 2005. Symposium für Angewandte Geographische Informationstechnologie. Salzburg.

Jong, T. de, J.Maritz & J. Ritsema van Eck (2001): Using optimisation techniques for comparison of the accessibility criteria of facility siting scenarios; a case study of siting police stations in South Africa's Bushbuckridge area. In: Proceedings of the 4th Agile conference on Geographic Information Science, Masaryk University Brno, Czech Republic.

Juliao, R.P. (1998): Measuring Accessibility: a GIS based methodology for accessibility evaluation, in GIS PlaNET'98 Proc., USIG.

Kehl, A. (2005): Ein GIS-gestütztes Immobilienportal für die regionalisierte Wohnungsmarktbeobachtung (ReWoB) Rheinland-Pfalz. Diplomarbeit. FH Mainz.

Kiehle, C.; Greve, K.; Heier, C. (2006): Standardized Geoprocessing - Taking Spatial Data Infrastructures one Step Further. Proceedings AGILE 2006: 273-282.

Malaka, R. and Zipf, A. (2000): DEEP MAP - Challenging IT research in the framework of a tourist information system. In: Fesenmaier, D. Klein, S. and Buhalis, D. (Eds.): Information and Communication Technologies in Tourism 2000. Proceedings of ENTER 2000, Barcelona. Spain. Springer Computer Science, Wien, New York. 15-27.

Miller H. J. (1999): Measuring space-time accessibility benefits within transportation networks: Basic theory and computational methods" In: Geographical Analysis, 31, 187-212.

Neis, P. (2006): Routenplaner für einen Emergency Route Service auf Basis der OpenLS Spezifikation. Diploma Thesis. University of Applied Sciences FH Mainz.

Neis, P., A. Schilling, A. Zipf (2007 accepted): 3D Emergency Route Service (3D-ERS) based on OpenLS Specifications. GI4DM 2007. 3rd International Symposium on Geoinformation for Disaster Management. Delft, The Netherlands.

Neis, P. (2007 in prep): Die OpenLS Core Services. Reihe: OpenGIS Essentials - Spezifikationen des OGC im Überblick. Hrsg: Andrae, C., Fitzke, J., Zipf, A. Wichmann Hüthig Verlag. Heidelberg.

OK-GIS Project Website: Offenes Katastrophenmanagement mit freiem GIS. http://www.ok-gis.de

OPENLS: OGC Open Location Services Version 1.1 http://www.opengeospatial.org/functional/?page=ols.

Schilling, A., Basanow, J., Zipf, A. (2007): VECTOR BASED MAPPING OF POLYGONS ON IRREGULAR TERRAIN MESHES FOR WEB 3D MAP SERVICES. 3rd International Conference on Web Information Systems and Technologies (WEBIST). Barcelona, Spain. March 2007.

Stollberg, B. (2006): Geoprocessing in Spatial Data Infrastructures - Design and Implementation of a Service for Aggregating Spatial Data. Diplomarbeit FH Mainz (Joint Research Centre Ispra, Italy)

Weiser, A., Zipf, A. (2007 accepted): Web Service Orchestration (WSO) of OGC Web Services (OWS) for Disaster Management. GI4DM 2007. 3rd International Symposium on Geoinformation for Disaster Management. Delft, The Netherlands.

Weiser, A., Neis, P., Zipf, A. (2006): Orchestrierung von OGC Web Diensten im Katastrophenmanagement - am Beispiel eines Emergency Route Service auf Basis der OpenLS Spezifikation. In: GIS - Zeitschrift für Geoinformatik. Abc-Verlag. 09/2006. pp. 35-41.

Wilson, A. G. (1971) “A family of spatial interaction models, and associated developments,” Environment and Planning A, 3, 1-32.

Zipf, A. & Röther, S. (2000): Tourenvorschläge für Stadttouristen mit dem ArcView Network Analyst. In: Liebig (Hrsg.)(2000): ArcView Arbeitsbuch. Hüthig Verlag. Heidelberg.

Zipf, A. and Malaka, R. (1999): Web-basierte Planung und animierte Visualisierung von 3D Besichtigungstouren im Rahmen des Touristeninformationssystems Deep Map. In: Zagel, B. (Hrsg.): GIS in Verkehr und Transport. Hüthig. Heidelberg.

🏆 *reviewed paper*

Metadaten für 3D-Stadtmodelle – Untersuchung der Eignung von ISO 19115 und Möglichkeiten der Erweiterung

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ZUSAMMENFASSUNG

3D Stadtmodelle gewinnen in Verwaltung und Wirtschaft an Bedeutung. Dementsprechend werden immer mehr 3D-Stadtmodelle auf Basis unterschiedlichster Methoden und Verfahren erstellt und zum Teil auch schon in Datenbanken verwaltet. Durch die Heterogenität der Entstehungsgecshichte und der verwendeten Daten kommt der Dokumentation der 3D-Stadtmodelle mittels Metadaten besonderer Bedeutung zu. Dies ist auch eine Grundvoraussetzung für die erfolgreiche Erstellung von 3D-Geodateninfrastrukturen. In diesen werden Metadaten zu Geodaten notwendigerweise zur Suche nach relevanten Datensätzen mittels auf Standards basierender Katalogdiensten benötigt. Daher ist zu untersuchen in wieweit die aktuellen Metadatenstandards den speziellen Anforderungen von 3D-Stadtmodellen genügen und ob und wo gegegebenenfalls Erweiterungen sinnvoll sein können. Daher wurde u.a. der Metadatensatz ISO 19115 (daneben Dublin Core, FGDC und CEN-TC287) bzgl. der Eignung zur Beschreibung von 3D-Stadtmodellen untersucht. Hierzu wurden die einzelnen Elemente des Standards kritisch daraufhin überpüft, ob sie für 3D-Geodaten und Stadtmodelle geeignet sind und welche weiteren Metainformationen wünschenswert wären, die nicht in den Standards zu finden sind. Die Ergebnisse werden vorgestellt und sinnvolle Erweiterungen vorgeschlagen. Hierbei wurde insbesondere auf den aktuellen OGC Diskussionsentwurf „CityGML“ (Quad und Kolbe 2005) Bezug genommen, da dieser versucht die Stuktur von 3D-Stadtmodellen semantisch zu beschreiben.

1 EINLEITUNG

Unter Metadaten ("Daten über Daten") versteht man bekanntlich strukturierte Daten, mit deren Hilfe Datenquellen beschrieben und dadurch besser auffindbar gemacht werden. Im Umfeld von Geodaten sind insbesondere ISO 19115, und als Vorläufer Dublin Core bzw. CEN-TC287 relevant, ind en USA va. der FGDC. Diese wurden auf ihre Eignung bzgl. der Verwendung für 3D-Stadtmodelle untersucht. In diesem Bericht wird v.a. auf die Ergebnisse bzgl. des für zukünftige nationale und europäische GDI besonders relevanten ISO 19115 eingegangen. Details zu den Ergebnissen bzgl. der anderen untersuchten Standards sind in Nonn (2006) zu finden.

Die International Standards Organisation (ISO) entwickelte einen Datenkatalog für GIS-Metadaten mit dem Ziel, eine Struktur für die Beschreibung von digitalen geografischen Daten zu definieren unter der Norm 19115. Diese Norm basiert auf einer Reihe von Vorgängerstandards (CEN, CSDGM) und einer Zusammenarbeit des ISO/TC 211 mit der FGDC und dem OGC.

Der ISO19115 Standard für Geodaten ist gleich dem CEN oder CSDGM in Sections eingeteilt, die inhaltlich verwand-te Elemente klassenähnlich bündeln. Eine Section (nämlich MD_Metadata) beinhaltet im Gegensatz zu den DC-Elementen sogar Metadatenelemente über die Metadaten selbst, d.h. hier werden auch die Metadaten durch die Anga-be deren Sprache, der Kodierung, des Erstellers usw. beschrieben. Aus dem gesamten 409 Elemente umfassenden Satz bzw. Datenkatalog muss für entsprechende Zwecke, z.B. dem Aufbau einer GDI (Geodateninfrastruktur) mit Catalog über spezielle Daten, eine Untermenge an brauchbaren ISO19115-Elementen durch Gremiensitzungen und langwieri-ge Entscheidungsprozesse herausgefiltert werden, um ein möglichst kompaktes und auf die eigenen Daten zugeschnit-tenes Metadatenschema anzubieten. Zu beachten gibt es hier, dass ISO

bestimmte, aussagekräftige Elemente als Hauptelemente deklariert und zu den so genannten core metadata (Mindest-umfang an Metadaten) zusammengefasst hat. Neben sieben verpflichtenden gibt es empfohlene optionale bzw. kondi-tionell verpflichtende Elemente, durch deren Einsatz die Interoperabilität gesteigert werden soll. Hierzu die Einteilung des ISO-Core-Satzes:

mandatory	verbindliche/verpflichtende Kernelemente: Dataset title, Dataset reference date, Abstract, Metadata point of contact, Metadata date stamp, Dataset language, Dataset topic category

conditional	bedingt notwendige Elemente (notwendig, falls andere bedingte oder optionale Elemente nicht angegeben wurden oder die Angabe nicht in einem best. Standard erfolgt): Geographic location, Dataset character set, Metadata character set, Metadata language
optional	optionale Elemente: Dataset responsible party, Spatial resolution (für Rasterdaten), Distribution format, Additional extent-temporal, Spatial representation, Reference system, Lineage, File identifier, Metadata standard name, Metadata standard version

Reicht das generische Modell der ISO-Metadaten nicht aus, so definiert der Standard für individuelle Lösungen ein Regelwerk mit vorgegebenen Strukturen, so dass standardgerechte Erweiterungen zu den ISO-Elementen hinzugefügt werden können und Teil eines neuen Application Profiles (Profil, Metadatenschema) werden.

1.1 Detaillierte Metadatenstruktur nach ISO19115

Als metadata entities bezeichnet man eine Menge von Metadaten, die den gleichen Aspekt beschreiben. Solche entities können Bestandteil einer übergeordneten Einheit sein oder selbst wiederum entities enthalten. In der UML Notation sind entities mit UML Klassen zu vergleichenn die Elemente einer entity mit UML Attributen. Nach Definition der International Standards Organisation werden Metadaten 14 verschiedenen Einheiten zugeordnet:

- MD_Metadata
- MD_Identification
- MD_Constraints
- DQ_DataQuality
- MD_MaintenanceInformation
- MD_SpatialRepresentation
- MD_ReferenceSystem
- MD_ContentInformation
- MD_PortrayalCatalogueReference
- MD_Distribution
- MD_MetadataExtensionInformation
- MD_ApplicationSchemaInformation
- EX_Extent
- CI_Citation

1.2 Metadata entity set information (MD_Metadata):

Die Metadata entity set information besteht aus der Entität MD_Metadata, welche die oberste Einheit bildet und ver-pflichtend ist. Die MD_Metadata Entität enthält sowohl notwendige als auch optionale Metadatenelemente. Die MD_Metadata Entität ist eine Aggregation zu den nachfolgend erklärten Paketen bzw. Klassen (entities):

1.3 Identification information (MD_Identification)

Metadaten, die der Einheit MD_Identification zugeordnet sind, enthalten Informationen, die eindeutig die Daten und den Datensatz identifizieren (Basisinformationen über den Datensatz). Sie beinhalten u.a. allgemeine Angaben zum Datensatz, eine kurze sachlich-inhaltliche Beschreibung des Datensatzes, eine zusammenfassende Beschreibung des Herstellungszwecks des Datensatzes, aktuellen Bearbeitungsstand der Daten und alle Angaben über die für den Daten-satz verantwortliche Institution.

1.4 Constraint information (MD_Constraints)

Dieses Paket enthält Informationen über Beschränkungen bezüglich des Zugriffs und der Nutzung der Datenbestände oder Metadaten. Die MD_Constraints Entität ist optional und kann durch die Klassen MD_LegalConstraints und/oder MD_SecurityConstraints spezifiziert werden.

1.5 Data quality information (DQ_DataQuality)

Dieses Paket enthält eine allgemeine Bewertung der Qualität des Datensatzes. Die DQ_DataQuality Entität ist optional und enthält den Geltungsbereich der Qualitätsbeurteilung. Dieses Paket enthält auch Informationen über die Quellen und Produktionsabläufe, die verwendet wurden, um einen Datensatz herzustellen.

1.6 Maintenance information (MD_MaintenanceInformation)

Dieses Paket enthält Informationen über den Rahmen und Turnus der Fortführung der Daten. Die MD_MaintenanceInformation Entität ist nicht zwingend notwendig und enthält sowohl vorschreibende als auch optio-nale Metadatenelemente.

1.7 Spatial representation information (MD_SpatialRepresentation)

3D Erweiterung des Metadatenstandard ISO 19115 Dieses Paket enthält allgemeine Informationen über die Mechanismen, die genutzt wurden, um räumliche/raumbezogene Informationen in einem Datensatz zu beschreiben/darzustellen. Die MD_SpatialRepresentation Entität ist optional.

1.8 Reference system information (MD_ReferenceSystem)

Dieses Paket enthält die Beschreibung des räumlichen und zeitlichen in einem Datensatz verwendeten Bezugssystems. MD_ReferenceSystem enthält ein Element (referenceSystemIdentifier), um das verwendete Bezugssystem zu identifi-zieren.

1.9 Content information (MD_ContentInformation)

Dieses Paket enthält die Erläuterungen von Umfang und Merkmalen der Datensätze, sowie Informationen zum ver-wendeten Objektartenkatalog (MD_FeatureCatalogueDescription) und/oder Informationen, welche den Inhalt eines Coverage-Datensatzes (MD_CoverageDescription) beschreibt.

1.10 Portrayal catalogue information (MD_PortrayalCatalogueReference)

Dieses Paket enthält Informationen, die den verwendeten Signaturenkatalog identifiziert und somit, welche Art der Darstellung für die Datensätze verwendet wurde. Das optionalen MD_PortrayalCatalogueReference enthält ein Element, das beschreibt, welcher Signaturenkatalog verwendet wird.

1.11 Distribution information (MD_Distribution)

Dieses Paket enthält Informationen über den Vertreiber und Optionen für den Erwerb des Datensatzes.

1.12 Metadata extension information (MD_MetadataExtensionInformation)

Dieses Paket enthält Informationen über benutzerspezifische Erweiterungen der Datensätze

1.13 Application schema information (MD_ApplicationSchemaInformation)

Die unter diesem Paket zusammengefassten Informationen beschreiben das Anwendungsschema, das zur Erstellung von Datensätzen benutzt wird. Es enthält die optionale Entität MD_ApplicationSchemaInformation.

1.14 Extent information (EX_Extent)

Der Datentyp in diesem Paket ist eine Aggregation der Metadatenelemente, welcher die räumliche und zeitliche Aus-dehnung für das betreffende Objekt beschreibt. Die EX_Extent Entität enthält Informationen über die geografische (EX_GeographicExtent), zeitliche (EX_TemporalExtent) und die vertikale (EX_VerticalExtent) Ausdehnung für die betreffende Entität.

1.15 Citation and responsible party information (CI_Citation and CI_ResponsibleParty)

Dieses Paket von Datentypen stellt eine standardisierte Methode (CI_Citation) zur Verfügung, um einen Datensatz (Datensatz, Merkmal, Quelle, Veröffentlichung, usw.) zu zitieren, wie auch Informationen über die Institution, die verantwortlich (CI_ResponsibleParty) für einen Datensatz ist. Der CI_ResponsibleParty Datentyp enthält die Identität der Person(en), und/oder Position, und/oder Organisationen, die mit dem Datensatz in Beziehung stehen. Der Standort (CI_Address) der verantwortlichen Person oder Institution wird hier auch definiert.

2 EIGNUNG VON ISO 19115 FÜR 3D-STADTMODELLE

Nachfolgend erfolgen mehrere Beispiele mit Auflistungen und Erläuterung der Klassen und Attribute aus ISO-Standard 19115, die für ein 3D-Stadtmodell von besonderer Bedeutung sein können. Diese zeigen dass ISO 19115 bzgl. verschiedener Aspekte für die Beschreibung eines 3D-Stadtmodells schon ansatzweise geeignet ist.

2.1 Räumliche Auflösung

Klasse MD_Identification mit der Unterklasse MD_DataIdentification mit dem Attribut spatialResolution, welches Angaben über die räumliche Auflösung der geographischen Informationen (z.B. Maßstab,

Bodenauflösung, Gitterwei-te, Rasterauflösung) liefert. Das Attribut wird weiter spezialisiert durch die MD_Resolution, welche weiter die Werte equivalentScale und distance enthält. distance beinhaltet die Bodenauflösung für Vektordaten oder die Gitterweite für Geländemodelle oder die Rasterauflösung für Rasterdaten. Die Belegung dieses Attributes mit einem entsprechenden Wert z.B, mit Information über die Gitterweite des Rasters des DGMs kann auch in Bezug auf das 3D-Stadtmodell von Bedeutung sein.

2.2 Angaben zum DGM

Die Klasse MD_Identification beinhaltet die Unterklasse MD_DataIdentification mit dem Attribut spatialRepresenta-tionType und der Code-Liste MD_SpatialRepresentationTypeCode, die die Art der räumlichen Darstellung der geo-graphischen Informationen (z.B. Vektor, Gitter) wiedergibt. Hier gibt es den Attributwert tin. Dieser besagt, dass die Daten z.B. als TIN in Bezug auf das verwendete DGM für das 3D-Stadtmodell vorliegen, sowie den Attributwert grid:

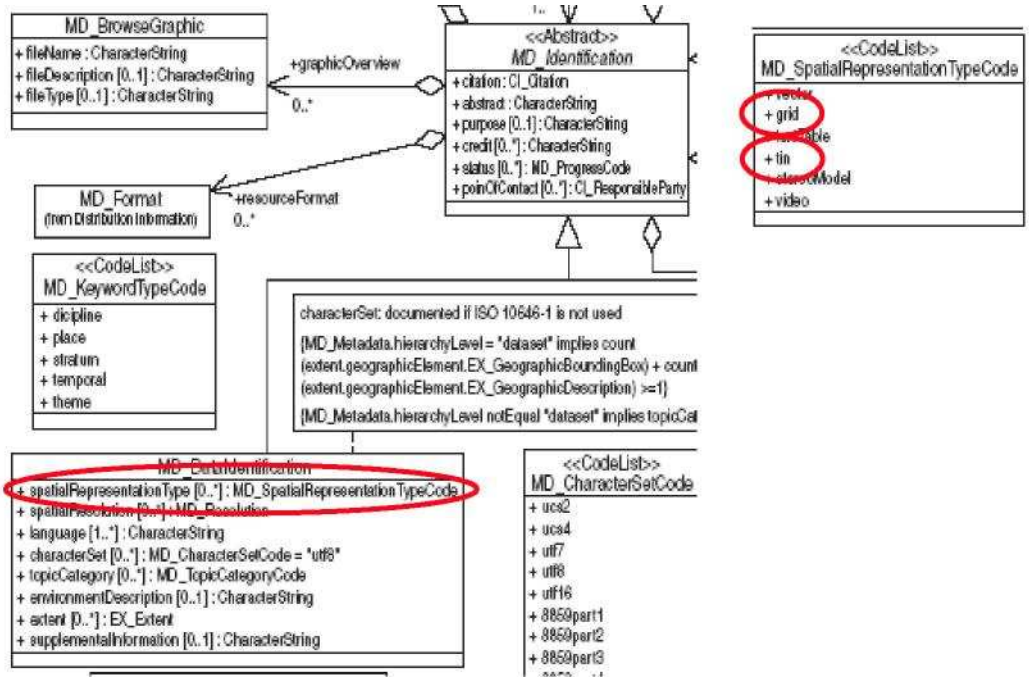

Abb 1: SpatialRepresentationType in ISO 19915

2.3 BoundingBox in 3D

Die Klasse MD_Identification enthält die Unterklasse MD_DataIdentification mit dem Attribut extent. Dazu steht der Datentyp EX_Extent zur Verfügung mit dem Attribut description, das eine Beschreibung über die räumliche und zeit-liche Ausdehnung für das betreffende Objekt liefert. Darüber hinaus hat der Datentyp EX_Extent eine Aggregation zu der abstrakten Klasse EX_GeographicExtent und diese eine Unterklasse EX_BoundingPolygon mit dem Attribut polygon mit dem Wert bzw. Verweis GM_Object. BoundingPolygon bedeutet Umringspolygon, d.h. eine umschließende Grenze des Datensatzes, ausgedrückt als eine geschlossene Gruppe von (x,y,z) Koordinaten eines Polygons. GM_Object ist die Hauptklasse der ISO 19107, die ein Basisschema für die Eigenschaften der Geometrie und Topologie von geographischen Daten definiert. Sie beinhaltet auch die Klasse GM_Solid, wobei solid Volumen bedeutet und demnach aus x, y und z Koordinate besteht.

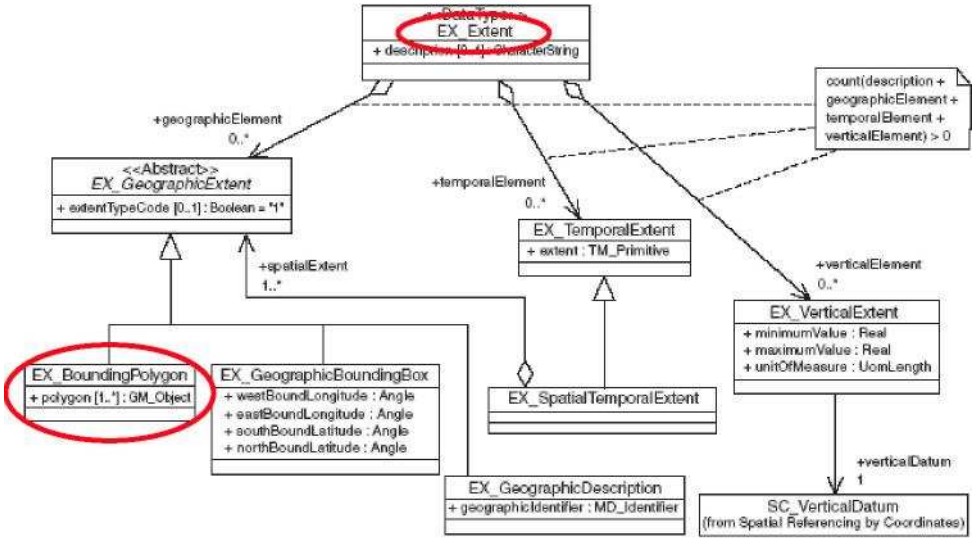

Abb2: GeographicExtent in ISO 19915

2.4 Genauigkeit der Lage und Höhe

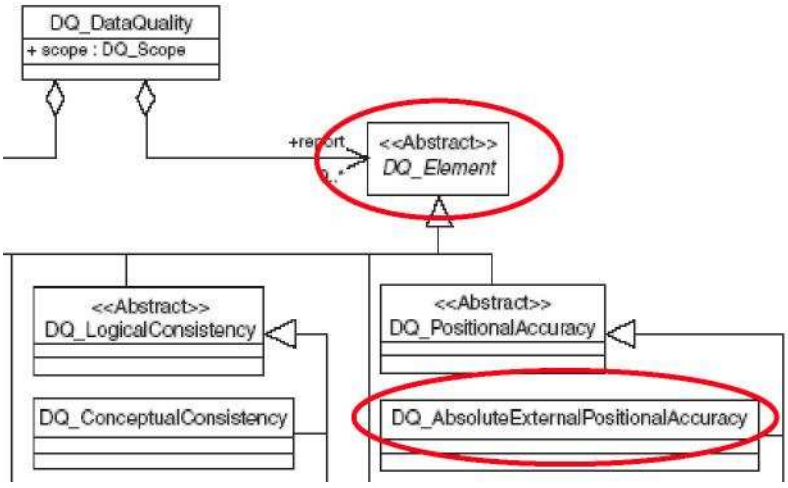

Abb. 3: Positionsgenauigkeit in ISO 19915

Die Klasse DQ_DataQuality enthält die Unterklasse DQ_Element, DQ_PositionalAccuracy und dann die Klasse DQ_AbsoluteExternalPositionalAccuracy. Diese liefert Informationen über die Genauigkeit der Lage und Höhe. Dies ist ebenfalls bedeutsam für 3D-Stadtmodelle.

2.5 3D-Objektgeometrien

Die Klasse MD_SpatialRepresentation enthält die Unterklasse MD_VectorSpatial Representation mit dem Attribut geometricObjects und dem Datentyp MD_GeometricObjects. Die Objektgeometrie (MD_GeometricObjects) selbst enthält auch wieder Attribute wie z.B, geometricObjectType, welches den Geometrietyp der Objekte spezifiziert laut einer Code-Liste (Diese trägt die Bezeichnung MD_GeometricObjectTypeCode). In dieser Code-Liste gibt es den Wert solid, der ein durch eindeutige Grenzen gekennzeichnetes 3D-Objekt beschreibt, das einen geschlossenen Raum dar-stellt.

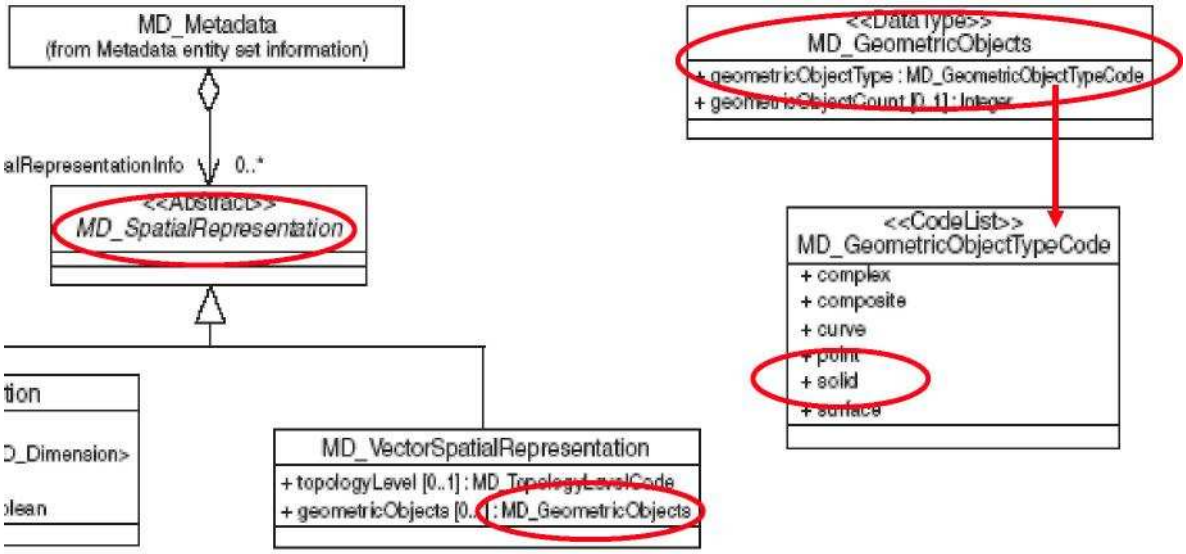

Abb 4: 3D-Objektgeometrien in ISO 19915

2.6 Unterstützung von 3D-Topologie

Die Klasse MD_SpatialRepresentation enthält die Unterklasse MD_VectorSpatial Representation mit dem Attribut topologyLevel und einer Auswahlliste mit dem Namen MD_TopologyLevelCode. In der wirddas Maß der Komplexität der räumlichen Beziehungen beschrieben. In dieser Code-Liste befinden sich auch u.a. die Auswahlpunkte topology3D und fullTopology3D, welche eine 3D-Topologie einmal für den Körper und einmal für den Raum beschreiben.

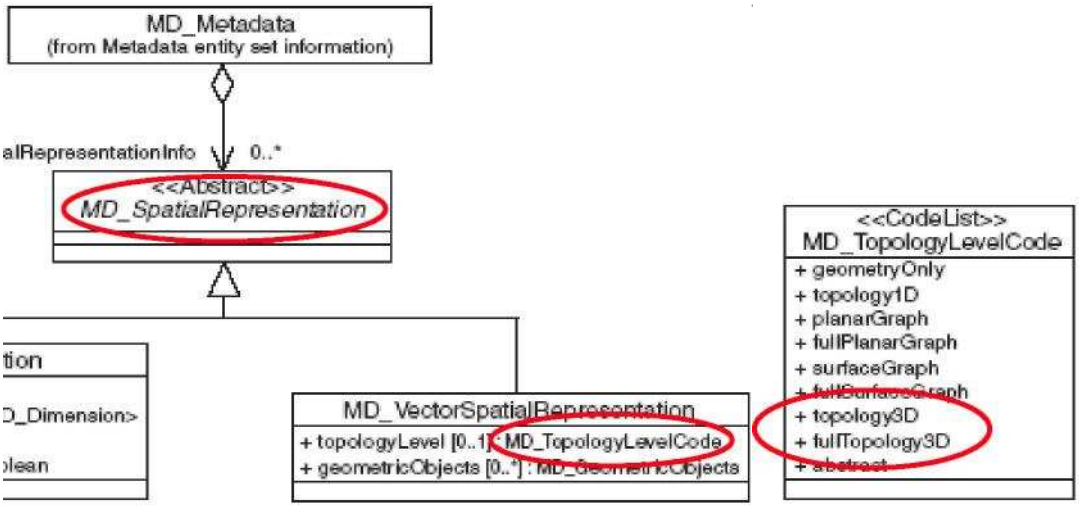

Abb 5: 3D-Topologie in ISO 19915

3 ERWEITERUNGEN VON ISO 19115 AUF BASIS VON CITYGML UND EIGENEN VORSCHLÄGEN

Nachfolgend erfolgt eine Darstellung möglicher Erweiterungen (Klassen, Attribute, Attributwerte) von ISO 199115 in Hinblick auf 3D-Stadtmodelle. Dies soll das Suchen und Finden nach spezifischen 3D-Stadtmodellen in Metadatenka-talogen verbessern. Hierbei ließen wir uns besonders von CityGML als einem allgemeinen semantischen Informati-onsmodell für die Darstellung von dreidimensionalen städtischen Objekten inspirieren. CityGML definiert die Klassen und Beziehungen für die relevantesten topografischen Objekte in Städten und Regionalmodellen in Bezug auf ihre geometrischen, topologischen, semantischen und visuellen Eigenschaften. Die Grundklasse aller Gegenstände ist Ci-tyObject. Alle Objekte erben die Eigenschaften von CityObject. Die folgenden Klassen erscheinen uns als mögliche ERweiterungen von ISO 19115 in Frage zu kommen:

3.1 Level of Detail

Dreidimensionale Stadt- und Regionalmodelle liegen in unterschiedlichen Detaillierungsgraden (Levels of Detail, LoD) vor, die in der Regel aus verschiedenen, voneinander unabhängigen Erfassungen hervorgehen. Oft liegen flä-chendeckend gering detaillierte Daten – z.B. ein Blockmodell einer Stadt – vor, während für ausgewählte Gebiete ver-einzelt sehr detaillierte Gebäuderepräsentationen verfügbar sind – etwa einzelne Architekturmodelle.

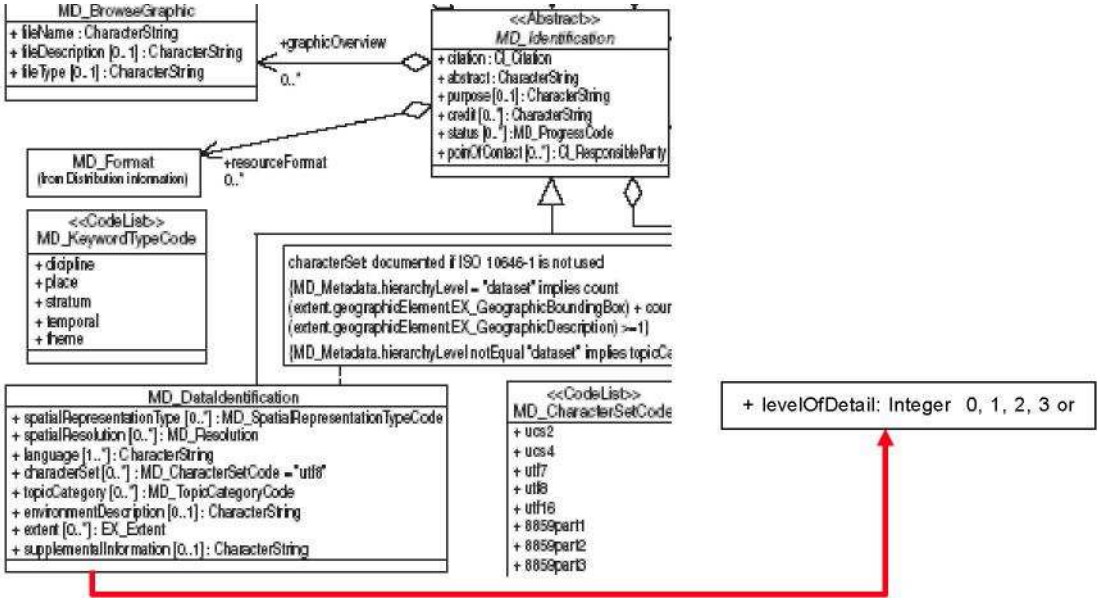

Abb 6: Erweiterung von ISO 19915 um levelOfDetail

CityGML unterscheidet fünf LoD, beginnend mit dem gröbsten LoD 0 bis hin zu dem am höchsten aufgelösten LoD 4. Diese LoD differieren sowohl hinsichtlich des Umfangs an modellierten Objektarten als auch bezüglich der Anforde-

3.2 3D Erweiterung des Metadatenstandard ISO 19115

rungen an den Detailreichtum und die geometrischen Genauigkeiten. Der LoD 0 ist ein Regionalmodell, das im We-sentlichen aus einem Digitalen Geländemodell besteht, auf das ggf. ein Satelliten-/Luftbild oder eine Karte drapiert ist. Der LoD 1 ist das Blockmodell, das weder Dachstrukturen noch Texturen enthält. Beides kommt erst im LoD 2 hinzu, während im Architekturmodell LoD 3 differenzierte Dach- und Fassadenstrukturen geometrisch ausgeprägt sind. Der LoD 4 fügt Strukturen im Inneren von Gebäuden zu dem Modell hinzu. Zu jedem LoD werden entsprechende Erfas-sungskriterien und Genauigkeitsanforderungen angegeben. Die LoD 1 bis 3 entsprechen den in der Literatur behandel-ten Detaillierungsgraden, während die LoD 0 und 4 Ergänzungen der SIG 3D sind. Die Klassifikation in fünf LOD kann verwendet werden, um die Qualität der 3D-Stadtmodell-Datensätze zu bewerten. Die LOD Kategorisierung macht Datensätze vergleichbar und stellt eine Unterstützung für ihre Integration zur Verfügung. Hieraus ergibt sich folgende Erweiterungsmöglichkeit für den Metadatenstandard ISO 19115: Die Unterklasse MD_DataIdentification der Klasse MD_Identification erhält ein neues Attribut levelOfDetail. Dieses erhält eine Belegung mit einem Integer-Wert zwischen 0-4, um den vorliegenden Detailierungsgrad zu vermerken (vgl. Abb. 6).

3.3 Erweiterung der Angaben zum DGM

Ein amtliches digitales Geländemodell (DGM) ist für die Erstellung vieler 3D-Modelle zwingend erforderlich, da es die räumliche Bezugsebene des Modells bildet. Von daher sollte es hierzu Informationen über die Genauigkeit des Rasters geben in Bezug auf die Rasterweite, bzw. Informationen darüber, welche Art von Geländemodell verwendet

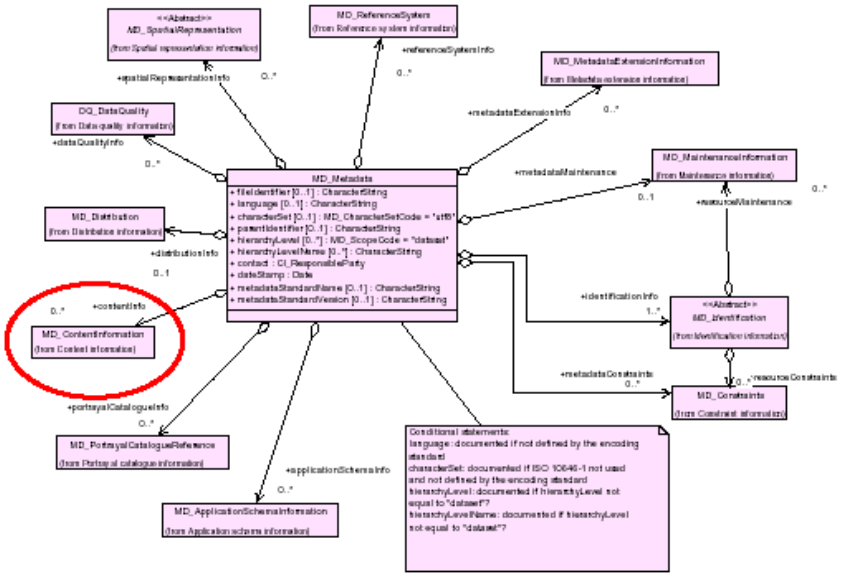

Abbildung 7: Auszug aus ISO 19915 mit hervorgehobenem Annüpfungspunkt für Erweiterungen

wurde: Raster = GRID, unregelmäßige Dreiecksvermaschung = TIN (Triangulated Irregular Network), Bruchkanten oder Massenpunkte. Folgende Erweiterungen erscheinen wünschenswert: Wie erwähnt gibt es bereits die Elementwer-te tin und grid in der der Code-Liste MD_SpatialRepresentationTypeCode für das Attribut spatialRepresentationType der Klasse MD_DataIdentification. Es müsste eine Erweiterung um mass points (Massenpunkte) und break lines (Bruchkante) erfolgen, damit genauer beschrieben werden kann, welches Gelände für das Stadtmodell verwendet wurde.

3.4 Semantische Objektklassen

Vielleicht ist es sinnvoll, die Struktur der ISO 19115 in Bezug auf ein 3D-Stadtmodell um Elemente für semantische Beschreibung der Objektklassen zu erweitern. Dies würde es ermöglichen folgende beispielhafte Fragen beantworten zu können:

- Suche ein 3D-Stadtmodell mit Ampeln.
- Suche ein 3D-Stadtmodell mit Grundflächen der Häuser aus dem Kataster.
- Suche ein 3D-Stadtmodell mit Level Of Detail 1.
- Suche ein 3D-Stadtmodell mit Gebäude, deren Fassaden texturiert sind.

In CityGML gibt es schon ausführliche semantische Strukturen für die verschiedenen möglichen vorkommenden Objekte und ihrer Teile. Als Bsp. stellt Tabelle 1 eine funktionale Typisierung von Gebäuden vor.

BuildingFunctionCode (kleiner Auszug)			
1000	residential building	1780	heat plant
1010	tenement	1790	pumping station
1020	hostel	1800	building for disposal
1030	residential- and administration building	1810	building for effluent disposal
1040	residential- and office building	1820	building for filter plant
1050	residential- and business building	1830	toilet
1060	residential- and plant building	1840	rubbish bunker
1070	agrarian- and forestry building	1850	building for garbage incineration
1080	residential- and commercial building	1860	building for abatement disposal
1090	forester's house	1870	building for agrarian and forestry

Tabelle 1: BuildingFunctionCode laut CityGML (kleiner Auszug)

Abbildung 7: Auszug aus ISO 19915 mit hervorgehobenem Annüpfungspunkt für Erweiterungen

Ähnliche Objektklassen gibt es für verschiedene weitere relevante Objektarten für 3D-Stadtmodelle (vgl. Abb x). Auf dieser Basis wurden Erweiterungsoptionen von ISO 19115 erörtert. Diese werden unten kurz skizziert

Als erster Entwurf wurden die neu definierten Klassen MD_Building, MD_Water, MD_Street, MD_Plant und MD_CityFurniture unter die Oberklasse MD_CityModelDescription und dann unter MD_ContentInformation gestellt. Diese Erweiterung scheint sinnvoll, da unter der Klasse MD_ContentInformation Informationen gespeichert werden, die den Inhalt eines Datensatzes beschreiben. D.h. in unserem Fall sie sollen Informationen zum 3D-Stadtmodell liefern:

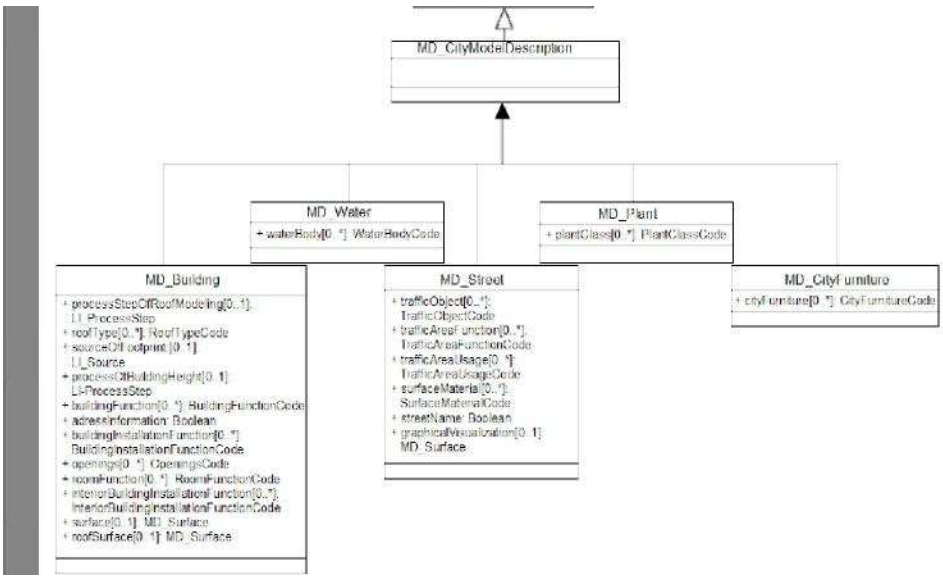

Abb 8: Erweiterung von ISO 19915 um

Es wird von uns eine Reihe weiterer Klassen und Attribute vorgeschlagen, die hier nur übersichtsartig in mehreren Tabellen dargestellt werden sollen: Alle Attribute, die kursiv gedruckt sind, entstanden aus eigenen Gedanken. Die anderen Attribute bzw. die Code-Listen stammen aus dem Anhang A des Discussion Paper von CityGML.

Name	Erläuterung / Interpretation
MD_CityModel-Description	Informationen zum 3D-Stadtmodell
Name	Erläuterung / Interpretation
MD_Building	Informationen zum Gebäudeobjekt
processOf_RoofModeling	Angabe des Herstellungsprozess der Dächer wie bspw. laserscanning, digitalization oder photogrammetry. Das ISO19115 Metadatenmodell bietet die Klasse *LI_ProcessStep* an (Unterklasse von *DQ_DataQuality* und *LI_Lineage*), welche Information über den Entstehungsprozess liefert und mit dem Attribut *description* belegt ist, welches den Herstellungsprozess beschreibt. Hier

	könnte die Beschreibung des Herstellungsprozess der Dächer erfolgen.
roofType	Angabe der Art des Daches bzw. der Dächer
sourceOf-Footprint	Angabe der Quelle der Grundfläche wie bspw. cadastre data, architectural model. Das ISO19115 Metadatenmodell bietet die Klasse *LI_Source* (Unterklasse von *DQ_DataQuality* und *LI_Lineage*) mit dem Attribut *description* an, mit der die detaillierte Beschreibung der Datenquellen erfolgt. Hier könnte auch die Angabe der Quelle der Grundfläche des Gebäudes hinterlegt werden.
processOf-BuildingHeight	Beschreibung des Prozesses der Gebäudehöhenermittlung wie bspw. measured height (gemessene Höhen aus ALKIS), calculated height from the number of storeys (berechnete Höhen). Das ISO19115 Metadatenmodell bietet die Klasse *LI_ProcessStep* an (Unterklasse von *DQ_DataQuality* und *LI_Lineage*), welche Information über den Entstehungsprozess liefert und mit dem Attribut *description* belegt ist, welches den Herstellungsprozess beschreibt. Hier könnte die Beschreibung des Prozesses der Gebäudehöhenermittlung erfolgen.
buildingFunction	Angabe der Funktion des Gebäudes
adressInforma-tion	Information darüber, ob der Name und die Adresse des Gebäudebesitzers hinterlegt ist oder nicht. Angabe: yes or no
buildingInstalla-tion Function	Angabe der vorkommenden Gebäudeelement(e), die stark das äußere Erscheinungsbild des Gebäudes beschreiben
openings	Information über den Typ von Öffnung in einer äußeren oder inneren Wand
roomFunction	Angabe der Nutzung eines Raumes in einem Gebäude
interiorBuild-ing Installation-Function	Angabe der inneren Ausstattung eines Gebäudes
surface	Angabe der Oberflächengestaltung der Gebäudefassade
roofSurface	Angabe der Oberflächengestaltung des Daches
Name	Erläuterung / Interpretation
MD_Water	Informationen zum Wasserobjekt
waterBody	Angabe über die Art des Gewässers
Name	Erläuterung / Interpretation
MD_Street	Informationen zum Straßenobjekt
trafficObject	Art des Verkehrsobjektes
trafficAreaFunc-tion	Beschreibung der Funktion des Verkehrsobjektes
trafficAreaUsage	Beschreibung der Nutzung des Objektes
surfaceMaterial	Angabe des Oberflächenmaterial des Verkehrsobjektes
streetName	Information darüber, ob Straßennamen existieren oder nicht: Angabe: yes or no
Graphical-Visualization	Angabe der Oberflächengestaltung der Verkehrsobjekte
Name	Erläuterung / Interpretation
MD_Plant	Informationen zum Pflanzenobjekt
plantClass	Beschreibung der Bepflanzung
Name	Erläuterung / Interpretation
MD_CityFurnitur e	Informationen zu Straßenmöbel
cityFurnitureCo-de	Angabe der verwendeten Straßenmöbel
Name	Erläuterung / Interpretation
MD_Surface	Allgemeine Informationen zur Oberfläche eines Objektes oder mehrerer Objekte
surfaceStyle-Type	Spezifierung der Oberfläche eines Objektes: Jeder Fläche kann wahlweise eine Farbe mit Angabe von Beleuchtungseigenschaften oder eine Textur zugeordnet werden.
MD_Resolution	Angaben über die räumliche Auflösung bzw. Qualität (der Textur) der geographischen Informationen. MD_Resolution ist eine Klasse aus der ISO19115 und enthält Informationen über den Detailliertheitsgrad.

3D

Erweiterung des Metadatenstandard ISO 19115

Tabelle 2: Erweiterungsvorschläge für ISO 19915

Wenn keiner der Werte in der Code-Liste für die Belegung in Frage kommt, dann kann der Attributwert „other“ ge-wählt werden und der Anwender kann mit einer freien Texteingabe (CharacterString) das Attribut belegen und seine Daten beschreiben.

4 DISKUSSION UND AUSBLICK

Es gibt zu CityGML bisher noch keinen Online-Objektartenkatalog, aus dem Attributwerte entnommen werden kön-nen. Wenn der Katalog bzw. die Code-Listen von CityGML online verfügbar wären, dann

könnte der Teil, der zu-nächst unter der Klasse MD_ContentInformation angehängt wurde, unberücksichtigt bleiben. Stattdessen könnte man auf die Daten im Internetkatalog verweisen. Dies geschieht durch Belegung der entsprechenden Attribute featureTypes und featureCatalogueCitation der Klasse MD_FeatureCatalogueDescription. Diese Klasse befindet sich unter MD_ContentInformation. Das dort existierende Attribut featureCatalogueCitation liefert bibliographische Angaben zum verwendeten Objektartenkatalog (Titel, Kurzname, Datum, Edition). Diese Information bzw. der Wert kann als Link gestaltet werden, wenn ein Objektartenkatalog im Internet verfügbar ist. Weiter gibt es das Attribut featureTypes, in dem eine Auflistung der Objektarten erfolgen soll, nach Möglichkeit als Link auf den jeweiligen Katalogteil, sofern der Objektartenkatalog im Internet verfügbar ist.

5 DANKSAGUNG

Wir danken allen Kollegen für ihre Hilfe. Die Arbeit wurde von der Klaus-Tschira-Stiftung gGmbH gefördert.

6 LITERATUR

Coors, V. und Zipf, A, (Hrsg.)(2004): 3D-Geoinformationssysteme. Grundlagen und Anwendungen. Wichmann -Hüthig Verlag. Heidelberg. 525 Seiten.

Frey S., Pörsch A. (2006): Geodateninfrastruktur Berlin/Brandenburg Berlin/Brandenburgisches Profil der ISO 19115/19119

Gröger, G., Kolbe, T.H., Czerwinski, A. (2006): OpenGIS City Geography Markup Language (CityGML), Implementation Specification Version 0.3.0, Discussion Paper, OGC Doc. No. 06-057

Nougeras-Iso, J., P.R. Muro-Medrano, F. J.. Zarazaga-Soria (2005): Geographic Information Metadata for Spatial Data Infrastructures - Resources, Interoperability and Information Retrieval. Springer. 2005, XXII, 264 p

ISO/TC 211 Geographic information/Geomatics. ISO reference number: 19115 (2002).

OpenGIS CityGML Implementation Specification (City Geography Markup Language) Discussion Paper (2006)

Abdul-Rahman, A.; Zlatanova, S.; Coors, V. (Eds.): Innovations in 3D Geo Information Systems Springer: Lecture Notes in Geoinformation and Cartography , 2006, 760 p.

Schilling, A., Basanow, J., Zipf, A. (2007 accepted): VECTOR BASED MAPPING OF POLYGONS ON IRREGULAR TERRAIN MESHES FOR WEB 3D MAP SERVICES. 3rd International Conference on Web Information Systems and Technologies (WEBIST). Barcelona, Spain. March 2007.

Zipf, A. & Tschirner, S. (2005): Finding GI-datasets that otherwise would have been lost - GeoXchange - a OGC standards-based SDI for sharing free geodata. 2nd International Workshop on Geographic Information Retrieval (GIR 2005. Bremen, Germany. Springer Lecutre Notes in Computer Science.

Zipf, A. & Schilling, A. (2003): Generation of VRML City Models for Focus Based Tour Animations. Integration, Modeling and Presentation of Heterogeneous Geo-Data Sources. 8th Int. Symp. on Web 3D Technology. Web3D 2003. 03/2003 Saint Malon. France.

Zlatanova, S. and D. Prosperi (Eds) (2005): Large-scale 3D Data Integration (Gisdata). CRC Press. 256 pages.

🏆 *reviewed paper*

GIS – MODELLIERUNG VON WILDÖKOLOGISCHEN- VERNETZUNGS-POTENTIALEN ALS GRUNDLAGE ZUR RAUMPLANERISCHEN ABSICHERUNG

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1 EINLEITUNG

Der verschwenderische Umgang mit der Ressource Raum in der Vergangenheit zwingt uns zu neuen Konzepten für die Zukunft. Während vor allem alpine und periphere Lagen von einer Extensivierung und der Aufgabe der landwirtschaftlichen Nutzung, einer Ausdünnung der Versorgungsinfrastruktur und starken Bevölkerungsverlusten geprägt werden, kommt es rund um die Ballungsräume und entlang der hochrangigen Verkehrsinfrastruktur zu einer fortschreitenden Nutzungsintensivierung, die sich unter anderem in einem steigenden Flächenverbrauch widerspiegelt. (Abb. 1).

Die Ursachen hierfür sind in demographischen, sozioökonomischen und im Allgemeinen wirtschaftliche Komponenten zu sehen. Eine zentrale Rolle spielt dabei die Wechselbeziehung zwischen Verkehrsinfrastruktur, Betriebsansiedelung, Besiedelung der Stadtumlandgebiete, Zersiedelung und dem steigenden Motorisierungsgrad der Bevölkerung.

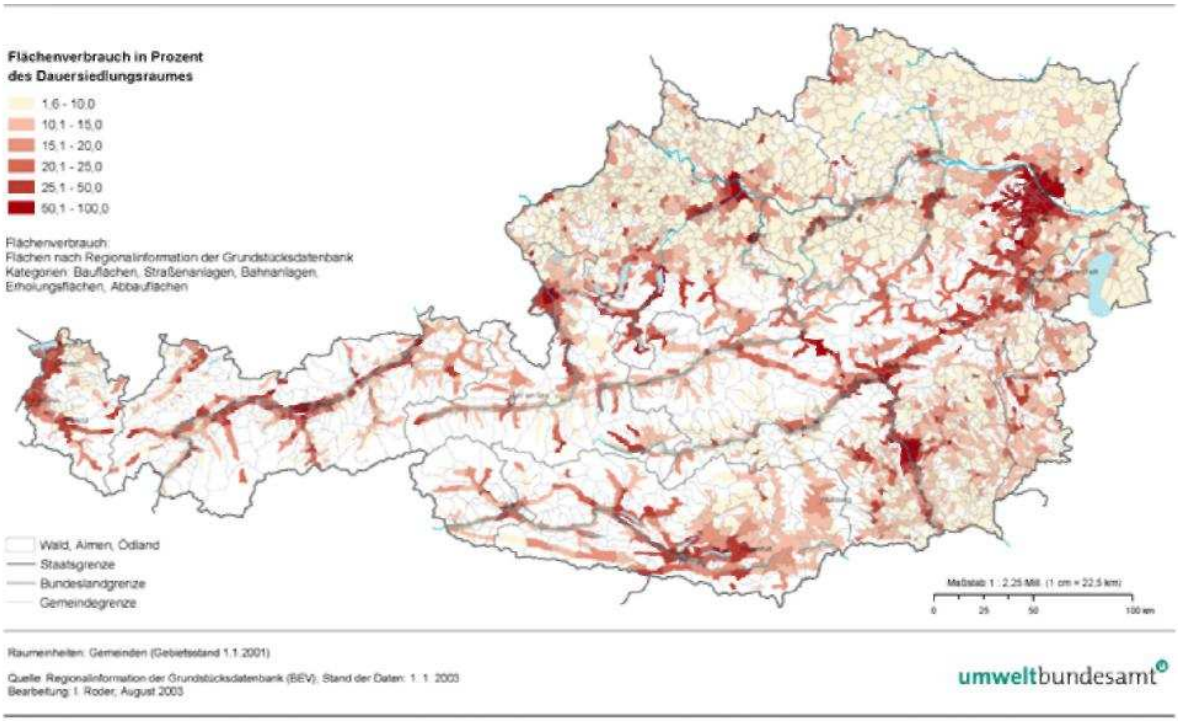

Abb. 1.: Flächenverbrauch in Prozent des Dauersiedlungsraumes nach Gemeinden. Quelle: Regionalinformation der Grundstücksdatenbank (BEV). Stand 1. 1. 2003; Bearbeiter I. Roder; Umweltbundesamt WIEN; http://www.umweltbundesamt.at/umwelt/raumordnung/flaechenverbrauch/ (besucht am 25. 10. 2004)

Diese Entwicklungen führen, neben einer Reihe von weiteren Umweltproblemen, zu einer stetig steigenden Fragmentierung der österreichischen Landschaften und Lebensräume. Intensive anthropogene Raumnutzungen verkleinern Lebensräume für anspruchsvolle Tierarten und stellen in der Regel Hindernisse und Barrieren für die natürliche Migrationsbewegung von Wildtieren dar.

Durch die Errichtung von Grünbrücken und Wildtierquerungshilfen in ausreichender Frequenz und Dimension (vgl. VÖLK 2001) kann die Zerschneidung von Lebensräumen durch bestehende und geplante Verkehrsinfrastrukturen abgemildert werden. Hingegen können durch die großflächige Verbauung der Ressource Raum in ökologisch sensiblen Landschaftsräumen irreversible Barrieren entstehen und eine Gefährdung für den Genaustausch von Populationen darstellen.

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Die negativen Auswirkungen der oben skizzierten Entwicklungen auf die Biodoversität und im Speziellen auf die Populations- und Arealentwicklung großräumig migrierender Säugetiere ist sind inzwischen in zahlreichen Studien dokumentiert (EUROPÄISCHE KOMMISSION, 2003; IUELL ET AL. 2003; HLAVAC & ANDEL, 2002; OGGIER ET AL., 2001; HOLZGANG ET AL., 2001; FORSTNER ET AL., 2001; PFISTER ET AL., 1999).

1.1 Internationale und nationale Richtlinien, Konventionen und Gesetze

Die Sicherung von Genflusskorridoren und die Vernetzung von Lebensraumen ist, wie der Schutz der Natur generell, ein allgemeines öffentliches Interesse. Dies spiegelt sich insbesondere durch rechtliche Vorgaben auf internationaler und und nationaler Ebene wieder. Einige dieser Vorgaben werden in der DIENSTANWEISUNG GZ.BMVIT-300.040/002-II/ST-ALG/2006 wie folgt angeführt:

- FFH-Richtlinie 92/43/EWG Anhang II und Anhang IV (Richtline des Rates vom Mai 1992)
- Weltcharta für Natur der Vereinten Nationen (1982)
- Bonner Konvention (1972) und Berner Konvention (1983; BGBI. Nr. 372/1983 i.d.g.F.)
- Alpenkonvention (1991) mit dem Protokoll Naturschutz und Landschaftspflege
- Biodiversitätskonvention (1991; BGBI. Nr. 213/1995)
- UNEP (Rio 1992, Addis Abeba 2004) und IUCN (Amman 2000) sowie daraus abgeleitet die Österreichische Nachhaltigkeitsstrategie
- Naturschutzgesetze und Jagdgesetze sowie Tierschutzverordnungen der Länder

1.2 1Foschungsschwerpunkte in Österreich

In Österreich wurden seit dem Jahr 1997 zahlreiche Forschungsprojekte und Diplomarbeiten zu diesem Themenschwerpunkt durchgeführt. So wurden in einer Studie von VÖLK et al. (2001) erstmals alle höherrangigen Straßen in Österreich hinsichtlich ihrer Durchlässigkeit für Wildtiere untersucht und Mindeststandards für Wildtierquerungsbauwerke definiert. In der Studie wurden des Weiteren die wichtigsten Genflusskorridore für Großwildtierarten in Österreich identifiziert sowie Nachrüstvorschläge für Grünbrücken auf bestehenden Strecken des höherrangigen Straßennetzes ausgewiesen. In einem weiterführenden Projekt wurde durch GRILLMAYER et al. (2002) ein GIS-Modell für die räumliche Ausweisung von potentiellen Migrationsbereichen für waldbevorzugende Großsäugetiere entwickelt. Aufbauend auf diese Arbeit wurde im Rahmen einer Diplomarbeit von KÖHLER (2005) sowie KÖHLER et al. (2005) ein expertenbasiertes GIS-Modell im Auftrag der Österreichischen Bundesforste (Öbf AG) erstellt, mit dem die Habitatvernetzung in Österreich und damit auch die möglichen Hauptmigrationsachsen für waldbevorzugende Großsäuger erstmals klar verortet und navollziehbar dargestellt werden können. Diese Modellierung stellt eine Weiterentwicklung der durch VÖLK et al. (2001) durchgeführten Zusammenstellung der wichtigsten Genflusskorridore für Großwildtierarten dar und gibt einen detaillierten Aufschluss über den Zustand und den räumlichen Verlauf der potentiellen Migrationsachsen. Weiters wurde im Rahmen einer Studie, die von der Autobahn und Schnellstraßen Finanzierungs- Aktiengesellschaft (ASFINAG) beauftragt und vom WWF-Österreich durchgeführt wurde (PROSCHEK 2005), auf diese Datengrundlagen aufgebaut und eine Priorisierung der wichtigsten Nachrüstungsvorschläge für Grünbrücken über Autobahnen und Schnellstraßen vorgenommen. Insgesamt wurden zwanzig Grünbrückenstandorte für die Wiederherstellung der wichtigsten Genflusskorridore in Österreich identifiziert. In einer Dienstanweisung des Bundesministeriums für Verkehr, Innovation und Technologie (BMVIT) (GZ.BMVIT-300.040/002-II/ST-ALG/2006) wird die Realisierung dieser zwanzig Bauwerke bis zum Jahr 2027 verankert.

1.3 Funktionssicherung durch die Raumplanungsbehörden der Länder

Um die Funktion dieser zwanzig Grünbrücken sicherzustellen ist die Durchgängigkeit der Wildtierwanderwege über ihren gesamten Verlauf sicherzustellen. Diese Absicherung der Genflusskorridore fällt in den Kompetenzbereich der Raumplanungsbehörden der Länder. Bis heute werden nur in der Steiermark wildökologisch wichtige Genflusskorridore und Migrationsachsen durch die Raumplanung berücksichtigt. In der Steiermark finden diese im übergeordneten Raumordungskonzept Berücksichtigung und werden als eigene Kategorie der „Wildökologischen Korridore“ ausgewiesen (Abb. 2).

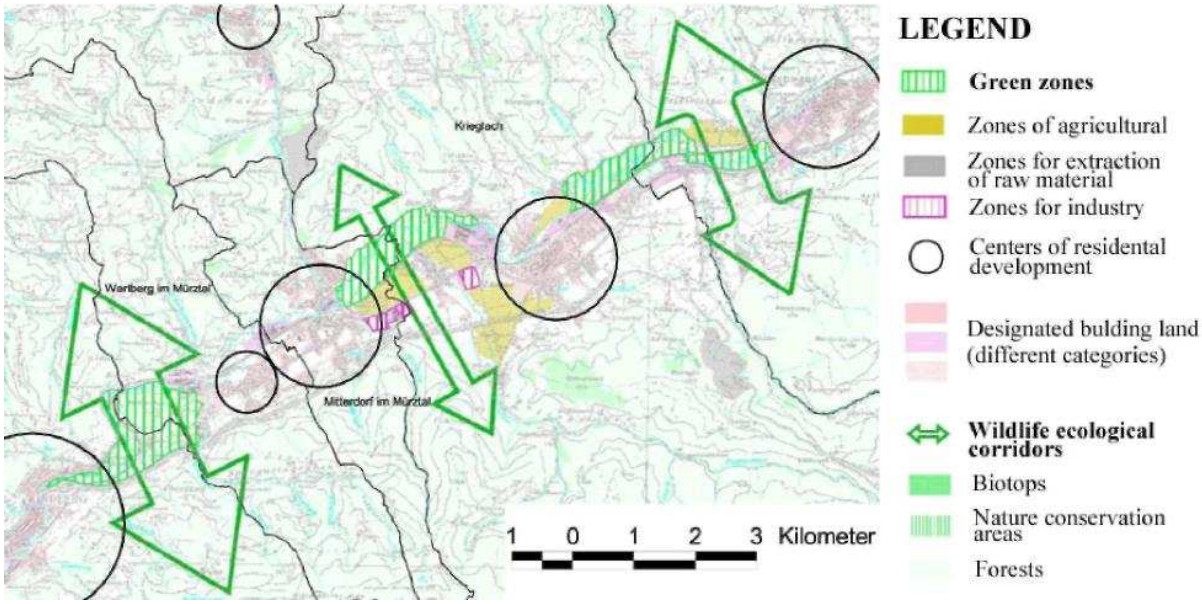


Abb. 2.: Beispiel aus dem regionalen Raumordnungsprogramm der Gemeinde Mürzzuschlag, Steiermark (Fachabteilung 16 A, Land Steiermark 2003b)

Auch in anderen Raumplanungsbehörden der Länder wird zur Zeit dieser Themenschwerpunkt intensiv und mögliche raumplanerische Absicherungen werden erwogen. Einen Überblick über die existierenden länderspezifischen Raumplanungsinstrumentarien und deren Eignung für die Absicherung der Genflusskorridore gibt eine Studie, die im Auftrag der ASFINAG, BMVIT und des WWF-Österreichs erstellt wurde (MAUERHOFER 2006).

1.4 Expertenbasierte GIS-Modelle als Werkzeuge für die Raumplanung

Um den Behörden ausreichend Argumente für eine rechtsverbindliche Ausweisung und damit fur die Absicherung der Korridore, bereitzustellen, werden detaillierte Kartengrundlagen produziert, die den Verlauf, die räumliche Ausdehnung und den aktuellen Zustand dieser Genflussachsen darstellen sollen. Expertenbasierte GIS-Modelle leisten hier eine wesentlichen Beitrag für die Erstellung dieser Planungsgrundlagen (Abb. 3) und ermöglichen eine nachvollziehbare Ausweisung der Genflussachsen. Durch eine Top-Down-Strategie werden in einem ersten Arbeitsschritt österreichweit die wichtigsten Genflussachsen auf nationalem Maßstab nach KÖHLER (2005) ausgewiesen (nationales Modell). In einem zweiten Arbeitsschritt werden „Problembereiche“, die aufgrund der naturräumlichen Gegebenheiten ein bereits geringes Vernetzungspotential aufweisen, anhand detaillierter Geodaten auf regionalen/lokalen Maßstab modelliert (regionale/lokale Detailmodellierung). Bei dieser Modellierung wird zusätzlich zum Naturraumpotential die aktuelle Flächenwidmung berücksichtigt. Neben den Ergebnissen der ersten Modellierung auf nationaler Ebene dienen die Ergebnisse der regionalen/lokalen Detailmodellierungen als Diskussions- und Planungsgrundlage für die räumliche Ausweisung und Absicherung bedeutsamer Genflussachsen durch die Raumplanungsbehörden der Länder.

Nachfolgend werden die entwickelten Modelle, deren Einsatzbereiche sowie mögliche Weiterentwicklungen dargestellt und erfolgreiche „Best Practice“-Anwendungen vorgestellt.

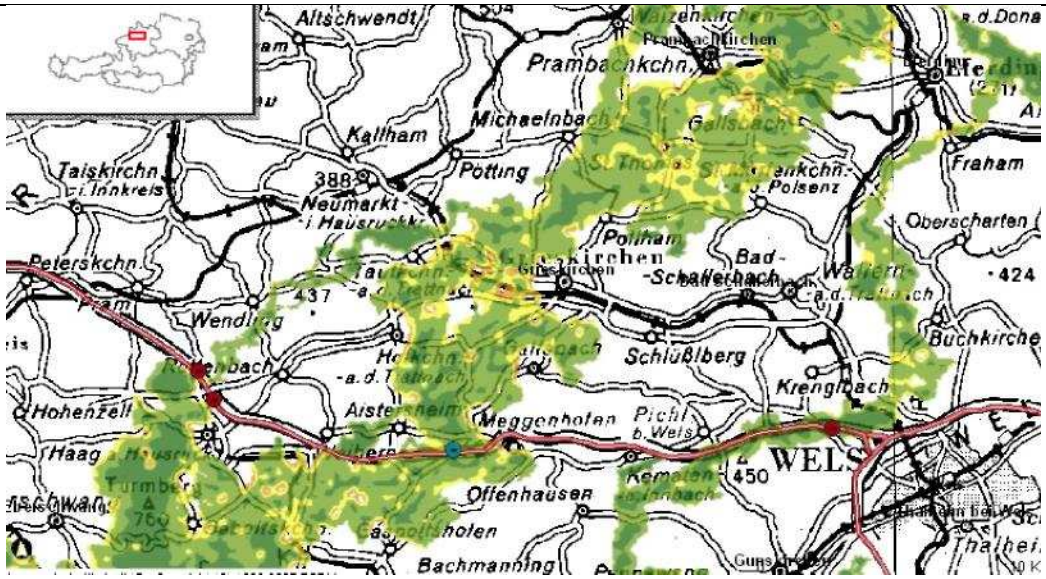


Abb. 3.: Ausweisung eines national wichtigen Genflusskorridors mit Hilfe eines expertenbasierten GIS-Modells am Beispiel des sogenannten „Kobernausserwald - Korridors“ in Oberösterreich. Detailausschnitt aus der Arbeit von KÖHLER et al. (2005)

2 MODELLE

Für die Modellbildung werden auf nationaler und auch auf regionaler/lokaler Maßstabsebene die selben Methoden und geographischen Operatoren verwendet, lediglich die verwendeten Geodaten und somit das Fuzzy-Logic basierte Regelwerk ist entsprechend zu adaptieren. In weiterer Folge wird der Modellansatz sehr allgemein skizziert und die beiden Modelle, die zur Anwendung kommen, werden dargestellt.

2.1 Allgemeines

Basierend auf einem Widerstandsmodell werden mit Hilfe der Korridor-Funktion (ARCGIS 9.2 DESKTOP HELP 2006), die zu den Funktionen der Cost-Path-Familie gehört, Genflussachsen berechnet. Das erstellte Widerstandsmodell repräsentiert die Summe aller positiven und negativen raumwirkenden Einflüsse, die das Wanderverhalten von Wildtieren beeinflussen. Landschaftsräume, die eine geringe Durchlässigkeit für Wildtiere aufweisen, werden durch einen hohen Widerstandswert repräsentiert, geringe Widerstandswerte repräsentieren hingegen intakte Habitate, Stepstones bzw. Landschaftsräume im Allgemeinen, die eine hohe Durchlässigkeit für Wildtiere aufweisen. Wesentlich für die Erstellung des Regelwerkes ist die Auswahl der Zeigertierarten (engl. Umbrella Species) (WILCOX 1984, NOSS & COOPERRIDER 1994, ANDELMAN & FAGAN 2000), d.h. jener Tierarten, deren ökologische Ansprüche und Migrationsverhalten repräsentativ für eine möglichst große Anzahl an Tiergruppen sind. Des Weiteren müssen die Lebensraumansprüche sowie das Migrationsverhalten dieser Tierarten ausreichend dokumentiert sein oder Verbreitungsdaten für die Ableitung des Regelwerkes bestehen.

Als Zeigertierarten für die Berechnung der Genflussachsen für waldgebundene Großsäuger in Österreich wurden die drei großen Beutegreifer (Bär – Ursus arctos; Luchs – Lynx lynx; Wolf – Canis lupus) sowie der Elch (Alces alces) und der Rothirsch (Cervus elaphus) ausgewählt. Alle fünf Tierarten sind Arten mit großen Arealansprüchen sowohl hinsichtlich ihres Lebensraumes als auch hinsichtlich ihren Migrationstendenzen. Alle fünf Arten sind in unterschiedlichem Ausmass abhängig von intakten Migrationsrouten, die Subpopulationen untereinander verbinden können und somit den genetischen Austausch aufrecht erhalten (Metapopulationstheorie – HANSKI, I. 1999).

Basierend auf Landbedeckungsdaten werden Landschaftselemente hinsichtlich ihrer positiven, neutralen und negativen Funktion der Lebensraumvernetzung beurteilt und deren Raumwirkung wird berücksichtigt. Unter Raumwirkung versteht man die über die Grenzen eines Landschaftselements hinweg wirkenden Funktionen, wie zum Beispiel die Störfunktionen von Infrastruktureinrichtungen, die durch Licht- und Lärmemissionen bedingt sind und anhand von Fuzzy-Mebership-Funktionen Berücksichtigung finden (siehe Abb. 4).

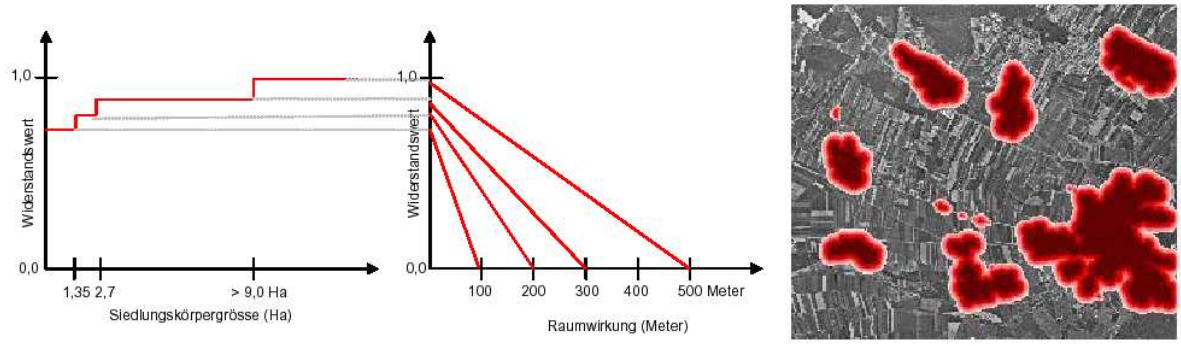


Abb 4.: Fuzzy Mebership-Funktionen für die Landbedeckungskategorie „Siedlungskörper“. In Abhängigkeit von der Gröfie der Siedlungsfläche steigen die durch die Lärm- und Lichtemission bedingten, über die Grenzen des Siedlungskörpers wirkenden raumwirksamen Störeinflüsse. Ab einer Siedlungsgröfie von 9 Hektar beträgt die maximale Beinflussungsdistanz 500 Meter. Der Widerstandswert nimmt linear zur Entfernung von Siedlungskörper ab.

Nach der Fertigstellung des Widerstandsmodells müssen Ziel- und Quellgebiete definiert werden, die sich aus den ökologischen Grundlagen ableiten, um eine räumliche Abgrenzung und den Verflauf der Genflussachsen berechnen zu können. Falls mehrere Genflussachsen existieren, müssen diese in einem abschlie&enden Arbeitsschritt zusammengeführt werden.

2.2 Modellberechnung

Als Datengrundlage für die Ausweisung der wichtigsten Genflussachsen in Österreich wird ein Datensatz, der im Rahmen des Projektes „Spatial Indicators for Land Use Sustainability“ erstellt wurde, verwendet. Eine detaillierte Dokumentation zu den Datensatzeigenschaften findet man in HOLLAUS ET AL. (2004). In einem ersten Arbeitsschritt werden die achtzehn Landbedeckungsklassen des Orginaldatensatzes zu neun für die Fragestellung relevanten Landbedeckungskategorien zusammengefasst, anschlie&end werden die FlächengroBen berechnet sowie die dazugehörigen Fuzzy-Membership-Funktionen erstellt und das Widerstandsmodell wird berechnet.

Für die Berechnung der wichtigsten Genflussachsen in Österreich werden die Ziel- und Quellgebiete basierend auf der Studie von VÖLK ET AL. (2001) definiert. Insgesamt wurden 78 Genflussachsen berechnet und in einem abschlie&enden Arbeitsschritt zusammengeführt. Die räumliche Abgrenzung der Genflussachsen erfolgt anhand österreichweit verfügbarer Bärennachweise, die vom WWF-Österreich zur Verfügung gestellt wurden. 80 % aller Bärennachweise liegen innerhalb der berechneten wichtigsten Genflussachsen in Österreich. Eine ausführliche Dokumentation des Modells sowie der Kartenwerke findet man unter http://ivfl.boku.ac.at/proiekte/woek .

Um eine Darstellung des aktuellen Zustandes bzw. der „Problembereiche“ innerhalb der Genflussachsen zu ermöglichen, wird die räumliche Abgrenzung der Genflussachsen mit den Ergebnissen des Widerstandsmodells kombiniert. Durch diese Vorgehensweise können Bereiche, die ein geringes Vernetzungspotential aufweisen, identifziert werden. Diese Bereiche werden dann in einem zweiten Modell unter Verwendung der gleichen Methodik, jedoch anhand detaillierter Geodaten und unter Berücksichtigung der aktuellen Flächenwidmung näher untersucht und dienen in weiterer Folge als Datengrundlage für die raumplanerische Absicherung. Neben den flächenhaften Daten werden bei dieser Detailmodellierung auch linienhafte Strukturen wie Gehölzsteifen, Gewässer, Infrastruktureinrichtungen, Zäunungen usw. berücksichtigt. Diese wildökolgisch relevanten linienförmigen Strukturen werden anhand einer Luftbildinterpretation sowie durch Feldbegehungen erhoben. Eine detaillierte Beschreibung der Erhebungsmethodik dieser Kartierung sowie eine Abschätzung der Kosten in Abhängigkeit der FlächengroBe des Untersuchungsgebietes ist in der Diplomarbeit von HOFFMANN (2001) dokumentiert. Das an diese Modellparameter und Detaildatensätze adaptierte Widerstandsmodell ist in GRILLMAYER ET AL. (2000) ausführlich dargestellt.

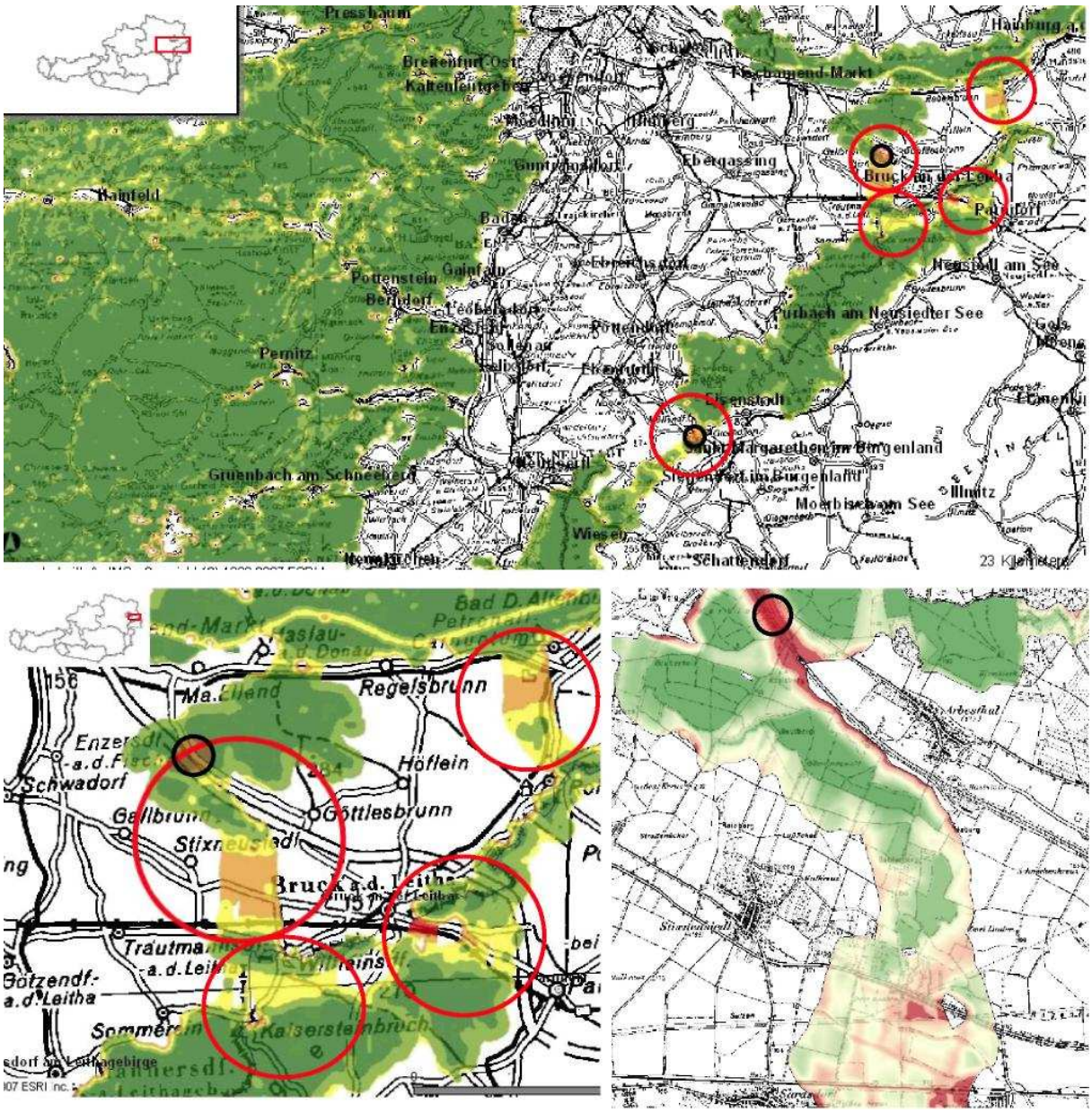
Eine Gegenüberstellung des unterschiedlichen Detaillierungsgrades der beiden Modelle ist in Tabelle 1 dargestellt.

Nationales Modell	*Regionales / Lokales Detailmodell*	*Wildökologische Funktion*
Landschaftselemente mit Genflussfunktion		
Wald (Fläche)	Wald (Flächen)	Habitatfunktion
	Komplexlandschaften (Flächen) (verbuschtes Grünland)	Hauptlebensraum Leitstruktur
	Gehölzstreifen (Linien)	Stepstone hohes Deckungspotential
Landschaftselemente mit Barrierefunktion		
Siedlungskörper (Fläche)	Siedlungsflächen (Flächen)	Barrierewirkung räumliche Störfunktion
	Baulandumhüllende (Fläche)	
Gewässer (Flächen)	Gewässer (Fläche + Linie)	
	Straßen (Linien)	
	Niveausprünge	
	Zaunflächen	
Landschaftselemente mit neutraler Genflussfunktion		
Ackervegetation (Fläche)	Offener Boden (Fläche)	Nahrungspotential geringes Deckungspotential Saisonaler Lebensraum
	Grüne Ackervegetation (Fläche)	
	Gelbe Ackervegetation (Fläche)	
	Sonstige Ackervegetation (Fläche)	
	Weingarten (Fläche)	
Grünland (Fläche)	Grünland (Fläche)	
Schilf, Moor (Fläche)	Brachen (Fläche)	
Vegetationsfreie Standorte (Fläche) Schnee – Eisfläche (Fläche) Nicht definierte Landbedeckung (Fläche)	Vegetationslose Flächen (Fläche)	

Tab. 1: Gegenüberstellung des Detaillierungsgrades des nationalen Modells und der regionalen/lokalen Detailmodellierung in Bezug auf Waldbevorzugende Großsäuger.

2.3 Ergebnisse

Ergebnisse der oben genannten Methodik sind in den Abbildungen 5a, 5b und 5c dargestellt. Anhand des nationalen Modells (Abb. 5a, 5b) können z.B. der Verlauf sowie Problembereiche innerhalb des sogenannten Alpen-Karpaten-Korridors identifiziert werden. Bereiche die in gelb-oranger Farbe dargestellt sind, weisen ein geringes Vernetzungspotential auf. In Abbildung 5a können für diesen Abschnitt des Alpen-Karpaten-Korridors fünf Problemzonen identifiziert werden, die mit Hilfe des regionalen/lokalen Modells näher untersucht werden müssen. Große zusammenhängende bewaldete Gebiete müssen hingegen nicht zwingend untersucht werden, da diese aus Sicht der Wildtierökologie und Raumplanung für die untersuchten Zeigertierarten keine kritischen Flächennutzungen aufweisen, sofern keine Zäunungen vorhanden sind. In Abbildung 5b ist einer dieser fünf Problembereiche innerhalb des Alpen-Karpaten-Korridors und die dazugehörende detaillierte Modellierung auf regionaler/lokaler Maßstabsebene zu sehen (Abb. 5c). Die Ergebnisse dieser Modellierung wurden z.B. bei der Planung eines Windkraftparkes berücksichtigt, der ursprünglich direkt in dieser Genflussachse projektiert wurde. Des Weiteren wurden die Ergebnisse der Modelle in der von PROSCHEK 2005 erstellten Studie „Strategische Planung für die Lebensraumvernetzung in Österreich. Prioritätensetzung für Nachrüstvorschläge für Grünbrücken über Autobahnen und Schnellstraßen“ berücksichtigt. Da bei der Prioritätenreihung der geplanten Bauwerke unter anderem die aktuell vorherrschende Flächenwidmung im Vor- und Hinterland der Grünbrücke berücksichtigt wird, stellen die Ergebnisse der Modelle und der ausgewiesene Verlauf des Genflusskorridors im Speziellen eine wesentliche Planungsgrundlage dar.



Legende

Grünbrückenstandorte, die in der Studie von PROSCHEK 2005 priorisiert und bis spätestens 2027 umgesetzt werden

Problembereiche innerhalb der Genflussachsen, die anhand des regional/lokalen Modells detaillierter ausgewiesen werden müssen

Abb. 5a: Oben (Nationales Modell): Teilbereich des Alpen-Karpaten-Korridors im Wiener Becken. In diesem Bereich können insgesamt 5 Landschaftsräume identifiziert werden, die ein geringes Vernetzungspotential aufweisen
Abb. 5b: Links unten (Nationales Modell): Detailbereich des Alpen-Karpaten-Korridors.
Abb. 5c: Rechts unten (Regionales/Lokales Modell): Ergebnisse der Modellierung auf regionaler / lokaler Maßstabsebene

3 BEST PRACTICES ANWENDUNGEN – LAUFENDE/GEPLANTE PROJEKTE

Die in den letzten Kapiteln dargestellte Methodik und die entwickelten Modelle haben sich in ersten Praxistests bereits bewährt und werden in folgenden Projekten weiterentwickelt.

3.1 Wildökologische Vernetzung des Biosphärenreservates Wienerwald

Das Biosphärenreservat Wienerwald ist durch Bebauung in drei wildökologische Einheiten gegliedert, die durch folgende zwei Barrieren gebildet werden:

1. Die Verbauungen auf der Linie Hütteldorf-Purkersdorf-Pressbaum-Neulengbach
2. Die für größere Säuger kaum passierbare Außenring-Autobahn A 21

Durch Planung geeigneter Maßnahmen ist zu gewährleisten, dass eine weitere wildökologische Fragmentierung innerhalb des Biosphärenreservats nicht stattfindet. Die für kleinere Wildarten möglicherweise derzeit noch passierbaren kleinen „Durchschlupfe“ quer zu den beiden genannten nahezu vollständigen wildökologischen Barrieren sollen unbedingt langfristig erhalten und raumplanerisch abgesichert werden.

Im Rahmen des Projektes wird das Modell an neue Zeigertierarten adaptiert. Des Weiteren werden die durch den Naturraum potentiell am besten geeigneten Genflussachsen den durch die aktuelle Flächenwidmung bedingten verbliebenen Genflussachsen gegenübergestellt. Für die Endausweisung und Absicherung der Korridore können durch diese Vorgangsweise sowohl raumordnungspolitische als auch naturräumliche Aspekte berücksichtigt werden.

3.2 Geplantes ETZ-Projekt Alpen-Karpaten-Korridor

In Rahmen eines ETZ Projektes wird der gesamte Verlauf des Alpen-Karpaten-Korridors ausgewiesen und „Problembereiche“ innerhalb diesem werden kartiert. In den kritischen Bereichen wird durch landschaftspflegerische Maßnahmen die wildökologiche Situation verbessert und die Lebensraumvernetzung erhöht. Als Planungswerkzeug für diese Maßnahmen werden der Einsatz und die Praxistauglichkeit des Modellansatzes erprobt.

3.3 Vorgeschlagenes Konzept: LLRVK-Tirol - Landschafts- und Lebensraumvernetzungskonzept Tirol

Das Freiraumkonzept im „Leitbild ZukunftsRaum Tirol“ analysiert sehr genau die Gefährdungsursachen für die derzeit noch unverbauten Räume und beschäftigt sich eingehend mit den Funktionen und Entwicklungsaspekten dieser Freiräume in Tirol. Die Zielsetzungen des Leitbilds ZukunftsRaum Tirol „ Freiraumentwicklung“ bilden die politische Grundlage für die Etablierung eines regionalen ökologischen Netzwerkes. Das Landschafts und Lebensraumvernetzungskonzept (LLRVK) Tirol bietet die Möglichkeit, über eine kartographische Darstellung die Funktionen der Landschaft anschaulich darzustellen. Im Rahmen dieses Projektes werden Ausbreitungs- und Genflusskorridore für verschiedene Tier- und Pflanzenarten berechnet und zu einer Gesamtübersicht zusammengeführt. Das als unverbindliches Planungsinstrument konzipierte Instrument ist in der Vorbereitungsphase und und bedarf noch der politischen Zustimmung.

4 AUSBLICK

Für die Weiterentwicklung des Modellansatzes zur Steigerung der Qualität und Transparenz der Ergebnisse werden in den oben angeführten Projektskizzen folgende Themenschwerpunkte berücksichtigt.

4.1 Ableiten der Fuzzy-Membership-Funktionen anhand von Verbreitungsdaten

Einer der wichtigsten Themenschwerpunkte stellt die Ableitung der Fuzzy-Mebership-Funktionen anhand von Verbreitungsdaten dar. Diese würden zu einer Steigerung der Transparenz der Ausweisung führen. Problematisch bei diesem Ansatz sind die oftmals nicht flächendeckend vorhandenen Verbreitungsdaten der Zeigertierarten. Erste Ansätze und Ableitungsmethoden wurden im Rahmen einer Diplomarbeit von HAFNER 2006 entwickelt.

4.2 Automatisierte Ausweisung der Ziel- und Quellgebiete

Die Auswahl der Ziel und Quellgebiete für die Berechnung der Genflussachsen erfolgte in KÖHLER 2005 expertenbasiert. Durch die Entwicklung von Habitatmodellen und die Berechnung sogenannter „Core Areas“, die Ziel- und Quellgebiete repräsentieren, kann eine Automatisierung ermöglicht werden. Erste Versuche werden im Rahmen der „Wildökologischen Vernetzung des Biosphärenpark Wiener Wald“ durchgeführt.

4.2 Weiterentwicklung zur Ausweisung von Ökologischen Netzwerken

Eines der spannendsten Forschungsfelder in den nächsten Jahren wird die Weiterentwicklung dieses Ansatzes zur Ausweisung sogenannter „Regionaler Ökologischer Netzwerke“, wie in Kapitel 3.3 dargestellt, sein. Die Harmonisierung der ausgewiesenen Netzwerke, die zu berücksichtigenden Tier- und Pflanzenarten und deren Indikatorwirkung sowie die Berücksichtigung der Neophytenproblematik sind Fragestellungen und Forschungsschwerpunkte, die noch kaum bzw. nicht ausreichend erforscht sind.

5 ZUSAMMENFASSUNG

Dem sparsamen und nachhaltigen Umgang mit der Ressource Raum wird von Seiten der Politik in den letzten Jahren immer mehr Bedeutung geschenkt. Damit die politischen Entscheidungsträger dieser Verantwortung gerecht werden können, benötigen diese nachvollziehbare und qualitativ hochwertige Planungsgrundlagen. Einen Beitrag bei der Erstellung dieser Planungsgrundlagen können geographische Informationssysteme und der in diesem Beitrag vorgestellte Top-Down-Modellansatz leisten. Experten und deren Expertise können anhand dieser Ansätze unterstützt und objektiviert, jedoch niemals ersetzen werden. Anhand erster Projekte konnte die Praxistauglichkeit dieser Methoden erprobt und bestätigt werden. Durch das Zusammenarbeiten aller in diesem Themenbereich tätigen Personen und Institutionen konnten bereits erste Erfolge erzielt werden. Die Absicherung der letzten noch verbliebenen Genflussachsen in Österreich ist eine Verpflichtung gegenüber den kommenden Generationen.

6 LITERATUR

ANDELMAN, S. J., & W. F. FAGAN. 2000. Umbrellas and flagships: efficient conservation surrogates or expensive mistakes. Proceedings of the National Academy of Science 97:5954-5959.

EUROPÄISCHE KOMMISSION (Hrsg.), 2003: Habitat fragmentation due to transportation infrastructure. The European review. COST Action 341, European Commission, Directorate-General for Research; Office for Official Publications of the European Communities, Luxembourg, 226 pp and Annex.

FORSTNER, M., REIMOSER, F., HACKL, F. & HECKL, F., 2001: Kriterien und Indikatoren einer nachhaltigen Jagd. Monographien Bd. 158, Umweltbundesamt Wien, 70 pp.

GRILLMAYER, R., SCHACHT, H., SCHNEIDER, W., VÖLK, F., WÖSS, M. , 2000: Entwicklung von fernerkundungsgestützten Methoden zur Erfassung und wildökologischen Bewertung von Korridoren, insbesondere Gehölzstrukturen in der Agrarlandschaft, als Grundlage landschaftsplanerisch - naturschutzfachlicher Planungen. Forschungsprojekt "Wildökologische Korridore"; 1. Endbericht, IVFL, IWJ, 36 S. + Anhang (24 S.). Verfügbar als Online Ressource unter ("Wildökologische Korridore - Detailstudie Ellender Wald, Niederösterreich"; Publikationen): http://ivfl.boku.ac.at/projekte/woek

GRILLMAYER, R., WÖSS, M., SCHACHT, H., 2002: Fuzzy Logic basiertes Durchlässigkeitsmodell zur Analyse der Habitatvernetzung von Rotwild. In: Strobl, J., Blaschke, Th., Griesebner, G. (Hrsg.): Angewandte Geographische Informationsverarbeitung XVI: Beiträge zum AGIT-Symposium Salzburg 2002, 4.6.2002, Salzburg. Wichmann Verlag, Heidelberg.

HAFNER, E., 2006: Modellierung der Habitateignung für den Braunbären in Österreich. Diplomarbeit, Universität für Bodenkultur, Wien, 73 pp and Annex. Verfügbar als Online Ressource unter (Modellierung der Habitateignung für den Braunbären in Österreich – Publikationen - Hochschulschriften): http://ivfl.boku.ac.at/projekte/woek

HANSKI, I. (1999): Metapopulation ecology. - Oxford University Press, Oxford.

HLAVÁČ, V. & ANDĚL, P., 2002: On the permeability of roads for wildlife – a handbook. Agency for Nature Conservation and Landscape protection of the Czech Republic, EVERNA, 35 pp and Annex.

HOFFMANN, C., 2001: Gewinnung von Information über wildökologische Korridore aus Fernerkundungsdaten. Diplomarbeit am Institut für Vermessung, Fernerkundung und Landinformation, Universität für Bodenkultur, Wien. Verfügbar als Online Ressource unter ("Wildökologische Korridore - Detailstudie Ellender Wald, Niederösterreich"; Publikationen - Hochschulschriften): http://ivfl.boku.ac.at/projekte/woek

HOLLAUS, M., SUPPAN, F. (2004): Landbedeckungsdatensatz aus der Kulturlandschaftsforschung (SINUS). In: Grillmayer R. / Schneider W., Geodaten zur Landbedeckung in Österreich, 33 - 44; Shaker Verlag GmbH, Aachen; ISBN 3-8322-2793-8; ISSN 0945-0777.

HOLZGANG, O., PFISTER, H.P., HEYNEN, D., BLANT, M., RIGHETTI, A., BERTHOUD, G., MARCHESI, P., MADDALENA, T., MÜRI, H., WENDELSPIESS, M., DÄNDLICKER, G., MOLLET, P. & BORNHAUSER-SIEBER, U., 2001: Korridore für Wildtiere in der Schweiz. Schriftenreihe Umwelt Nr. 326, Bundesamt für Umwelt, Wald und Landschaft, Schweizerische Gesellschaft für Wildtierbiologie, Schweizerische Vogelwarte Sempach, Bern, 116 pp.

IUELL, B., BEKKER, G.J., CUPERUS, R., DUFEK, J., FRY, G., HLAVÁČ, V., KELLER, V., ROSELL, C., SANGWINE, T., TØRSLØV, N., WANDALL, B. (Hrsg.), 2003: Wildlife and Traffic: A European Handbook for Identifying Conflicts and Designing Solutions. KNNV Publishers, Utrecht, 141 pp.

KÖHLER, C., 2005: Habitatvernetzung in Österreich. GIS Modellierung von Mobilitäts-Widerstandwerten für waldbevorzugende, wildlebende Großsäuger. Diplomarbeit, Universität für

Bodenkultur, Wien, 71 pp and Annex. Verfügbar als Online Ressource unter (WÖK - Austria | Habitatvernetzung in Österreich – Publikationen - Hochschulschriften): http://ivfl.boku.ac.at/projekte/woek

KÖHLER, C., GRILLMAYER, R. & VÖKL, F., 2005: Habitatvernetzung in Österreich. Expertenbasierte GISModellierung von Mobilitäts-Widerstandswerten für waldbevorzugende, wildlebende Großsäuger. Institut für Vermessung, Fernerkundung und Landinformation; Universität für Bodenkultur, Wien, Karte. Verfügbar als Online Ressource unter (WÖK - Austria | Habitatvernetzung in Österreich – WebMapServices): http://ivfl.boku.ac.at/projekte/woek

MAUERHOFER, V., 2006: Wildökologische Korridore in der österreichischen Raumplanung. Möglichkeiten zur raumplanerischen Sicherung wildökologischer Korridore mit Mitteln des öffentlichen Rechtes und des Privatrechtes. Studie im Auftrag der Autobahn-und Schnellstraßen Finanzierungs- Aktiengesellschaft, des Bundesministeriums für Verkehr, Innovation und Technologie sowie des WWF Österreichs. Erschienen beim WWF-Österreich, Ottakringerstr. 114-116., 1160 Wien, Austria, Juni 2006, 85 pp.

NOSS, R. F., & A. Y. COOPERRIDER. 1994. Saving nature's legacy: Protecting and restoring biodiversity. Island Press, Washington D.C., USA.

OGGIER, P., RHIGETTI, A., BONNARD, L. (Hrsg.), 2001: Zerschneidung von Lebensräumen durch Verkehrsinfrastruktur COST 341. Schriftenreihe Umwelt Nr. 332, Bundesamt für Umwelt, Wald und Landschaft; Bundesamt für Raumentwicklung; Bundesamt für Verkehr; Bundesamt für Straßen. Bern, 102 pp.

PFISTER, H.P., KELLER, V. RECK, H., GEORGII, B., 1999: Bio-ökologische Wirksamkeit von Grünbrücken über Verkehrswege. Forschung Straßenbau und Straßenverkehrstechnik 756. Bundesministerium für Verkehr. Bonn – Bad Godesberg, 590 pp.

PROSCHEK, M., 2005: Strategische Planung für die Lebensraumvernetzung in Österreich. Prioritätensetzung für Nachrüstvorschläge für Grünbrücken über Autobahnen und Schnellstraßen. Wildökologische Bedeutung und raumplanerische Sinnhaftigkeit untersucht anhand der Tierarten Bär (Ursus arctos), Luchs (Lynx lynx), Wolf (Canis lupus), Elch (Alces alces) und Rothirsch (Cervus elaphus) Studie im Auftrag der Autobahn- und Schnellstraßen Finanzierungs- Aktiengesellschaft Bd. 158, WWF-Österreich, Ottakringerstr. 114-116., 1160 Wien, Austria, Oktober 2005, 172 pp.

VÖLK, F., GLITZNER, I. & WÖSS, M., 2001: Kostenreduktion bei Grünbrücken durch deren rationellen Einsatz. Kriterien – Indikatoren – Mindeststandards. Bundesministerium für Verkehr, Innovation und Technologie, Straßenforschung, Heft 513, Wien, 97 pp and Annex.

WILCOX, B. A. 1984. In situ conservation of genetic resources: determinants of minimum area requirements. Pages 639-647 in J. A. McNeely, & K. R. Miller, editors, National Parks, conservation, and development: the role of protected areas in sustaining society. Smithsonian Institution Press, Washington D. C., USA.

6.1 Verwendete Onlineressourcen

ArcGIS 9.2 Desktop Help 2006, Release 9.2; Capter: Least Cost Path and Least Cost Corridor:

http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Least_cost_path_and_least_cost_corridor; last modified 20.Juli 2006; zuletzt besucht am 08.01.2007

Standortkonzept Central European Park for Innovative Technology.
Innovations-, Ausbildungs- und Gründerzentrum Bratislava

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1 LEITBILD

Ausgangspunkt für die Entwicklung eines Technologieparks ist die zunehmende Notwendigkeit sich in Europa auf Ausbildung, Forschung und Entwicklung zu konzentrieren. Die Slowakei insgesamt und Bratislava im Besonderen sind im Wandel von einem Billiglohnland zu einem, als Mitglied der Europäischen Union verpflichteten, Forschungs- und Technologie Standort. Im Sinne der Lissabon Strategie, (auch Lissabon-Prozess oder Lissabon-Agenda) die im Jahre 2000 das Ziel der EU, innerhalb von zehn Jahren (also bis 2010) zum wettbewerbsfähigsten und dynamischsten wissensbasierten Wirtschaftsraum der Welt zu machen, definiert hat, ist auch die Slowakei dazu angehalten ihre Politik in Richtung dieser Zielvorstellung zu führen.

Wissen und Innovation finden sich in unterschiedlichsten Orten und Zusammenhängen, jedoch gilt ein so genannter Science Park in seiner Konzeption immer noch als wesentliche Initialzündung für neue und innovative Impulse für die Wirtschaft und Technologie insgesamt.

An diesen Orten können auf engem Raum Synergien zwischen Wissenschaft und Wirtschaft entstehen. Die Nähe zwischen den unterschiedlichen Funktionen spielt dabei eine wesentliche Rolle für das Entstehen von „Think Tanks“. In diesem Klima entstehen neue Firmen, neue Produkte, die das Wirtschaftswachstum und anhaltenden Wohlstand fördern.

Wesentlich aber ist nicht nur die räumliche Nähe, sondern auch ein lebenswertes Umfeld, da die nutzenden Personen solcher Parks eine hohe Qualität am und um den Arbeitsplatz verlangen. Serviceeinrichtungen aller Art in unmittelbarer Nähe sind damit eine Voraussetzung. Diese Parks werden nicht nur von lokal lebenden Personen genutzt, sondern im gleichen Maße auch von einem internationalen Publikum. Deshalb werden nicht nur im Park lebenswerte Räume geschaffen, sondern es sollten auch in der näheren Umgebung Kultur- und Freizeiteinrichtungen schnell und problemlos, sowohl mit öffentlichen wie privaten Verkehrsmitteln, erreichbar sein. Das Publikum dieser Parks benötigt die Nähe zu einer Großstadt, ebenso wie die Anbindung an internationale Verkehrsträger (z.B.: Flughafen).

Bezüglich CEPIT ist folgendes zu sagen: In unmittelbarer Nähe befindet sich der internationale Flughafen von Bratislava, eine Autobahn, Erholungsgebiete, sowie ein Golfplatz. CEPIT befindet sich innerhalb des Stadtgebietes von Bratislava und ist damit an die urbane Infrastruktur angebunden. Die Region um Bratislava bietet mit ca. 7 Mio. Einwohnern ausreichend Potenzial für einen Science Park. Das starke Wirtschaftswachstum bietet steigende Lebensqualität für anspruchsvolle Menschen.

Um dem oben beschriebenen Leitbild gerecht zu werden, muss das CEPIT Gebiet als multifunktionaler Stadtteil mit Schwerpunkt auf Ausbildung und Forschung mit der notwendigen Nahversorgung, Infrastruktur und hochqualitativen Erholungsrangeboten ausgestattet sein. Die Lage des Gebietes bietet bereits wesentliche Grundvoraussetzungen vor allem im Zusammenhang mit Lebens- und Arbeitsqualität.

Darüber hinaus muss CEPIT als Konzept impulsgebend für die Entwicklungen des gesamten Stadtteils zwischen Vajnory und Raca sein. Nutzungen um das Gelände sollten zukünftig nunmehr in Einklang mit dem Science Park stehen.

Insgesamt kann CEPIT dazu dienen, dass der derzeit wachsenden Abwanderung von höchstqualifizierten Arbeitnehmern und potenziellen Unternehmensgründern mit neuen Angeboten Einhalt geboten wird.

Auf Grund der hohen wirtschaftlichen Bedeutung des Parks für Bratislava ist davon auszugehen, dass die Stadt und auch der Staat Slowakei eine hohe Kooperationsbereitschaft zeigen werden. Diese Kooperationen müssen sowohl in rechtlichen, als auch in finanziellen Belangen sichergestellt werden.

Die derzeit nicht ausreichende Anbindung, sowohl an den öffentlichen Verkehr als auch im Bereich des Individualverkehrs, muss durch die Attraktivität des Parks selbst kompensiert werden. Dennoch ist eine zukünftige Verbesserung der Verkehrssituation im gesamten Stadtteil notwendig, um den erwünschten Entwicklungsschub voranzutreiben.

2 PLANUNGSGEBIET

2.1 Lage des Plangebietes

Das CEPIT Areal ist derzeit von allen Seiten durch Grünraum und landwirtschaftliche Flächen geprägt und nicht unmittelbar an das urbane Gebiet angebunden.

Nordwestlich des Gebietes sind Gewerbenutzungen angesiedelt. Nördlich und südlich ist das Gebiet von Ackerland begrenzt. Dies entspricht auch der derzeitigen Nutzung des Gebietes selbst. Westlich des CEPIT Areals liegt der Sportflughafen Vajnory, der grundsätzlich einer anderen Nutzung zugeführt werden soll.

2.2 Charakteristik und Größe

Das Planungsgebiet umfasst insgesamt rund 635.100 m². Die in einzelne Gesellschaften aufgeteilt sind. Von den rund 635.100 m² liegen rund 51.000 m² in Bereich von übergeordneten Grünflächen, die als solche erhalten bleiben müssen.

Diese so genannten Biokorridore verlaufen nördlich und südlich von West nach Ost durch das Gebiet und bilden damit natürliche Sektoren. Darüber hinaus liegen im vorliegenden Gebiet sowohl Gas, Wasser als auch Stromleitungen die durch Schutzzonen das Gebiet weiter einschränken. Diese Schutzzonen, die keine Bebauung und nur sehr eingeschränkte Befestigung erlauben, betragen insgesamt 106.000 m².

2.3 Nachbarschaftssynergien

Das CEPIT Areal liegt im Spannungsfeld zwischen urbaner, verdichteter Struktur, lockerem dörflichem Wohnbau und landwirtschaftlichen Flächen, bzw. ehemaligen Industriezonen und übergeordneten Grünzonen (siehe Abb. 1). Bei der Entwicklung des Gebietes ist auf optimale Übergänge und optimale Nutzungssynergien zu achten. Nicht zuletzt, weil CEPIT in seiner Konzeption ein neues urbanes Zentrum darstellen wird. Dieses Verlangt durch die periphere Lage am Stadtrand von Bratislava nach einem eigenständigen Charakter bzw. einer eigenständigen Attraktivität.

2.3.1 Umgebungsnutzung

Nordwesten

Nordwestlich des Gebietes entsteht derzeit ein Gewerbegebiet. Es handelt sich dabei vornämlich um spezialisierte Produktion und Assembling[164] ohne derzeit messbare Umweltbelastungen. Direkt angeschlossen ist ein Reitstall, der keinen Einfluss auf das Gebiet direkt darstellt. Eine 6 Meter breite Liegenschaft, die direkt von der Rybnicnastrasse zum CEPIT Gelände in West-Ost Richtung führt steht derzeit zum Verkauf frei. Aus derzeitiger Sicht ist ein Ankauf nicht Ziel führend.

Westen

Das Gebiet schließt westlich zum Teil an die Rybnicnastraße an. Gegenüber dieser Straße liegt derzeit ein Sportflughafen in privatem Eigentum. Die Lizenz für den Betrieb des Sportflughafens lief zu Beginn des Jahres 2007 aus und wird voraussichtlich nicht verlängert. Geplant ist die Errichtung eines mehrgeschossigen Wohnungsbaus mit rund 15.000 Wohneinheiten.

Süden

Zwischen dem CEPIT Gelände und der Stadt Vajnory befindet sich ebenfalls landwirtschaftlich genutztes Gebiet. Der östliche Teil davon wird mittelfristig einer Wohnnutzung zugeführt.

Osten

Östlich liegt das Naturschutzgebiet SUR mit rund 1.000 ha. Der Sursky-Kanal dient als Grenze zwischen Sur und CEPIT. Sur ist einer der größten noch erhaltenen Erlensumpfwälder Europas und ist derzeit von der

[164] **Montage** siehe auch REGIONAL CONSULTING, TU WIEN – IFIP: ZEWISTA – Zentrenstruktur und Wirtschaftsstandortentwicklung; Wien; 2004

Trockenlegung des gesamten Gebietes bedroht. Ein Antrag auf Hebung des Wasserspiegels hätte der Trockenlegung Vorschub geleistet, wurde jedoch abgelehnt. Die Hebung des Wasserstandes hätte allerdings alle Bauvorhaben der Umgebung massiv beeinträchtigt. Zwei als Biokorridore ausgewiesene Wasserkanäle, die durch das CEPIT Gebiet fließen, dienen ebenfalls der Bewässerung des Sumpfgebietes.

Nordosten

Im Nordosten befinden sich derzeit landwirtschaftliche Flächen, die jedoch unter einem starken Entwicklungsdruck stehen. Im Falle einer Entwicklung ist mit Gewerbeansiedlung zu rechnen.

2.3.2 Anbindung an übergeordnete Erholungsgebiete

Der Gebirgszug kleine Karpaten erstreckt sich von Nordosten kommend bis in das Zentrum von Bratislava. An der CEPIT zugewandten Seite wird vor allem Wein angebaut. Der südliche Rand der Karpaten hat sicherlich großen Einfluss auf das Gebiet, da hier neben Sur ein weiteres hochwertiges Erholungs- und Naturschutzgebiet angrenzt.

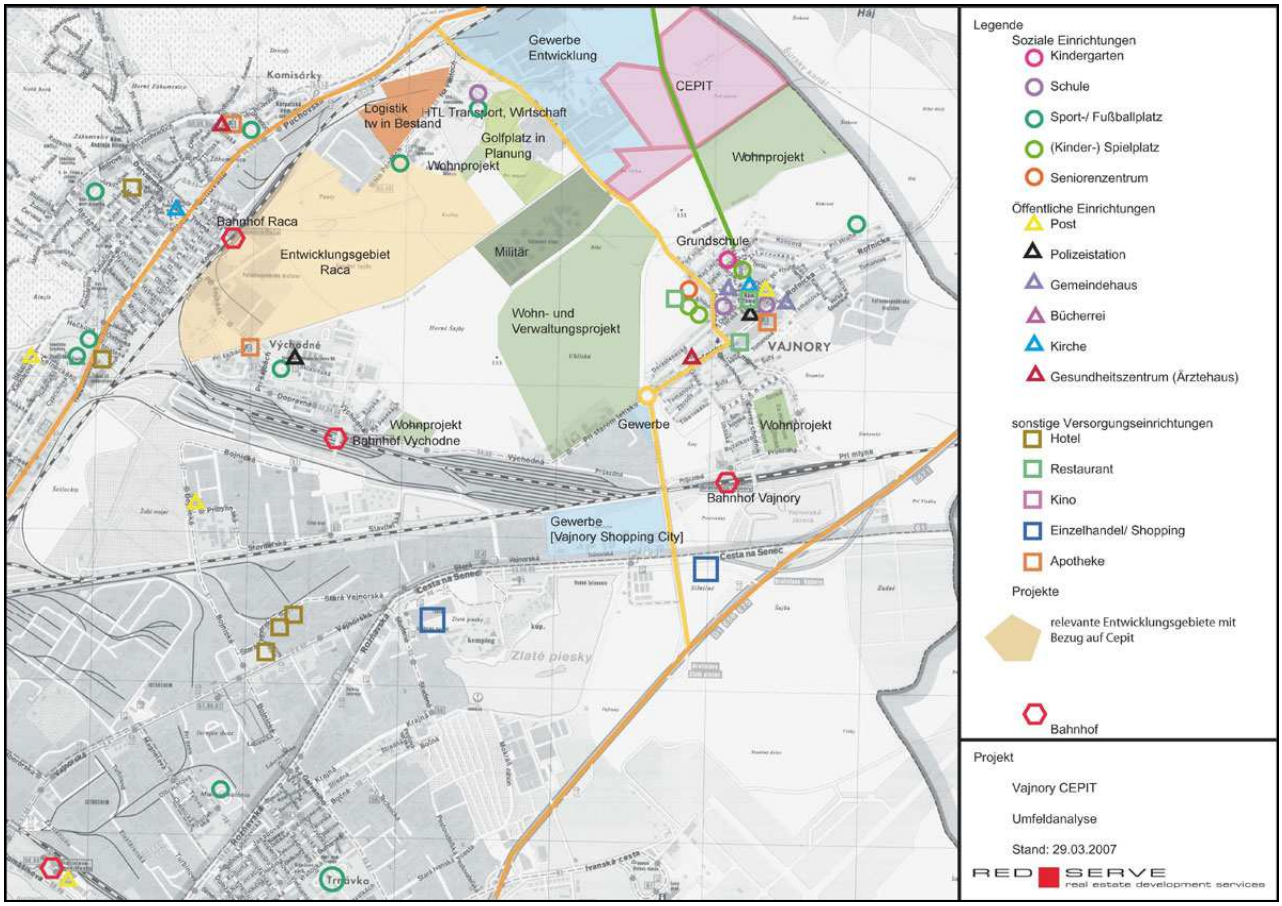

Abb. 1: Umgebungsanalyse CEPIT (Quelle: redserve, 2006)

2.3.3 Anbindung an das Stadtzentrum

Das Stadtzentrum von Bratislava ist rund 12 Kilometer entfernt. Die Verbindung zum Stadtzentrum erfolgt mit den Buslinien Nr. 65 und 59 bzw. mit dem PKW über die Rybnicnastraße. Das Gelände ist nicht ausreichend an das so genannte „City System“[165] angeschlossen. Vajnory und Raca liegen in einem Bahndreieck, das eine zusätzliche Barriere zum Stadtzentrum darstellt.

2.3.4 Versorgungseinrichtungen

CEPIT liegt zwischen zwei gut mit Versorgungseinrichtungen ausgestatteten Stadtteilen. Zudem liegt in unmittelbarer Nähe Nord-westlich des Projektgebietes eine HTL für Transport und Wirtschaft. In südlich des Planungsgebietes liegt der Ortskern von Vajnory, der durch Einfamilienwohnhausnutzung dominiert wird. Soziale Einrichtungen wie Schule, Kindergarten, Arzt, Polizei etc. werden je nach Wohnbevölkerung,

[165] Zentrale Erreichbarkeit durch öffentliche Verkehrsmittel

ermittelt. Dementsprechend sind in der Gemeinde Vajnory für den unmittelbaren Bedarf entsprechende Einrichtungen angesiedelt, dies gilt auch für Sport, und Freizeiteinrichtungen.

3 NUTZUNGSKONZEPT

Die Auswahl der Nutzungen ist sowohl auf den Bedarf der Stadt Bratislava insgesamt, als auch auf die Bedürfnisse der umliegenden Umgebung abgestimmt. Die Bedürfnisse der Stadt Bratislava liegen im Wesentlichen in der Schaffung von hoch qualitativen Innovations- und Forschungsstandorten. Diese Standorte beanspruchen ein hohes Maß an Arbeits- und Lebensqualität. Mit anderen Worten: es ist dafür Sorge zu tragen, dass einerseits Kommunikationszentren, und andererseits Erholungsräume am Standort bzw. in unmittelbarer Nähe geboten werden.

Dieser Anspruch entspricht den Vorgaben der Vertretung der Stadt Vajnory, die den Erholungscharakter des Gebietes als wesentlich erachtet. CEPIT soll demnach auch die Übergänge zwischen Stadt und Naturschutzgebiet gleitend sicherstellen.

Das Gebiet ist unmittelbar an das Naturschutzgebiet SUR bzw. den in nächster Umgebung befindlichen Karpatensüdhang mit Weinbau angebunden. Die Randlage des Gebietes ist dementsprechend nicht für eine dichte urbane Verbauung geeignet. Das Ziel ist es, ein Science Village mit lockerer Bebauung zu entwickeln. Da das Gebiet derzeit keinen Anschluss an urbane Strukturen der Stadt aufweist, ist die Schaffung sozialer Strukturen (Schulwesen, Gesundheitsvorsorge, sonst. soziale Einrichtungen,) sowie Serviceeinrichtungen (Greißler, Frisör, …) sicher zu stellen. Insgesamt soll die Bebauung ein urbanes Zentrum mit geringeren Dichten an den Rändern und einer zunehmenden Verdichtung in Richtung Zentrum wiederspiegeln. Unter der Annahme, dass unterschiedliche Nutzungen unterschiedliche Standortfaktoren nachfragen, wurden Nutzungen gewählt, die am Standort optimale Synergien sicherstellen und den am Standort zu Verfügung stehenden Faktoren Rechnung tragen. Das gesamte Konzept baut auf der Idee eines Ausbildungs- und Forschungszentrums auf. Dieses Zentrum sollte die Attraktivität des CEPIT Areals charakterisieren. Ein Gesamtkonzept ohne Ausbildungs- und Forschungszentrum ist weder auf Basis der Wirtschaftlichkeitsberechnung sinnvoll, noch entspricht es den Zielen der Stadt Bratislava. Auf Grund einiger wesentlicher Standortmängel (Erreichbarkeit, Zentrumsnähe) ist dieser Nutzungsmix ein vorgegebenes Optimum.

Die Entwicklung soll in Teilsektoren erfolgen, die das notwendige Eigengewicht haben, um als selbständige Einheiten funktionstüchtig zu sein und dennoch die notwendige Überschaubarkeit zu gewährleisten, um örtliche Identitäten zu ermöglichen.

Das Gebiet kann in zwei wesentliche Schwerpunkte geteilt werden:

- in den Gewerbe und Hightech-Produktionsschwerpunkt, der vor allem in den Randlagen westlich und teilweise in abgeschwächter Form im Osten angesiedelt ist
- in das urbane Zentrum, dass durch Wohnen, Ausbildung und Büro geprägt sein soll.

3.1 Nutzungen in Sektoren

Die Aufteilung in Sektoren ergibt sich aus unterschiedlichen Gesichtspunkten beginnend mit Anforderungen an die verkehrliche Infrastruktur bis zu zeitlichen und rechtlichen Restriktionen. Im Wesentlichen wird die Entwicklung wie bereits angesprochen von West nach Ost verlaufen, wobei in jeder Phase auf die Funktionalität des Teilabschnittes Rücksicht genommen wird.

Abbildung 2 stellt die einzelnen Sektoren und ihren jeweiligen Nutzungsschwerpunkt dar. Die Darstellung kann als das eigentliche Nutzungskonzept angesehen werden.

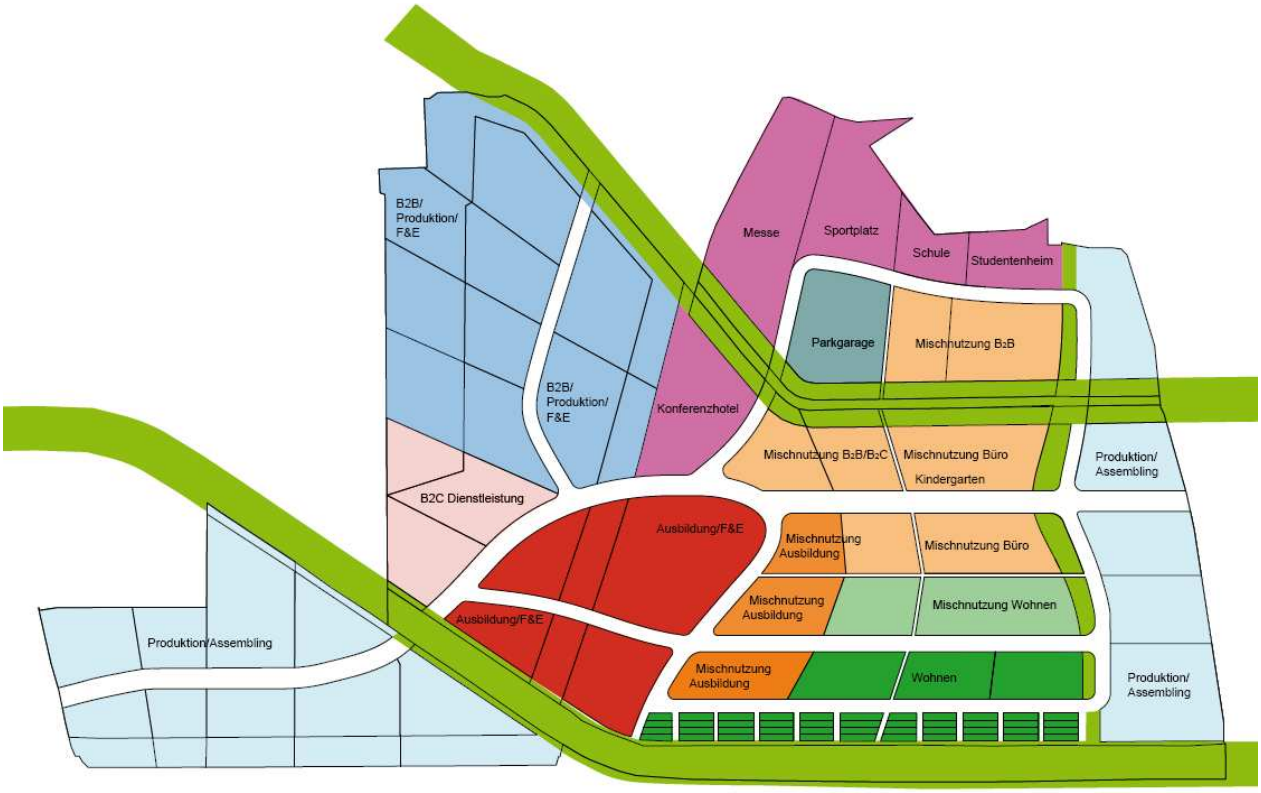

Abb. 2: Nutzungskonzept (Quelle: redserve/ATP, 2007)

Sektor I	Im Sektor I werden die als Gewerbe und Produktion gewidmeten Flächen in unmittelbarer Zukunft (2007/2008) einer Gewerbenutzung zugeführt. Die Dichte der Bebauung wird abzüglich der Schutzzonen und Verkehrsflächen maximal gemäß der Widmung gehalten. Auf Grund der noch bestehenden Höhenbeschränkung durch den angrenzenden Sportflughafen ist die Bebauungshöhe teilweise geringer als in der urbanistischen Studie vorgesehen. Die zentrale Westerschließung des CEPIT Gebietes führt durch Sektor I. Sektor I wird durch eine Querung des Biokorridors mit den übrigen Flächen verbunden. Alle potenziellen Ansiedler sollten im Bereich Hightech Produktion und Assembling gesucht werden.
Sektor II	Sektor II stellt das Herz des Gebietes dar. Den Nukleus mit Produktionsnahmen Forschungseinrichtungen die dem Projekt CEPIT den Charakter verleihen. Dieser Nukleus ist mit einem Zeithorizont von 2-3 Jahren projektiert und sollte auch architektonisch herausragen. Die Geschoßzahl variiert zwischen 4-7 Geschoßen. Neben den geplanten universitären Instituten ist auch die Ansiedlunge eines eigens gegründeten Forschungsinstituts und Weiterbildungszentren geplant Um die reine Forschung und Ausbildung aufzulockern, soll dieser Nukleus mit Nachversorgungseinrichtungen belebt werden. Der Nukleus ist so zu konzipieren, dass er einen Impuls für das ganze Gebiet darstellt.
Sektor III	Der wohndominierte Sektor III muss höchstem Standard entsprechen. Im Süden sind Einfamilienhäuser angedacht, die von 3-5-geschossigen Mehrfamilienhäusern nördlich begrenzt werden. Die Blockrandbebauung mit Wohnnutzung sollte ebenfalls hochqualitativen Standard aufweisen. Wohnen, Studieren und Forschen ergänzen sich und bestimmen insgesamt den Charakter und die Einzigartigkeit des Standortes. Demnach ist auch hier auf eine voll ausgereizte Bebauungsdichte zu verzichten und ein ausreichendes Ausmaß an Grün- und Erholungsflächen für öffentliche Nutzung einzurichten. Sektor III ist unbedingt im Zusammenhang mit Sektor V zu sehen. Zu vermeiden ist eine Wohnmonokultur im eigentlichen Sinne.
Sektor IV	Sektor IV umfasst Forschung, Entwicklung und Produktionsgebiete im Nordwesten. Dieser Sektor ist ebenfalls in engem Zusammenhang mit der Entwicklung bzw. dem Nutzungskonzept des Sektor II/V zu sehen. Sektor IV stellt Ansiedlungsmöglichkeiten für Unternehmen mit einem starken Fokus auf Forschungs- und Entwicklungstätigkeit in den CEPIT Schwerpunkten Mechatronik, Nanoelektronik und Maschinenbau dar. Empfohlen wird hier eine 2-3 geschossige Bebauung, wobei die Geschosszahlen sich von West nach Ost steigern sollten, um die Höhenentwicklung im gesamten Bebauungskonzept zu unterstreichen. Der Sektor ist durch einen hohen Anteil an nicht bebaubaren Flächen gekennzeichnet, die als Erholungs- und Freizeitzwecke zur Verfügung stehen können. Der östliche Grünbereich bildet auch eine klare Trennung zwischen dem Nukleus, dem urbanen Zentrum und der Produktions- und Gewerbearchitektur.
Sektor V	Sektor V spiegelt den Nukleus mit urbanen Strukturen. Hier ist eine hohe Dichte zu empfehlen, um den angestrebten urbanen Charakter des Gebietes zu unterstreichen. Die Geschosshöhen sind mit 5-7

	Geschossen angenommen. Eine gemischte Nutzung, die sowohl Ausbildung, Büro, Gastronomie, Handel aber auch Wohnen und damit auch soziale Dienstleistungen mit einbezieht, und den Ausbildungsschwerpunkt auflockert, vorzusehen. Darüber hinaus bietet ein Konferenzhotel in unmittelbarer Nähe zum Forschungs-, und Bildungsnukleus eine optimale Synergie
Sektor VI	Angrenzend an den Sektor V mit weitgehend urbanen Nutzungen und einer hohen Dichte liegt Sektor VI. Die Sektoren sind durch einen Biokorridor getrennt, der gleichzeitig als Grünraum fungiert. Weiterführend ist auch in diesem Sektor Wohnmischnutzung vorgesehen. Allerdings mit einer geringeren Dichte und in Synergie mit Freizeit- und Kultureinrichtungen. Die angebotenen Erholungs- und Kultureinrichtungen können nur durch ein funktionierendes Zentrum bestehen und sind in Ihrer Größe auch von dem des Zentrums abhängig. Anschließend an das Konferenzzentrum entsteht über den Biokorridor Richtung Norden eine Mehrzweckhalle, die vorrangig als Messe eingesetzt werden soll. Um einen allzu hohen Leerstand zu verhindern sollten die Hallen jedoch auch für andere Zwecke (Beispiel: kulturelle, sportliche) nutzbar gemacht werden.
Sektor VII	Sektor VII grenzt direkt an das Naturschutzgebiet und sollte als solches einen gewissen Puffer zur urbanen Nutzung der westlichen angrenzenden Sektoren schaffen. Zwischen Sektor V und VII besteht ein Grünkorridor, der ebenfalls die Pufferwirkung unterstreichen soll. Die Nutzung hängt stark von der Realisierung der geplanten Autobahn östlich des Gebietes ab. Im Falle dieser Realisierung ergibt sich vor allem in diesem Sektor ein höherer Entwicklungsdruck und es ist anzunehmen, dass dann auch eine höhere Dichte angestrebt wird als derzeit in der Widmung festgelegt. Derzeit gehen wir jedoch nur von einer Umfahrungsstraße östlich aus. Grundsätzlich sollte auch in diesem Sektor Forschung und Hightech Gewerbe dominieren. Im Falle einer übergeordneten Verkehrsanbindung sind allerdings auch andere Nutzungen, wie Beispielsweise übergeordnete B2B (Logistik) und B2C (Einkaufszentrum, Fachmärkte) in Erwägung zu ziehen. Derzeit wird jedoch nicht von einer Realisierung der Autobahn ausgegangen und dem nach wird die unten angeführte Nutzung vorgeschlagen.

3.2 Zeitliche Abfolge in Bauabschnitten

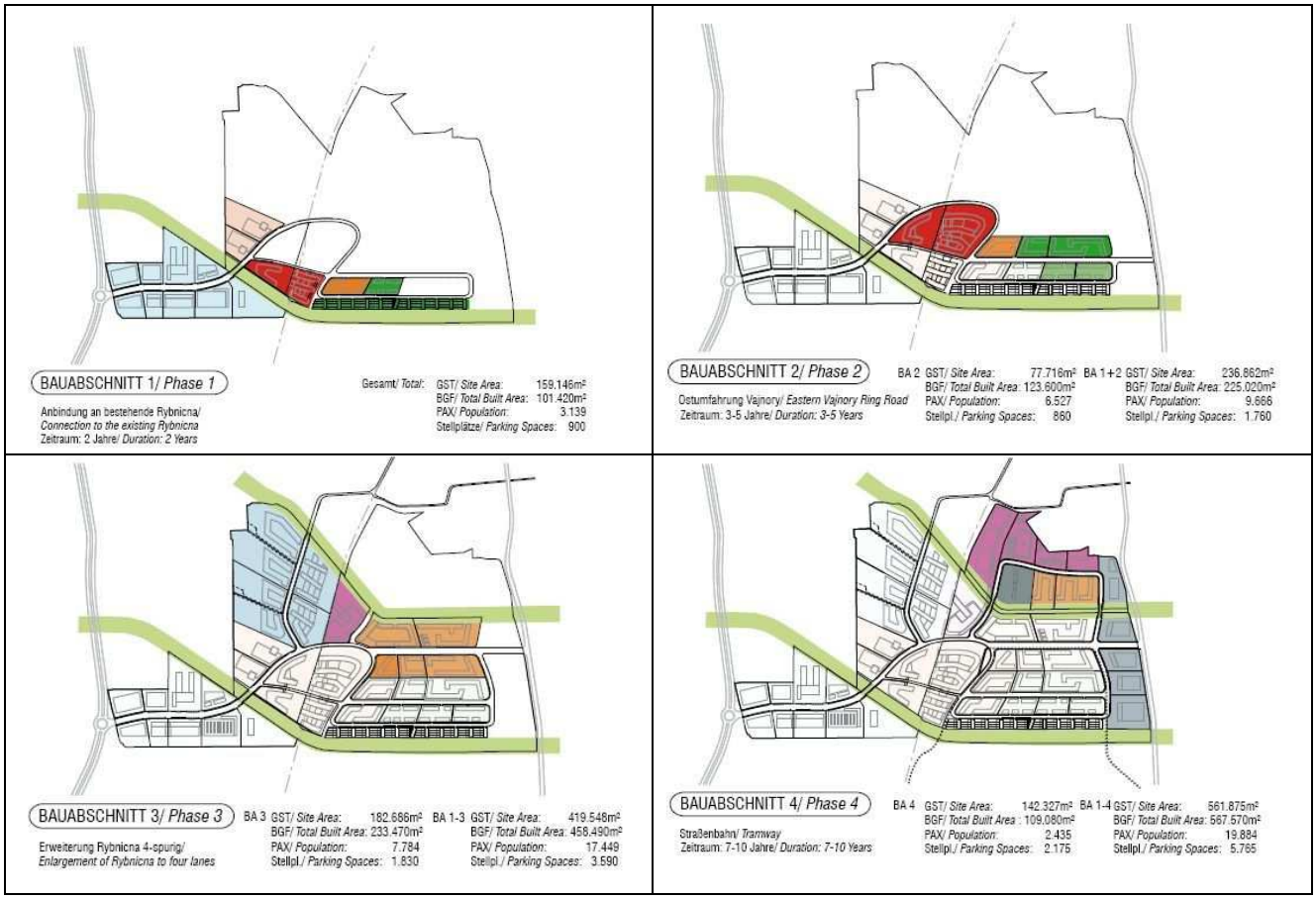

Abb. 3: Bauabschnitte (Quelle: ATP Wien,2007)

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Reaktivierung ungenutzter Räume in der Stadt - ganz Linz als Hotel

Richard STEGER

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ZUSAMMENFASSUNG

„Überschuss an frei gewordenem Raum eröffnet neue Spielräume…“

Unter diesem Leitsatz reaktiviert das Kunst- und Kulturprojekt "Pixelhotel" ungenutzte Räume in der Stadt und funktioniert diese im Zuge des Kulturhauptstadtjahres 2009 in Linz zu Hotelzimmern um. Leer stehende Gebäude und Gebäudeteile wie Industriehallen, öffentliche Gebäude, Geschäftsflächen, Mietshäuser, etc. werden gesucht, angemietet und anschließend durch investieren in den Einbau von Zimmern aufgewertet. Die begleitenden Dienstleistungen eines herkömmlichen Hotels werden hier von der Stadt selbst zur Verfügung gestellt. So nutzt das Pixelhotel die Ressourcen schon vorhandener Einrichtungen, wie Restaurants, Bars, Fitnesscenter, Friseure, etc. Jedes Zimmer bekommt seine eigene, auf den Standort bezogene Individualität. So ist es möglich Qualitäten, Facetten und Eigenheiten der Stadt Linz zu inszenieren, die sich Abseits des touristischen "main streams" befinden und dem Linz Besucher im Allgemeinen verborgen bleiben. Es wird besonderer Wert auf kulturelle und künstlerische Einzigartigkeit gelegt. Der Gast bekommt mit dem Schlüssel für sein Zimmer gleichzeitig einen Stadtplan in die Hand gedrückt und erlebt auf seinem Weg vom Empfang zur Unterkunft schon jede Menge Qualität, Eigenheit und Vielfalt der Stadt Linz. Die ganze Stadt ist das Hotel. Wer in Linz ankommt, hat bereits die Hotellobby betreten.

1 EINLEITUNG

Linz hat sich in den vergangenen Jahrzehnten als attraktiver Standort für Forschung, Technologie, Industrie und Dienstleistung etabliert und bildet einen der stärksten und erfolgreichsten Wirtschaftsräume Österreichs. Ergänzend dazu entstanden eine Vielzahl an Einrichtungen für Kongresse, Tagungen und Messen deren Teilnehmer den Großteil der Linzer Touristen ausmacht. Die Linzer Beherbergungsbetriebe sind auf den Touristen mit berufsbedingtem Aufenthalt ausgerichtet. Bei einer Gesamtbettenanzahl in Linz von 5000 mit einer theoretischen Kapazität von 1.825.000 Nächtigungen und 686000 tatsächlichen Nächtigungen im Jahr 2005 ergibt sich eine Auslastung von 37,5%. Diese Zahlen sagen eigentlich aus, dass genügend Betten in Linz vorhanden wären. Die Auslastung der Übernachtungsmöglichkeiten stellt sich jedoch im Jahresverlauf als Spitzen dar, dem saisonalen Kongress- und Seminarangebote in der Stadt folgend.

Das Kulturhauptstadtjahr 2009 stellt für die Beherbergungsbetriebe in Linz eine Ausnahmesituation dar. Es gilt eine Verschiebung im Bereich der Aufnahmekapazität und der Zielkundschaft temporär für dieses eine Jahr erfolgreich zu bewältigen. Bei einer konstant hohen Auslastung während des ganzen Jahres und gleichzeitigem Auftreten von Spitzen während Großveranstaltungen wird es nicht möglich sein den Bedarf quantitativ abzudecken. Ebensowenig wird es gelingen das kunst- und kulturinteressierte Publikum des Kulturhauptstadtjahres mit dem vorhandenen Beherbergungsangebot zufrieden zu stellen, da dieses auf ein anderes Zielpublikum ausgerichtet ist.

Neu errichtete Gebäude sind für das Kulturhauptstadtjahr schwer zu finanzieren da davon ausgegangen werden kann, dass die Nachfrage 2010 nicht in gleichem Ausmaß vorhanden sein wird. Es braucht neue Ansatzpunkte zur qualitätvollen Erhöhung der Aufnahmekapazitäten von Gästen.

2 KONZEPT PIXELHOTEL

2.1 Zwischennutzung von Leerständen

Für das „Wohnen auf Zeit“ werden keine neuen Bauwerke errichtet, sondern leer stehende Gebäude und Gebäudeteile wie Industriehallen, öffentliche Gebäude, Geschäftsflächen, Mietshäuser, etc. gesucht, angemietet, anschließend durch investieren in den Einbau von Zimmern aufgewertet und an die Gäste des Hotels weitervermietet. Die Hotelzimmer des Pixelhotels sind über das gesamte Stadtgebiet verteilt und nicht in einem „Haus“ zusammengefasst.

2.2 thematische Bespielung der einzelnen Standorte

Der touristische "main stream" befindet sich momentan in Nord-Süd-Richtung entlang der Landstraße vom Hauptbahnhof bis zum Ars-Electronica-Center auf der gegenüberliegenden Seite der Donau und in zwei Satteliten zu dieser Achse, der Altstadt von Linz und einem einem etwas weiter nördlich gelegenen Wahrzeichen der Stadt - dem Pöstlingberg.

Die tatsächlichen Qualitäten von Linz eröffnen sich jedoch erst auf den zweiten Blick mit einer großen Vielfältigkeit an unterschiedlichen Situationen. So befinden sich liebenswerte kleine Straßen und massiv überlastete Verkehrsknotenpunkte, paradiesisch grüne Wohnhöfe und mächtige Industrieanlagen, Filialen globaler Fast-Food-Ketten und authentische Wirtshäuser in unmittelbarer Nachbarschaft zueinander.

Pixelhotel will diese Eigenheiten, Qualitäten und Kuriositäten abseits der touristischen Wege inszenieren und erlebbar machen. Damit soll das Pixelhotel dazu beitragen die Qualität der Beherbergung in Linz hinsichtlich des stadtkulturellen Erlebens zu verbessern und mehr Publikum an diesen Standard zu binden.

2.3 Gastronomie- und Dienstleistungseinrichtungen

Das Hotel nutzt die Ressourcen schon vorhandener Einrichtungen, wie Restaurants, Bars, Friseure, Fitnessstudios,... und bindet diese als begleitende Dienstleistungen ein. Das Cafe nebenan ist der Frühstücksraum, das Szenelokal die Hotelbar, Restaurants des bio-alternativen Ernährungsangebotes der Speisesaal. Die Auswahl der Gastronomie- und Dienstleistungseinrichtungen versteht sich als Geheimtipp exklusiv für den Pixelhotelkunden. Es kommen ähnliche Qualitätskriterien zur Anwendung wie bei derAuswahl der Zimmer - Authentizität abseits des touristischen "main streams".

Durch die Vernetzung der eigenständig bestehenden Gastronomie- und Dienstleistungseinrichtungen und den Hotelzimmern in den Leerständen entsteht unter Berücksichtigung der thematischen Ausrichtung auf die kulturellen Qualitäten der Stadt die Marke Pixelhotel.

3 ZIELE

Tourismus- und Kulturveranstalter bringen im Kulturhauptstadtjahr 2009 mehr Gäste in die Stadt Linz. Neu errichtete Beherbergungsbetriebe sind für dieses Spitzenjahr schwer vorzuhalten bzw. nachzunutzen. Pixelhotel Linz geht hier einen neuen Weg. Leerstehende Gebäude bzw. Gebäudeteile werden zu architektonisch hochwertigen, Linz spezifischen Nächtigungsmöglichkeiten umgenutzt. Durch diese einzigartige Vernetzung des städtischen Angebotes wird ein Mehrwert für viele in der Stadt Linz geschaffen:

- Aufwertung des städtischen Raumes durch Revitalisierung brach liegender Gebäude oder
- Gebäudeteile auf künstlerisch und architektonisch hohem Niveau.
- Jedes Pixel hat eine inszenierte Beziehung zur Stadt Linz. Diese spezifische Ausprägung ist als unverkennbares Zeichen ein wichtiges Element der Pixelhotel-Idee. Damit unterscheidet sich Pixelhotel von reinen Zimmer-Vermittlungsplattformen.
- Bestimmen des weltweiten Trends der Virtualisierung auch in diesem Sektor. Während vieles bereits virtuell abgewickelt wird, wie zum Beispiel viele Bereiche des Arbeitens, sind Hotels noch immer
- sehr traditionell aufgebaut. Hier will Pixelhotel Linz Vorreiterrolle übernehmen.
- Neue Technologien für Schlüsselausgabe oder Buchung und Verrechnung können angewandt werden, um auch technologisch Zeitgeist zu dokumentieren und dem Gast den Aufenthalt so angenehm wie möglich zu machen.
- Pixelhotel Linz hat das Ziel unterschiedliche Pixelhotels in verschiedenen Städten im Franchisesystem zu etablieren. Neue Städtepartnerschaften entstehen durch ein immer dichter werdendes Pixelhotel -Netzwerk.

4 ZIELGRUPPE

Wir gehen davon aus, dass es nicht möglich ist für eine europäische Kulturhauptstadt eine umfassende und detailierte Definition der Kunden zu erstellen. Vielmehr gehen wir davon aus, dass grundsätzlich „jeder“ zur Zielgruppe eines Kulturhauptstadtjahres in Linz 2009 gehört.

Weiters nehmen wir an, dass sich innerhalb dieser umfassenden und allgemeinen Spezifikation „jeder“ Kundengruppen befinden, die in einer gewissen Regelmäßigkeit kulturelle Großveranstaltungen besuchen. Wir sprechen hier von einem Kulturfestival Touristen, der auch andere internationale Veranstaltungen wie zum Beispiel Dokumenta, Art Basel, Biennale, Diagonale, Viennale, Ars Electronica etc. besucht. Unser besonderes Augenmerk wird auf die Bereitstellung entsprechend künstlerisch und architektonisch hochwertiger Quartiere für diese Zielgruppe gelegt.

5 NUTZEN

Die gezielte Wahl der Standorte in Beziehung zu den jeweiligen Attraktionen der Stadt (Industrie, Kultur, Natur), sowie eine maßgeschneiderte Konzeption der Zimmer auf ein Thema der Stadt trägt zur Attraktivität sowohl des Beherbergungsbetriebes als auch der Stadt bei. Ein Pixelhotel in Linz erfüllt somit mehrere Funktionen:

5.1 Nutzen des Pixelhotels für den Kunden:

- Die Stadt selbst ist das Hotel und somit erlebt der Besucher auf dem Weg vom Zimmer zum Frühstück schon ein Stück Alltagskultur der Stadt. Dabei werden besondere und spezifische Räume der Stadt entdeckt, die herkömmlicher Weise den Touristen verborgen bleiben.
- Die Verbindung verschiedener zielgruppenorientierter Zusatzeinrichtungen (Dienstleistung, Gastronomie, Veranstaltung,...) durch die Organisationsplattform Pixelhotel sorgt für mehr Angebot und Vielfalt.
- Auf Grund seiner Lean Philosophie ergeben sich für den Kunden Preisvorteile bei gleichzeitig hohem Erlebnisniveau.
- Für den Gast ist das Pixelhotel ein Erlebnis, das es bisher nicht gegeben hat: von der Auswahl des Zimmers bei der Buchung, bei der Ankunft, im Erleben beim Aufenthalt und im Ausklang nach demVerlassen der Stadt.

5.2 Nutzen des Pixelhotels für die Stadt Linz:

- Die individuellen Eigenschaften, Qualitäten und Kuriositäten von Linz werden inszeniert. Für die Stadt ist das Pixelhotel eine integrative Bereicherung, die im Rahmen des Stadt-Marketings als Attraktion seinen Platz findet.
- Die Stadt als Ganzes hat eine Attraktion mehr. Die für Linz spezifischen thematischen Aspekte Kultur, Natur und Industrie werden mit und durch das Pixelhotel transportiert und für Gäste einzigartig erfahrbar gemacht.
- Leerstehende Immobilien werden einer neuen Nutzung zugeführt und auf künstlerisch und architektonisch hohem Niveau umgebaut. Diese Substanzaufwertung durch den Einbau von Hotelzimmern führt zur Verbesserung bislang brachliegenden Gebäudestrukturen und wird somit auch als Recycling urbaner Strukturen (Reurbanisierung, Stadtreperatur) gesehen.
- Das Hotel folgt dem Event und reagiert schnell auf veränderte Situationen in der Stadt. Größe und Platzierung der einzelnen Standorte werden den jeweiligen Gegebenheiten und Bedürfnissen schnell und ressourcenschonend angepasst. Daduch können zu erwartende Spitzen in der Hotelbranche, z.B. bei Großereignissen abgedeckt werden.
- Bereits verfügbare Dienstleistungs- und Gastronomieunternehmer werden in das Pixelhotel mit einbezogen anstatt durch ein neues Hotel Konkurrenz zu erfahren.

6 3 BEISPIELE

Die Auswahl der 3 Pixel ist rein exemplarisch und zeigt die große Auswahlmöglichkeit an Linz spezifischen Orten (ohne Anspruch auf Verfügbarkeit der Immobilien):

6.1 Pixel in der Tabakfabrik

Im Kesselhaus der ATW wird ein großräumiges Hotelzimmer implantiert. Das architekturhistorisch bedeutsame Haus soll im Zusammenhang mit der Industriegeschichte von Linz dem Gast erfahrbar gemacht

werden. Minimale Eingriffe im Innenraum (Einbau einer Nasszelle, Aufstellen eines Bettes) sollen die Ästhetik einer Turbinenhalle möglichst unangetastet lassen und ein besonderes Übernachtungserlebnis im industriellen Ambiente bieten.

6.2 Pixel in der ehemaligen Bügelstube Fadingerstr.

Drei Zimmer werden im Erdgeschoß eines gründerzeitlichen Miethauses eingebaut. Die Programmatik der Altbauwohnung wird in einzelnen Themenzimmern (Farbe, Designgeschichte, antiquarische Ausstattung) erarbeitet. Eine kleine Lobby ergänzt den Standort. Hier wird ein Einblick in die Alltagskultur des Linzer Bürgertums gegeben. Geschichtliche Zusammenhänge, ausgehend vom Straßennamen (Bauernkrieg) und der Fadingerschule (Wittgenstein, Hitler), können hier dem Gast nähergebracht werden.

6.3 Pixel im Dachgeschoß des Linzer Schlosses:

Der hohe Dachraum des Schlosses bietet den Rahmen für ein feudales Ambiente. In den von Dachbalken dominierten Innenraum soll ein einziges großräumiges Hotelzimmer mit minimal angedeuteter imperialistischer Ausstattung (Tigerfell mit Kopf, Kristallluster) entstehen. Besonderes Service (Butler) soll den Gesamteindruck in der Schlossanlage ergänzen. Die Programmatik soll durch geschichtliche Hintergründe zum Schloss und zur Stadt Linz im Mittelalter ergänzt werden.

7 AUSBLICK

Eine sinnvolle programmatische, thematische und zahlenmäßige Ergänzung des Übernachtungs-angebotes bis 2009 in Linz ist anzustreben. Ab 2007 werden einzelne Pixel als Prototypen den Betrieb aufnehmen. 2008 werden aus den Erkenntnissen der Prototypen weitere Pixel entstehen, um 2009 zu einer Gesamtbettenanzahl von ca. 100, verteilt im gesamten Stadtgebiet zu gelangen.

Mit Pixelhotel wollen wir letztlich ein weltweites Produkt entwickeln und dabei traditionelle Beherbergung mit modernem vernetzten Ambiente verbinden. Das heißt, dass das Pixelhotel in Zukunft als Eigenmarke zu einem fixen Bestandteil der Tourismusszene gehört soll, seinen Benutzerkreis ständig sucht, anspricht und darauf reagiert.

Ressourcenplaner Flugfeld Aspern: interaktive Entscheidungsunterstützung

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1 EINLEITUNG

1.1 Voraussetzungen

Das Flugfeld Aspern (im Folgenden kurz "Flugfeld") ist ein im 22. Wiener Gemeindebezirk gelegenes ca. 200 ha großes Areal und stellt die derzeit größte Entwicklungsfläche der Stadt Wien dar. In Zusammenarbeit zwischen dem Magistrat Wien und dem Wiener Wirtschaftsförderungsfonds (WWFF) wurde ein Projektteam für die Erarbeitung eines Masterplans hinsichtlich der künftigen Entwicklung am Flugfeld Aspern eingerichtet. Eine besondere Herausforderung bei der Planung derartiger städtebaulicher Projekte ist die kontinuierliche Übersicht über die Kosten und Auswirkungen der geplanten Maßnahmen. Informationsmängel in diesem Bereich führen oft zu Fehlentscheidungen, was sich natürlich auch auf die Qualität des daraus abgeleiteten Masterplans auswirkt.

Um der Entstehung derartiger Informationsmängel bei der Entwicklung des Flugfelds vorzubeugen, wurde ein städtebauliches Bewertungstool, in der Folge kurz "Tool" genannt, entwickelt, mit dessen Hilfe es EDV-gestützt möglich ist, Aussagen über die Auswirkungen von Planungsvarianten zu erhalten. Das Hauptaugenmerk liegt hierbei auf den ökonomischen Auswirkungen, d. h. es sollen hauptschächlich projektinduzierte Kosten und Folgekosten geschätzt und einander gegenüber gestellt werden.

Für die Zulieferung der benötigten Grundlagendaten konnten Experten gewonnen werden, die in den folgenden Bereichen tätig sind und jeweils in Kooperation mit dem EDV-Team die notwendigen projektbezogenen Daten aus ihrem Erfahrungsschatz zur Verfügung stellen:

- Wasserbau,
- Grünraum,
- Geomantie,
- Schotter- und Baustellenlogistik,
- Infrastruktur.

Ausgehend von diesen Grundlagendaten ist es Aufgabe des Tools, die Planer bei der Analyse und Feststellung des Sachverhalts zu unterstützen, ob und inwieweit der Entwicklungsprozess respektive jeweils einzelne Varianten desselben zu Ergebnissen führen, die innerhalb bestimmter, vorab gesetzter Leistungs- und Kostengrenzen liegen. Auch soll untersucht werden, ob und welche Veränderungen des Designs zu einer (positiven oder negativen) Qualitätsveränderung des Projekts führen.

Das Tool ist rein für den Einsatz in der Raumplanung bzw. städtebaulichen Entwicklungsplanung konzipiert. Es dient dazu, die Investitionen und Folgekosten von Planungsvarianten für das Flugfeld Aspern auf Basis von Richtwerten abzuschätzen. Für diese Richtwerte stehen Datensätze zur Verfügung, deren Inhalte von dem erwähnten Pool an Experten verschiedener Fachplanungsbereiche zusammengestellt und auf dem jeweils aktuellen Stand gehalten werden.

1.2 Herangehensweise

Das Projekt wurde eingangs in mehrere Bearbeitungsschritte gegliedert, die nachstehend angeführt und kurz erläutert sind:

1.2.1 Screening existierender Systeme und Literatur

Nach aktuellem Stand ist kein fertiges Standard-Tool bekannt, das die Anforderungen des Auftraggebers erfüllt, es sind jedoch einige Systeme am Markt, die in Teilen verwendbar erscheinen. Um sicher zu stellen, dass die zur Realisierung gelangende Lösung alle Anforderungen mit optimalem Wirkungsgrad erfüllt,

wurde ein Screening der existierenden Systeme und Publikationen zum Thema durchgeführt, um einen schnellen, aber systematischen Marktüberblick zu erhalten.

1.2.2 Klärung der Datensituation

Da im Bereich der Stadt Wien umfangreiches Material an räumlichen Daten in verschiedenen Aggregationsniveaus vorhanden ist, wurde zweckmäßigerweise sämtliches Datenmaterial von der Stadt Wien durch den Auftraggeber bereit gestellt. Dabei handelte es sich vor allem um ein Orthophoto, einen Ausschnitt aus der Wiener Mehrzweckkarte sowie räumliche Daten zu den einzelnen Planungsfachbereichen. Die Experten orientierten sich an diesem Datenbestand, sodass auf dieser Grundlage aufbauende neue Datenschichten von Koordinatensystem und kartographischer Projektion her mit den übrigen Daten überein stimmten.

1.2.3 Formalisierung und Operationalisierung des Inputs

Gemeinsam mit den Fachexperten wurde das vorhandene und benötigte Fachwissen so formalisiert, dass es in einfacher Formelsprache in ein Modell integrierbar ist. Im Allgemeinen wurden von den Experten Tabellen mit Richtwerten für Einzelmaßnahmen oder Maßnahmenbündel zur Verfügung gestellt, die gemeinsam mit aus den räumlichen Daten extrahierten Informationen über Fläche, Länge, Höhe etc. zur Kostenberechnung herangezogen wurden.

1.2.4 Konzeption der inhaltlichen Lösung des städtebaulichen Bewertungstools und der technischen Lösung des IT-Modells

In enger Abstimmung mit dem Auftraggeber wurde nunmehr der inhaltliche und der technische Lösungsweg des Projektes festgelegt, es wurde also die grundsätzliche Entscheidung getroffen, welche Inhalte so operationaliserbar sind, dass sie in das Modell einfließen können, welche Software-Ansätze weiter verfolgt werden sollen (z. B. Verwendung bestehender Software, Neuprogrammierung, Mischform) und welche Funktionalitäten das Endprodukt schließlich haben muss.

1.2.5 Erstellen eines Pflichtenheftes und Definition der Leistung der Programmierung

Aus den bisher erarbeiteten Schritten wurde in der Folge ein Pflichtenheft abgeleitet, das dem Programmierer als Anleitung und Zielvorgabe diente. In diesem Pflichtenheft wurden inhaltliche (Welche Funktionen, welche Datenarten bzw. Daten müssen in das Tool integriert sein?) wie auch technische Vorgaben (Welche Arbeitsschritte muss das Tool beherrschen? Wie sind diese umzusetzen?) festgehalten.

1.2.6 Funktionsprüfung und Abnahme der Programmierung

Nach Ausarbeitung des Tools durch den Programmierer wurden eingehende Tests durchgeführt, um sicherstellen zu können, dass das entwickelte Tool die Anforderungen des Pflichtenhefts tatsächlich zu erfüllen vermag. Bei Bedarf wurden in enger Kooperation mit dem Programmierer Nachbesserungs- bzw. Ergänzungsarbeiten durchgeführt, um – auch in Absprache mit dem Expertenteam – das Modell bestmöglich an die tatsächlichen Vorgaben anzupassen. Im Zuge dessen wurden auch Daten des Original-Masterplan-Entwurfs in das Tool eingearbeitet.

2 PROGRAMMIERUNG DES RESSOURCENPLANER-MODELLS

2.1 Wahl der Softwareplattform

Das Tool wurde mit der Extension "CommunityViz/Scenario 360" für ArcGIS 9.1 entwickelt.

CommunityViz bietet GIS-basierte Analysen, die es den Benutzern erlauben, Planungsalternativen zu visionalisieren, visualisieren und ihre potenziellen Effekte zu verstehen, Möglichkeiten zu untersuchen, Szenarien aus allen erdenklichen Perspektiven (Umwelt, Wirtschaft, Soziales,...)zu betrachten und als Entscheidungsunterstützung heanzuziehen. CommunityViz ist mehr als ein Stück Technik und stellt eine Methode, einen Planungsweg dar, der den Benutzern erlaubt, wie die Einwohnerschaft zu denken und zu handeln – jenseits der eigenen Hinterhöfe und Grundlinien –, indem sie die gemeinsame Sprache der Visualisierung verwenden. Es hilft Leuten mit unterschiedlichen Standpunkten und Hintergründen, miteinander kollaborative, fundierte und gerechte Entscheidungen über ihre Zukunft zu treffen. (Diese und weitere Information auf http://www.communityviz.com.)

CommunityViz arbeitet mit dynamischen Attributdaten, die auf Änderungen im selben oder in anderen Datenschichten selbsttätig zu reagieren imstande sind, und mit Benutzervorgaben, die mittels Schiebereglern oder Eingabefenstern getätigt werden. Aus der Verknüpfung solcher Daten und Vorgaben werden wiederum selbsttätig Indikatoren errechnet, die als Output oder Vergleichsgrundlage von Szenarien dienen. Darüber hinaus können auch noch Warnungen implementiert werden, die abhängig vom Über- oder Unterschreiten vorgegebener oder benutzerdefinierter Schwellenwerte manuell oder automatisch aktiviert werden.

CommunityViz arbeitet mit einer simplen Formelsprache, die vektor- und rasterbasierte Berechnungen erlaubt und somit die am häufigsten GIS-Funktionalitäten automatisierten kann. Außerdem steht die Abfrage von Bedingungen (IF...THEN...ELSE) zur Verfügung, die sich an allen vorhandenen oder "on the fly" berechneten Daten und Vorgaben orientieren kann. Selbst mit diesen einfachen Mitteln ist es möglich, relativ komplexe Sachverhalte in ein Modell zu packen, denn die große Stärke von CommunityViz liegt im Herstellen von Zusammenhängen zwischen (prinzipiell voneinander unabhängigen) Datenschichten respektive Planungsfachgebieten.

2.2 Implementierung der Grundlagendaten

Die Grundlagendaten, darunter sind all jene Daten zu verstehen, die den Ist-Zustand des Flugfelds beschreiben, wurden bereits vom Programmiererteam in das Tool eingespielt. Die Grundlagendaten dürfen nicht verändert werden, da sich etliche Berechnungen bzw. Formeln auf diese Daten stützen. Sie sind daher nicht als dynamische, sprich veränderbare Layer konzipiert.

2.3 Implementierung der Expertendaten

Die Expertendaten liegen in tabellarischer Form bzw. für den Bereich Geomantie als Geodaten vor. Sie wurden ebenfalls bereits vom Programmiererteam in das Tool eingespielt. Die Expertendaten dürfen in ihrer Struktur nicht verändert werden; eine Aktualisierung der Richtwerte ist jedoch möglich, indem die entsprechende Tabelle durch eine gleich strukturierte neue Version ersetzt wird.

2.4 Ablauf der Umsetzung

Zunächst wurden die Grundlagendaten in das Tool eingespielt und darauf aufbauend all jene (vorerst noch leeren) Objektklassen erstellt, die auf den Grundlagendaten beruhen, sich darauf beziehen oder mit ihnen verknüpft sind. Im nächsten Schritt wurden die Dynamic Attributes und gleichzeitig mit dem Ausbau selbiger auch die Assumptions (Schieberegler) erstellt. Währenddessen wurde stets mit Testdatensätzen die richtige Funktionalität aller Formeln und Verweise sicher gestellt.

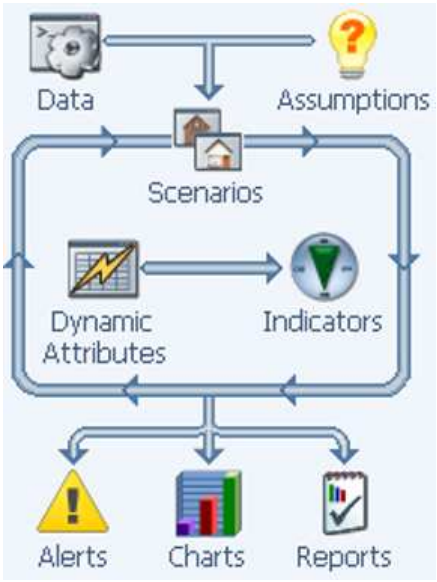


Abb. 1: Datenflussdiagramm von CommunityViz

Nach Fertigstellung der Objektklassen, Dynamic Attributes und Assumptions wurden die Indicators erstellt; dabei handelt es sich um die Ergebnisse der CommunityViz-Berechnungen. Indicators werden als Summen, Mittelwerte oder Relativanteile ausgegeben sowie als Datengrundlage für tabellarische Übersichten und Diagramme herangezogen.

Je nach Erfordernis wurden gleichzeitig mit der Arbeit an den übrigen Parametern und Klassen auch die Alerts aufgebaut, die sich nach Maßgabe auf Dynamic Attributes, Indicators, aber auch Assumptions beziehen können und bei Über- oder Unterschreitung festgelegter oder benutzerdefinierter Schwellenwerte automatisch oder manuell gesteuert Warnhinweise ausgeben.

Nach Fertigstellung des Grundgerüsts wurden ausgiebige Testläufe mit Testdaten wie auch mit Masterplan-Daten durchgeführt und an einigen Stellen des Tools Nachbesserung durchgeführt, um die Rechenzeit zu optimieren und notwendigerweise anfallende Zwischenergebnisse ebenfalls zur Darstellung aufzubereiten.

3 MODELLSTRUKTUR IN COMMUNITYVIZ

3.1 Dynamic Attributes

"Dynamic Attributes" sind jene Attributdaten von Shapefiles, die sich durch die Arbeit mit dem städtebaulichen Entwicklungstool automatisch verändern können bzw. vom Programm im Zuge der Interaktion mit dem Benutzer selbstständig festgelegt werden. Die Inhalte der "Dynamic Attributes" können einerseits durch direkte Abfrage der Daten vom Benutzer generiert werden (z. B. Eingabe des Straßentyps, der Straßenbreite oder der Stockwerksanzahl eines geplanten Gebäudes); andererseits kann die Berechnung auch nach vorab definierten Formeln ohne Zutun des Benutzers erfolgen (Berechnung der Errichtungskosten, Messung von Abständen oder Eignungsbewertungen). "Dynamic Attributes" sind Bestandteil der Shapefile-Attributtabelle, d. h. jedes Polygon, jede Linie oder jeder Punkt verfügt über seine eigenen "Dynamic Attributes".

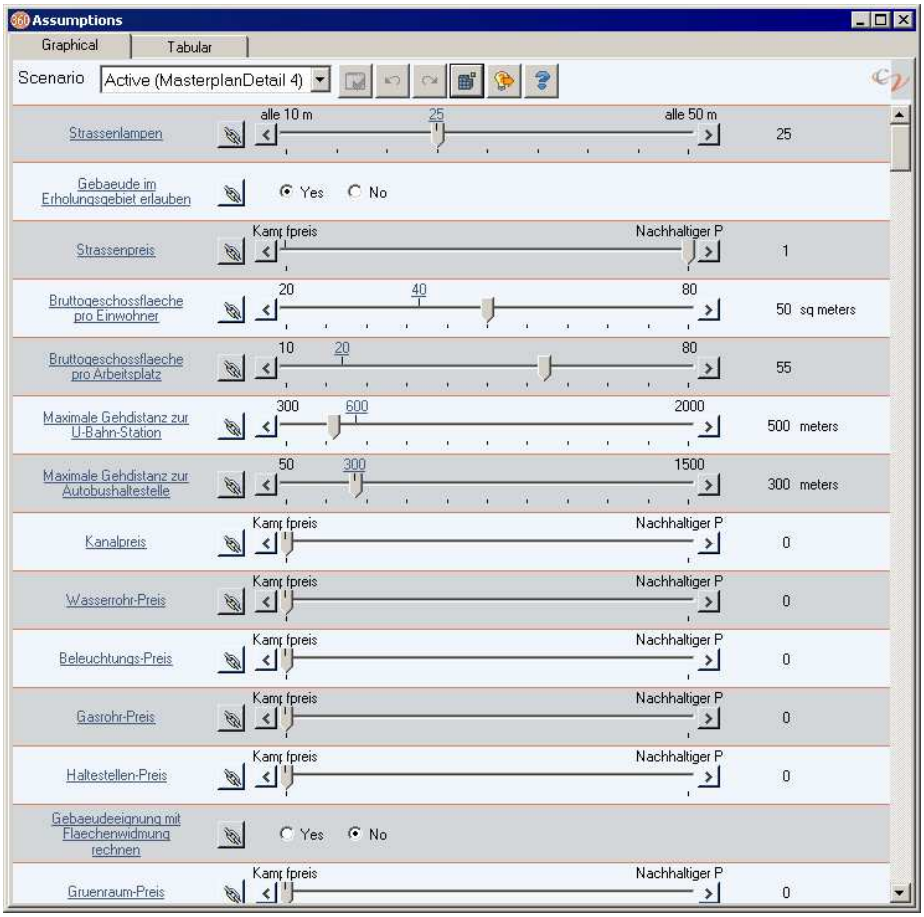


Abb. 2: Schieberegler für die Assumptions in CommunityViz

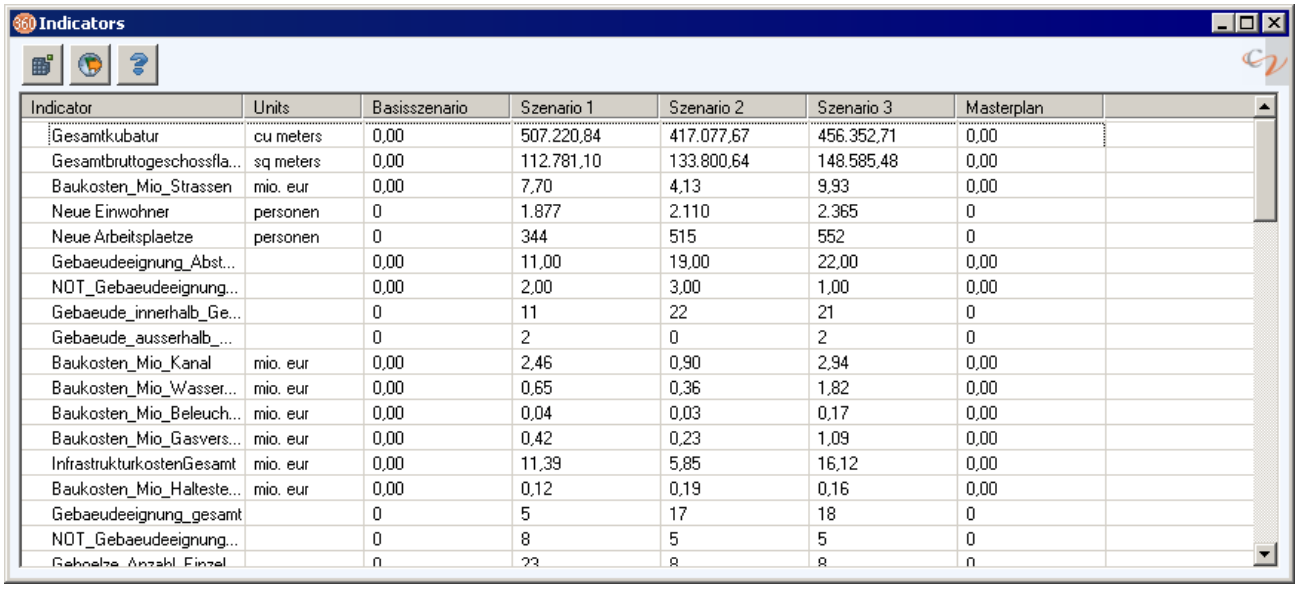
3.2 Assumptions (für alle Datenschichten gültige Annahmen)

"Assumptions" sind Werte, die – im Gegensatz zu den einzeln zuordenbaren "Dynamic Attributes" – gleichermaßen für alle Datenschichten gültig sind. Sie werden ausschließlich vom Benutzer festgelegt; der Rahmen, innerhalb dessen die Festlegung dieser "Assumptions" möglich ist, wird allerdings vom Entwicklungstool vorgegeben und kann nicht über- oder unterschritten werden. "Assumptions" fließen in die diversen Formeln ein, die zur Berechnung der "Dynamic Attributes" und der "Indicators" herangezogen

werden. Sie werden typischerweise über Schieberegler festgelegt, alternativ ist auch die Auswahl über Drop-Down-Menüs oder durch direkte Eingabe in einer Tabelle möglich.

3.3 Indicators

"Indicators" sind aus "Assumptions" und "Dynamic Attributes" errechnete Werte, die sich – ähnlich wie "Assumptions" – nicht auf einzelne Daten oder Datenschichten beziehen, sondern global für ein ganzes Entwicklungsszenario gelten (z. B. geschätzte Zahl der neuen Einwohner, Gesamterrichtungskosten). "Indicators" können sowohl als Absolutzahlen als auch als relative Werte (in Prozent) berechnet werden; sie bilden die Grundlage für alle durch das Entwicklungstool generierten Diagramme.



Indicator	Units	Basisszenario	Szenario 1	Szenario 2	Szenario 3	Masterplan
Gesamtkubatur	cu meters	0,00	507.220,84	417.077,67	456.352,71	0,00
Gesamtbruttogeschossfla...	sq meters	0,00	112.781,10	133.800,64	148.585,48	0,00
Baukosten_Mio_Strassen	mio. eur	0,00	7,70	4,13	9,93	0,00
Neue Einwohner	personen	0	1.877	2.110	2.365	0
Neue Arbeitsplaetze	personen	0	344	515	552	0
Gebaeudeeignung_Abst...		0,00	11,00	19,00	22,00	0,00
NOT_Gebaeudeeignung...		0,00	2,00	3,00	1,00	0,00
Gebaeude_innerhalb_Ge...		0	11	22	21	0
Gebaeude_ausserhalb_...		0	2	0	2	0
Baukosten_Mio_Kanal	mio. eur	0,00	2,46	0,90	2,94	0,00
Baukosten_Mio_Wasser...	mio. eur	0,00	0,65	0,36	1,82	0,00
Baukosten_Mio_Beleuch...	mio. eur	0,00	0,04	0,03	0,17	0,00
Baukosten_Mio_Gasvers...	mio. eur	0,00	0,42	0,23	1,09	0,00
InfrastrukturkostenGesamt	mio. eur	0,00	11,39	5,85	16,12	0,00
Baukosten_Mio_Halteste...	mio. eur	0,00	0,12	0,19	0,16	0,00
Gebaeudeeignung_gesamt		0	5	17	18	0
NOT_Gebaeudeeignung...		0	8	5	5	0
Gebaelze_Anzahl_Einzel		0	23	8	8	0

Abb. 3: Indicators in CommunityViz

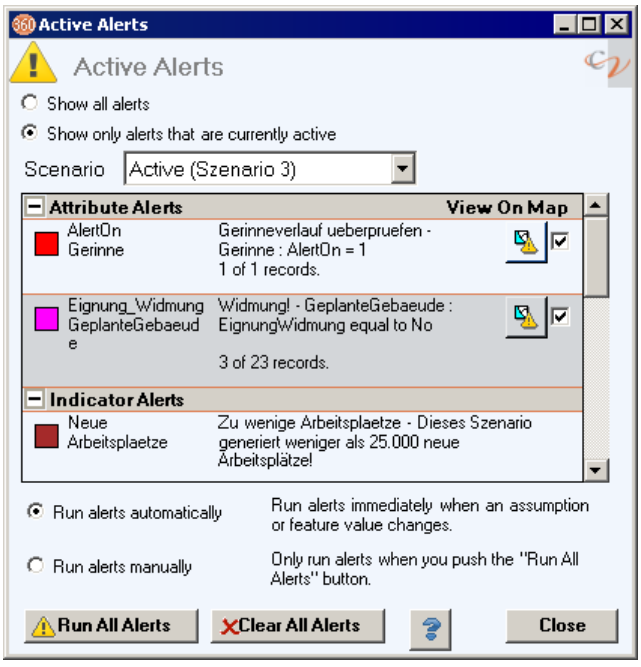


Abb. 4: Alerts in CommunityViz

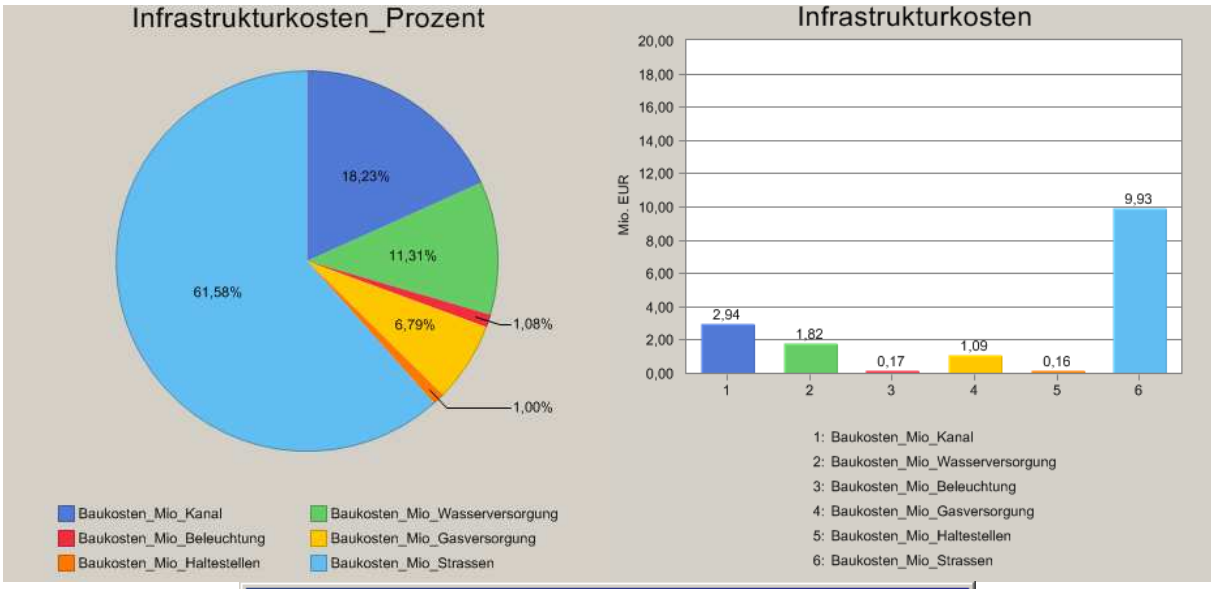
3.4 Alerts

"Alerts" sind vom Entwicklungstool automatisch generierte Warnungen, die bei Über- oder Unterschreiten bestimmter Werte aktiv werden. "Alerts" können entweder an "Dynamic Attributes" gekoppelt werden (z. B. Warnung, wenn Gebäude zu geringen Abstand zueinander aufweisen) oder aber auch mit "Indicators" (z. B. Warnung, wenn der in der Projektvorgabe vorgesehene Einwohnerzuwachs durch ein Entwicklungsszenario nicht erreicht wird). "Alerts" hindern den Benutzer nicht am Fortsetzen seiner Arbeit, sie machen ihn

lediglich darauf aufmerksam, wenn in seinem Szenario an manchen Stellen Abweichungen von Projektvorgaben auftreten.

3.5 Output

Die Ausgabe der Ergebnisse des Ressourcenplaner-Tools erfolgt in Form von Diagrammen, Tabellen oder als direkter Vergleich zweier Szenarien.



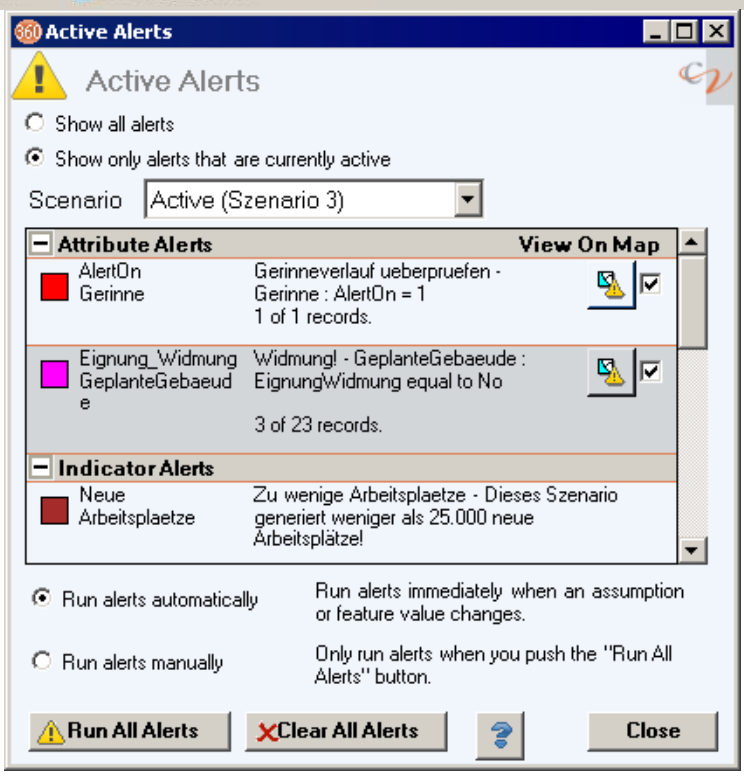


Abb. 5: Output

4 ENGLISH SUMMARY

The airfield Aspern is Vienna's currently biggest urban development site with about 200 hectares. One of the greatest challenges dealing with an area of that size is to have development costs and consequential charges under control at any time. The goal of this project was to compose a resource planning tool that deals with the following fields of spatial planning:

- hydraulic engineering,
- landscape planning,

- geomancy,
- gravel,
- technical and social infrastructure.

The development tool delivers basic datasets for the airfield (map, aerial view, data from special fields of spatial planning). The user brings in development concepts for the airfield area. The tool then calculates the amount of investment and consequential charges automatically. Experts of each special field of planning delivered datasets consisting of standard values within certain ranges. These data (e. g. prices of road building per road type and length, prices of trees apiece, etc.) are needed for benchmarking and calculating the financial effects of each scenario.

Scenarios for the airfield area are drafted by planners. They can be saved and reloaded, compared with one another or work as the basis of new scenarios. Comparison of scenarios is possible by area (area balance sheet), by costs (cost balance sheet) or by means of statistic analysis (cost ratios). Each scenario produces its own output (tables, maps, charts).

The tool is built up in a modular way so that single parts of the tool can be changed without affecting other parts of the software. It works in two-dimensional space (or ‘‘two-and-a-half-dimensional‘‘ space, e. g. by entering the proposed height of buildings) and is able to handle both quantitative and qualititative datasets. The tool is designed for use with a state-of-the-art PC.

The programmers' team decided to develop the tool in "CommunityViz/Scenario 360" which is an extension to ArcGIS 9.1. CommunityViz works with dynamic attributes which automatically react on changes in their own or even another data layer. It uses an easy formula language to interconnect layers, calculate values and check conditions (if…then…else). Formulas are entered manually or with the help of wizards. All formulas needed for the airfield Aspern development calculations were set up by the programmers but can – in case – be altered by the user. Under normal conditions, however, the user should not have any reason to alter the formulas themselves but only the variable assumptions in the slider window designed for that purpose.

Dynamic attributes are attribute data of shapefiles which are able to change automatically or can be defined in direct interaction with the user (input window). Assumptions are values valid for all data layers (opposite to dynamic attributes valid for each single point, line, or polygon). They are defined by the user within certain ranges which cannot be fallen below or risen above. The values of assumptions are parts of formulas for calcualting dynamic attributes and indicators.

On the basis of inter-layer connections and user-defined assumptions indicator values are computed. Similar to assumptions, indicator values are valid for the whole scenario and not for single parts only. Indicatory may e. g. be the number of new inhabitants or the total construction costs as well as relative values, e. g. proportional infrastructure costs. Indicators are the basis for the tool's charts.

In addition, there is a possibility to alert the user if an attribute or an indicator falls below or rises above a certain (user-defined) threshold level. That may happen, e. g., when buildings are raised up too close to each other, when digging activities fall below the ground water level, or when a scenario does not bring up the expected number of new inhabitants. Alerts do not inhibit the user from working on his analysis, their purpose is only to tell the user that there is something one should have a look at.

🏆 *reviewed paper*

Die Dynamik der Stadt
Untersuchung eines agentenbasiertes Simulationsmodells am Beispiel der Wohnortdynamik

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ABSTRACT

Der Beitrag präsentiert eine Methode, wie sich sowohl räumliche Strukturen, als auch individuelle und kollektive Aktivitäten einer Stadt als Spektrum von Prozessen mit unterschiedlicher Dynamik darstellen lassen.

Es wird einleitend erläutert, was man unter dem Begriff Dynamik versteht. Daran anschließend wird ein Modell vorgestellt, welches von den klassischen zwei Teilbereichen einer Stadt ausgeht, die Interaktion von Standortentscheidungen und dem Erschließungssystem, welche bei den meisten urbanen Modellen als Grundlage dienen. Darauf aufbauend erfolgt eine Beschreibung der Dynamik, welche aus individuellen Verhaltensweisen resultiert. Dazu wird das Konzept eines agentenbasierten Simulationsmodells operationalisiert, indem individuelle Akteure informationstechnisch als so genannte Agenten repräsentiert werden und die bauliche Struktur einer Stadt in einzelne Objekte gegliedert wird.

Auf der eingeführten Konzeption basierend wird dargelegt, wie sich innerhalb eines Teilbereichs, welcher als offenes, komplexes und sich selbst organisierendes System betrachtet wird, Sensitivitätsanalysen gegenüber den Kontrollparametern sowie Stabilitätsanalysen unter Beleuchtung kritischer Zustände vor Phasenübergängen durchführen lassen. Diese Analysen werden beispielhaft an einer Simulation der städtischen Wohnortdynamik durchgeführt.

Eine entscheidende Frage stellt sich darin, wie sich bei dem vorgestellten Modellkonzept die Kombination und das Zusammenwirken der Teilbereiche bewerkstelligen lassen. Eine entsprechende Koppelung ist nur sinnvoll, solange das Gesamtmodell weiterhin kontrollierbar bleibt. In diesem Sinne ist es notwendig, die Auswirkungen verschiedener Parameterkonstellationen eines Teilbereichs zu analysieren. Die Ausgaben des einen Teilbereichs könnten dann als Steuerungsparameter oder Taktgeber eines anderen Bereichs dienen.

Als abschließender Ausblick werden die Notwenigkeiten und Einschränkungen der Validierung der Simulationsmodelle anhand verfügbarer Daten besprochen und das Forschungsziel einer Planung als gezielte Stabilisierung beziehungsweise Destabilisierung von Prozessen skizziert.

1 EINLEITUNG

Das Wesen einer Stadt erschließt sich erst, wenn man ihre Entwicklung in der Zeit betrachtet. Das zeitliche Verhalten eines Systems kann mit dem Begriff der Dynamik charakterisiert werden. Seit Ludwig von Bertalanffy (1948) das allgemeine Konzept der Systemtheorie formuliert hat, begann sich auch die Sichtweise auf die Stadt zu verändern. Die bis dahin übliche Methode der Stadtforschung war eine historische Betrachtung aufeinanderfolgender Zustände räumlicher Konfigurationen (Benevolo, 2000; Mumford, 1961), welche in Form von Karten dargestellt werden konnten. Die genauen Ursachen der Übergänge von einem Zustand zum anderen waren dabei von peripherem Interesse. Dies hat sich mit der Etablierung der Systemtheorie weitgehend umgekehrt. Die Prozesse welche ein System verändern und die Kräfte welche diese Veränderungen bewirken und steuern rückten in das Zentrum des Interesses. Die räumlichen Strukturen einer Stadt können dabei als sich ständig verändernde Ergebnisse eines fortwährend ablaufenden Prozesses betrachtet werden. Das erinnert an die Weltsicht von Heraklit, der bereits vor über 2000 Jahren konstatierte, „Alles fließt und steht nicht still."

Einer der ersten prominenten Verfechter der Stadt als dynamisches System war Jay Forrester. Sein Modell der „Urban Dynamics" konzentrierte sich auf zeitlichen Veränderungen, allerdings unter völliger Vernachlässigung der räumlichen Aspekte. Es wurde ein innerstädtisches System angenommen, welches als geschlossene Modellwelt von seiner Umwelt getrennt ist. Innerhalb dieses Systems konnten nun unzählige Hypothesen über dynamische Beziehungen der Beschäftigungsverhältnisse, Wohnortsuche und Wirtschaftsentwicklung in einer Modellstadt aufgestellt werden. Ein guter Überblick über Forrester's und andere umfassender Stadtmodelle, sogenannte Large Scale Urban Models (LSUMs) sowie die prominente

Kritik von Lee (1973) finden sich im Journal of the American Institute of Planners (1973, Band 39). Eine aktuellere Besprechung der Nachfolgermodelle bietet Wegener (Wegener, 1994, 2005).

Ich möchte mich hier auf eine generelle Voraussetzung konzentrieren, welche bis heute für viele Systemmodelle wesentlich ist, nämlich dass ein untersuchtes System stets einem Gleichgewichtszustand mit einem Maximum an Entropie und einem Minimum freier Energie zustrebt und in einem solchen verharrt, bis eine Störung von außen durch hinzufügen freier Energie das Gleichgewicht beeinträchtigt. Diese Annahme ist allerdings für vitale Systeme nicht gültig, da sich diese im Allgemeinen in einem Nichtgleichgewichtszustand befinden und sich zudem nur schwer gegen ihre Umwelt abgrenzen lassen (Prigogine, 1998). Bei Systemen fern vom Gleichgewichtszustand führt eine Störung zu unerwarteten Konsequenzen. Anstatt in seinen Ausgangszustand zurückzukehren beginnt das System sich in unvorhersagbare Richtungen zu entwickeln und neue Strukturen zu erforschen, welche Prigogine dissipative Strukturen nannte, worunter man die Nichtgleichgewichtsstabilität offener System versteht.

Auf diesen Einsichten beruhen die Idee der Selbstorganisation, sowie die Katastrophentheorie welche später zur Chaostheorie weiterentwickelt wurde. Unter der Annahme, dass eine Stadt ein System fern vom Gleichgewichtszustand ist, ist es interessant, das oben erwähne Urban Dynamics Modell von Forrester, welches von einem Gleichgewicht ausgeht, einem einfachen Beispiel der Chaostheorie gegenüberzustellen, dem sogenannten deterministischen Chaos. Forrester's Modell pendelt sich nach Veränderungen der Kontrollparameter, welche als Störungen betrachtet werden können, wieder auf ein stabiles Gleichgewicht ein, bis eine weitere Störung auftritt. Das Verhalten des Urban Dynamics Modells kann anhand einer Anylogic-Simulation nachvollzogen werden, welche unter der URL http://www.xjtek.com/models/social_dynamics/ frei erhältlich ist. Beim deterministischen Chaos sind die Grundgesetze, also die Regeln des Systems selbst, ebenso wie bei Forrester's Modell rein deterministisch. Als einfaches Beispiel möchte ich die Verhulst oder Logistische Gleichung der Form $x_{n+1} = a\ x_n(1-x_n)$ anführen, welche oft für die modellhafte Entwicklung einer Population angewandt wird. Wählt man für x_0 einen beliebigen Anfangswert zwischen 0 und 1 kann sich die Trajektorie, also die Darstellung aller Werte x_n prinzipiell auf drei verschiedene Arten entwickeln, stabil, periodisch oder chaotisch, was nur von dem Faktor a abhängt, (Peitgen, Jürgens, & Saupe, 2004). Bei Werten für a zwischen 0 und 1 resultiert für x_n früher oder später in jedem Fall 0 (die Population stirbt aus). Bei a zwischen 1 und 2 stellt sich ein Grenzwert ein, bei a zwischen 2 und 3 nähern sich die Werte einem Grenzwert wellenförmig an. Mit a zwischen 3 und $1+\sqrt{6}$ (etwa 3,45) wechselt die Folge zwischen zwei Häufungspunkten, für a bis 3,54 wechselt die Folge dann zwischen vier Häufungspunkten und bei weiteren Erhöhungen von a ergeben sich dann zwischen 8, 16, 32 usw. Häufungspunkte. Die Intervalle mit gleicher Anzahl von Häufungspunkten, auch als Bifurkationsintervalle bezeichnet, werden immer kleiner, bis schließlich bei ca. a = 3,57 keine Perioden mehr erkennbar sind, also das System chaotisches Verhalten zeigt, wobei winzige Änderungen des Anfangswertes x_0 in unterschiedlichsten Folgenwerten resultieren. Selbst winzigste Rundungsungenauigkeiten des Ergebnisses einer Iteration summieren sich schnell auf und führen nach einigen Schritten zu vollkommen unterschiedlichen Ergebnissen.

Es macht demnach einen großen Unterschied, ob wir das System Stadt als im Gleichgewicht befindlich betrachten oder ob wir von einer Nichtgleichgewichtssituation ausgehen. Bei chaotischen Systemen macht eine Vorhersage über eine mögliche Entwicklung wenig Sinn, da es undenkbar ist, den Anfangszustand x_0 beispielsweise einer Stadt zu einem beliebigen Zeitpunkt auch nur annähernd genau bestimmen zu können. An der Qualität einer Vorhersage des Wetters – eines chaotischen Systems par excellence – für die nächste oder übernächste Woche kann dieser Effekte aus eigener Erfahrung nachvollzogen werden. Selbst unter Zuhilfenahme der modernsten Großcomputertechnologie, ausgetüftelter mathematischer Verfahren und endlosen Beobachtungsdaten ist es auch erfahrenen Meteorologen kaum möglich die Trefferquote einer simplen Schätzung auf der Basis allgemeiner Regeln zu übertreffen.

Des Weiteren ist für die Beobachtung des dynamischen Verhaltens eines Systems der räumliche und zeitliche Maßstab wesentlich, den man für die Definition der untersuchten Elemente oder der Aggregation der Daten wählt. Systeme werden immer unstetiger, je weiter sie in ihre grundlegenden Einheiten gegliedert bzw. disaggregiert werden. Im umgekehrten Fall werden Systeme immer homogener wenn der Maßstab vergrößert wird und einzelne Aktivitäten zu Durchschnittswerten zusammengefasst bzw. aggregiert werden. Betrachtet man eine Stadt als Ganzes und über einen längeren Zeitraum, erhält man anhand statistischer Erhebungen den Eindruck eines Gebildes in einem relativen Gleichgewicht, welches gleichsam einem

Lebewesen kontinuierlich Waren, Personen, Energie, Geld und vieles andere in sich einverleibt, verteilt und wieder von sich gibt. Verengt man aber den zeitlichen und räumlichen Bezugsrahmen und betrachte beispielsweise den Verkehr an einem Tag auf einer bestimmten Straße, so wandelt sich das Bild von einem System im Gleichgewicht schnell zu einem zeitweise chaotisch schwankenden und schwer vorhersehbaren Durcheinander. Geht man bei der Untersuchung einer Stadt von den kleinsten Elementen aus, stellt sich heraus, dass die Wechselwirkungen zwischen diesen vielfältigen Teilen zu Selbstorganisationsprozessen führen, durch welche sich die geordneten Strukturen auf den übergeordneten Maßstabsebenen formieren. Für die Erforschung solcher Bottom-Up Prozesse hat sich das relativ junge und interdisziplinäre Wissenschaftsgebiet der komplexen Systeme etabliert.

Im Folgenden stütze ich mich auf die Theorie komplexer Systeme zur Untersuchung urbaner Segregationsprozesse. Als Hilfsmittel werde ich auf Simulationstechniken unter Verwendung Zellulärer Automaten (ZA) zur Repräsentation der räumlichen Struktur einer Stadt und Multi-Agenten-Systeme (MAS) für die Simulation urbaner Akteure zurückgreifen. Durch die Einführung dieser Techniken wurde die Erforschung komplexer Systeme überhaupt erst möglich, da die erforderlichen Daten über die einzelnen Elemente in der notwendigen zeitlichen Auflösung nicht zu erheben sind. Simulationen in der oben skizzierten Art erlauben es, einfache Annahmen über die Interaktionsregeln der Elemente abzubilden und deren Auswirkungen zu erkunden. Es werden sehr einfache, künstliche Gesellschaften (Epstein & Axtell, 1996), im Computer (in silico) erzeugt, welche in beliebiger Genauigkeit analysiert werden können. Auf die Schwierigkeiten der Validierung solcher Simulationsmodelle werde ich am Ende des Textes eingehen.

2 EIN MODELL DER STADT

Für die Repräsentation eine Stadt mittels ZA und MAS werden zwei Ebenen eingeführt (Abb. 01). Die erste bildet räumliche Elemente wie Straßen, Parzellen und Gebäude ab, die als örtlich fixierte Objekte behandelt werden, deren Zustände sich aber zu bestimmten Zeitpunkten verändern können. In einem ersten Abstraktionsschritt werden diese Elemente in die Zellen eines regelmäßigen Rasters übertragen und anhand des Status' einer solchen Zelle gespeichert. Diese Struktur bildet die Grundlage für die Funktionsweise eines ZA. Bei einem ZA ist der Status und die Eigenschaften einer Zelle von den Zuständen seiner Nachbarzellen abhängig und kann sich bei jedem Zeitschritt *t* verändern. Die zweite Ebene beinhaltet die individuellen und kollektiven urbane Akteure, die im Folgenden als Agenten bezeichnet werden. Im Gegensatz zu den Zellen sind Agenten mobil und können sich frei über das Zellenraster, den zellulärer Raum, bewegen. Dabei lassen sich verschiedene Arten der Kommunikation der Agenten untereinander, sowie mit den Zellen definieren. Ein aus den beiden Komponenten ZA und MAS bestehendes System wird nach Portugali (2000) als FACS (Free Agents in a Cellular Space) bezeichnet und bildet ein IRN (Inter Representation Network).

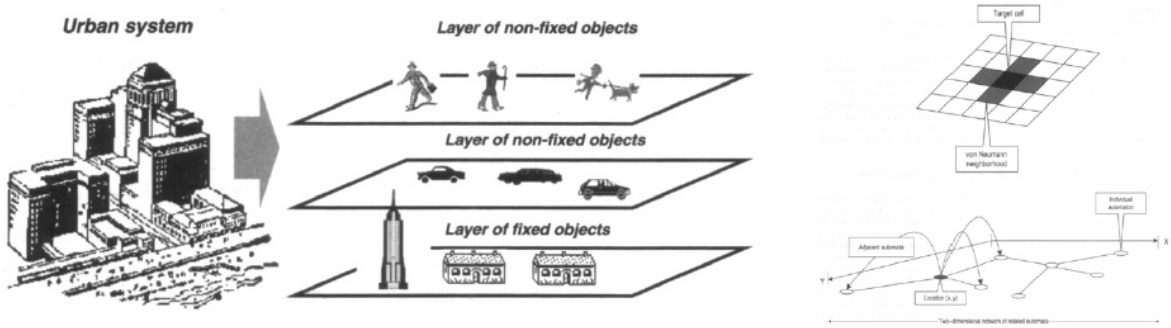

Abb. 01: Modell eines Urbanen Systems, welches in Layer für unterschiedliche Elemente gegliedert wird, welche wiederum durch die Zellen eines ZA oder Agenten des MAS repräsentiert werden können (Benenson & Torrens, 2004).

Nach den Einsichten, die in der Einleitung geschildert wurden, kann eine Stadt nicht als ein System im Gleichgewicht betrachtet werden. Dennoch finden sich, wie bei allen lebendigen Systemen Phasen, in welchen sich die Aktivitäten scheinbar im Gleichgewicht befinden, und sich die Systembestandteile in einer ausbalancierten Weise selbst erneuern. Kleine Fluktuationen während des Selbsterhaltungsvorgangs, bei dem von außen betrachtet nichts geschieht, können sich im Sinn des oben beschriebenen chaotischen Verhaltens scheinbar aus dem Nichts zu weitreichenden Veränderungen aufschaukeln und nach einiger Zeit wieder stabilisieren (Abb. 02).

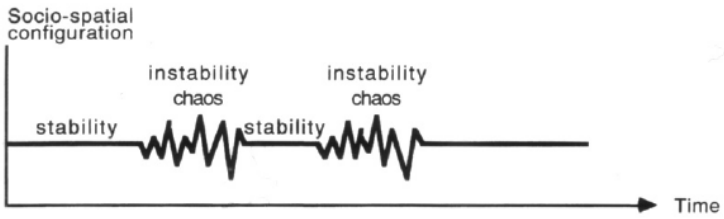

Abb. 02: Bei komplexen Systemen können sich stabile und instabile Phasen im Lauf der Zeit ohne ersichtlichen Grund abwechseln (Portugali, 2000).

Das Segregationsmodell, welches die Grundlage für das Teilmodell der Wohnortdynamik darstellt, geht in seiner ursprünglichen Form auf Schelling (1969) zurück. Das Modell beschreibt die Entmischung zweier Bevölkerungsgruppen unter der ausschließlichen Berücksichtigung individueller Standtortenscheidungen auf Basis lokaler Nachbarschaften. Bevor ich eine formale Beschreibung dieses Prinzips einführe, möchte ich kurz auf die Einbettung der Wohnortdynamik in ein umfassenderes Modell eingehen, welches in Abb. 03 zwar als Gesamtmodell betitelt ist, dennoch nicht den Anspruch erhebt, alle Vorgänge einer Stadt erfassen zu können, sondern sich auf einige wesentlichen konzentriert. Das Diagramm des Gesamtmodells beschreibt den Zusammenhang der individuellen Wohnortentscheidungen, welche hauptsächlich von den Mietpreisen, der Erreichbarkeit und den Umweltfaktoren wie Lärm oder Landschaftsqualität abhängen. Die Stadtortwahl der Betriebe hängt von ähnlichen Faktoren ab, wobei hier die Umweltbedingungen im Allgemeinen keine Rolle spielen. Die Miet- und Bodenpreise sowie die Erreichbarkeiten und der Verkehr hängen ihrerseits wieder von den mannigfachen Standtortenscheidungen ab. Das ausgewählte Teilmodell beschreibt die Wohnortwahl in dem jeder Teilnehmer am Wohnungsmarkt versucht, zu möglichst niedrigen Mietpreisen eine Wohnung mit möglichst guter Nachbarschaft und Lage zu erhalten (Abb. 03, rechts).

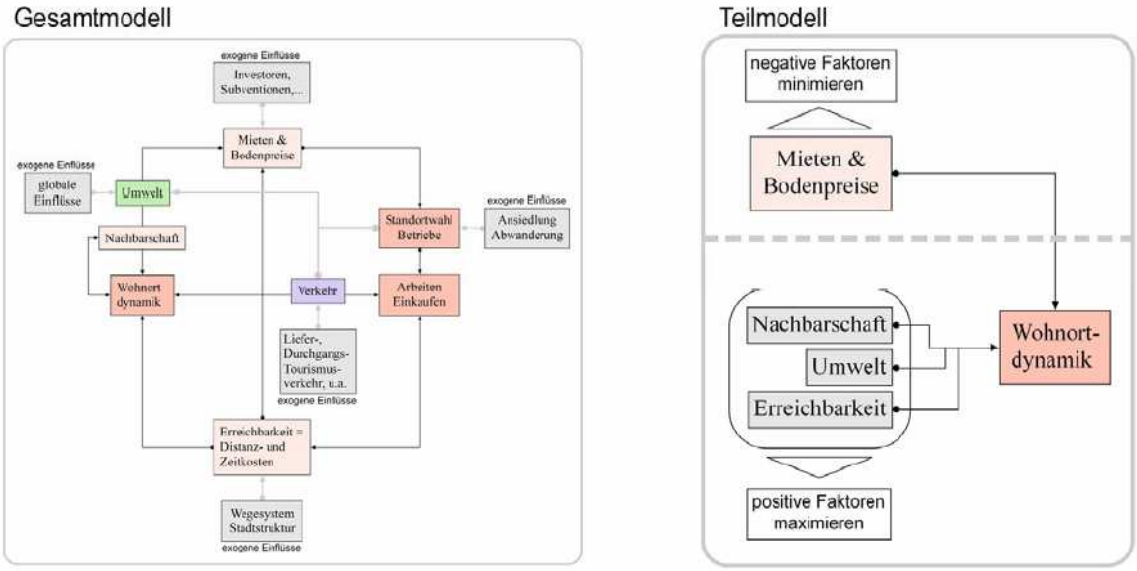

Abb. 03: Gesamtmodell urbaner Prozesse und deren Wechselwirkung (links) und als Ausschnitt daraus das Teilmodell der Wohnortdynamik (rechts).

Nach der allgemeinen Einführung in den Themenbereich möchte ich mich im zweiten Teil des Textes vertiefend mit dem Teilmodell zur Wohnortdynamik auseinandersetzen. Es ist meine Absicht zu zeigen, wie sensitiv die Ergebnisse einer Simulation gegenüber den zugrunde gelegten Anfangsbedingungen sind. Diese Bedingungen werden im Folgenden explizit betrachtet und als Kontrollparameter bezeichnet. Für eine detaillierte Analyse des Modells ist eine formale Beschreibung der Prozesse notwenig. Darauf aufbauend können die kritischen Systemzustände untersucht werden, welche durch die Verstärkung geringfügiger, lokaler Ursachen zu globalen Phasenübergängen führen können. Abschließend werde ich mögliche Schlussfolgerungen der Resultate diskutieren und auf allgemeine Probleme eingehen, welche die Qualität, Validität und den Nutzen von Simulationsmodellen betreffen.

3 FORMALES MODELL DER WOHNORTDYNAMIK

Bei der formalen Beschreibung des Modells habe ich versucht weitgehend dem Stil von Benenson (1998) und Portugali (2000) zu folgen. Für den ZA wird ein zweidimensionales reguläres Raster aus *x*y* quadratischen Zellen als Infrastrukturlayer eingeführt. Anstelle jede Zelle mit ihren x- und y-Koordinaten zu bezeichnen wird für jede der *i* Zellen der Index $H=\{1, 2,\ldots, i\}$ vergeben. Außerdem kann sich jede Zelle in einem von *n* möglichen Zuständen $S_H=\{S_1, S_2,\ldots, S_n\}$ befinden. Die Nachbarschaft einer Zelle *H* wird geschrieben als *U(H)*, wobei $S_{U(H)}$ die Nachbarschaftskonfiguration bezeichnet. Im Folgenden gehe ich von der Moore Nachbarschaft aus, welche im Normalfall (k=1) aus den acht umgebenden Zellen einer betrachteten Zelle besteht (Abb. 04). Bei den nachfolgenden Untersuchungen werden verschiedene Werte für *k* verwandt. Die Nachbarschaft *U(H)* einer Zelle beinhaltet jeweils alle Zellen in dem $(k*2+1)^2$ Feld mit *H* im Zentrum. Um ein gleichförmiges Feld ohne Ränder zu erhalten wird angenommen, dass die vier Seiten des ZA zu einem Torus zusammengefügt sind, demzufolge beispielsweise der linke Nachbar einer Zelle am linken Rand die Zelle in der gleichen Reihe am rechten Rand ist.

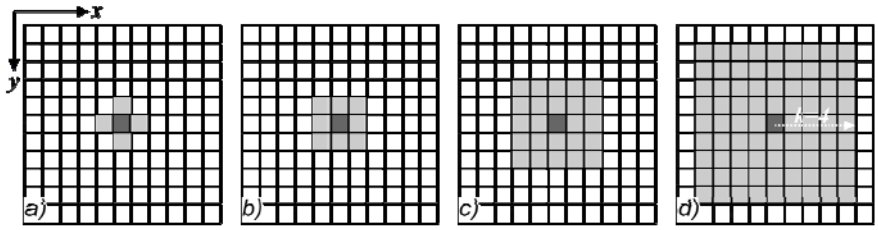

Abb. 04: Verschiedenen Definitionen der Nachbarschaft einer Zelle. *a)* von Neumann Nachbarschaft; *b) – d)* verschiedene Moore Nachbarschaften mit unterschiedlichen Radien *b)* k= 1; *c)* k=2; *d)* k=4.

Die Ebene über dem ZA beinhaltet das MAS mit *m* individuellen Agenten $A = \{A_1, A_2,\ldots, A_m\}$ welche sich von Zelle zu Zelle frei bewegen können. Genauso wie die Zellen können sich die Agenten in einem von *g* möglichen Zuständen $S_A=\{S_1, S_2,\ldots, S_g\}$ befinden, welcher die Zugehörigkeit zu einer bestimmten Gruppe wiedergibt. Des Weiteren wird die Variable $M_A=\{0, 1\}$ definiert, welche angibt, ob ein Agent mit der Nachbarschaft an seiner aktuellen Position zufrieden ist (M_A=1) oder nicht (M_A=0). Die gegenwärtige Position eines Agenten wird mit P_A bezeichnet, wobei gilt P_A □¼*H*, da sich die Agenten nur von einer Zelle zu einer Anderen bewegen können. Zu einem Zeitpunkt *t* kann lediglich ein Agent eine Zelle *H* besetzen. Ob ein Agent seinen Standtort wechselt oder nicht kann jetzt mittels der generellen Migrationsregel F_t angegeben werden:

$$P^A(t+1) = F_t\left(S^A(t),\ P^A(t),\ M^A(t),\ S^{U(H)}(t),\ P^{U(H)}(t)\right), \qquad (1)$$

wobei $P^{U(H)}(t)$ die möglichen Standorte einschränkt, zu welchen ein Agent im nächsten Zeitschritt wechseln kann. Die Größe dieses Bereichs wird mit *l* bezeichnet und entspricht dem Mobilitätsradius eines Agenten, der die maximale Distanz angibt, die sich ein Agent von seinem momentanen Standort wegbewegen kann. Der Mobilitätsradius *l* ist auf die gleiche Weise definiert wie die Nachbarschaftsgröße *k*. Die Transitionsregel *T* für die Zellen des ZA ist sehr einfach, da bei dem von uns betrachtetem Modell der Status einer Zelle entweder leer ist S^H=0, oder einfach den Status des Agenten wiedergibt, der sie besetzt:

$$S^H(t) = T_t\left(S^A(t),\ P^A(t)\right). \qquad (2)$$

Das bedeutet, dass die Nachbarschaftskonfiguration $S^{U(H)}$ der Menge der Zustände der Agenten entspricht, welche die benachbarten Zellen besetzen. Soweit die allgemeinen formalen Zusammenhänge. Jetzt müssen die Migrations- und die Transitionsregel im Detail dargestellt werden. Ob ein Agent mit seiner Nachbarschaft zufrieden ist hängt von dem Anteil an Agenten mit anderer Gruppenzugehörigkeit ab, die sich darin befinden. Die globale Anzahl *g* verschiedener Gruppen im System wird bezeichnet mit $G=\{1, 2, \ldots, g\}$, wobei *G* für den Status eines Agenten verwendet wird, der dadurch angibt, zu welcher Gruppe dieser gehört. Zu beginn einer Simulation werden nacheinander *m* Agenten generiert, zufällig einer Gruppe zugeordnet und beliebig über das Raster auf die noch freien Zellen mit dem Status $S^H(0)$ =0 verteilt:

$$P^A(0) = random\{H \mid S^H=0\}, \qquad S^A(0) = random\{G\}. \qquad (3)$$

Die Transitionsregel T_t für die Zellen kann angegeben werden mit:

$$S^H(t)=\begin{cases} S^A(t) & if\ P^A(t)=H \\ 0 & otherwise \end{cases} \quad (4)$$

Nach der Anfangsverteilung prüfen die Agenten ihre Nachbarschaft daraufhin, ob der Anteil $v^H(t)$ von gleichartigen Agenten ihren Toleranzwert Ψ erreicht. Befinden sich nicht genügend Agenten derselben Gruppe in der Nachbarschaft, sind die Agenten nicht zufrieden und versuchen einen besser geeigneten Wohnort innerhalb ihres Mobilitätsradius l zu finden:

$$v^H(t)=\sum_B \left\{1 \mid B\in U(H),\ S^B=S^H\right\}/N^H(t), \quad (5)$$

wobei

$$N^H(t)=\sum_B \left\{1 \mid B\in U(H),\ S^B\neq 0\right\} \quad (6)$$

der Anzahl besetzter Zellen innerhalb U(H) entspricht. Die Bedingung eines Agenten seinen internen Status M zu ändern kann wie folgt geschrieben werden:

$$M^A(t+1)=\begin{cases} 1 & if\ v^H(t)\geq\Psi \\ 0 & otherwise. \end{cases} \quad (7)$$

Sofern ein Agent nicht länger mit seinem gegenwärtigen Wohnort zufrieden ist (M_A=0), versucht er zuerst eine leere Zelle innerhalb seines Mobilitätsradius l zu finden und prüft dann, ob die Nachbarschaft an diesem neuen Standort $P_{A\ new}$ besser ist als an seinem alten. Ein Agent zieht nur um, wenn er eine leere Zelle finden und seine Nachbarschaftskonfiguration verbessern kann. Andernfalls muss er unzufrieden an seinem alten Wohnort bleiben. Das Verhältnis v_{Hnew} der Agenten an einem möglichen neuen Standort H_{new} wird ebenfalls mit den Gleichungen (5) und (6) berechnet. Die Migrationsregel lautet:

$$P^A(t+1)=\begin{cases} P^A_{new}(t) & if\ \left(v^{Hnew}(t)>v^H(t)\ \ and\ \ S^{Hnew}=0\right) \\ P^A(t) & otherwise. \end{cases} \quad (8)$$

Ein unzufriedener Agent kann nur einmal pro Zeitschritt versuchen seinen Standtort zu wechseln. Die Reihenfolge in der die Programmschleife die Bedingungen durchläuft ist in Abb. 05 dargestellt.

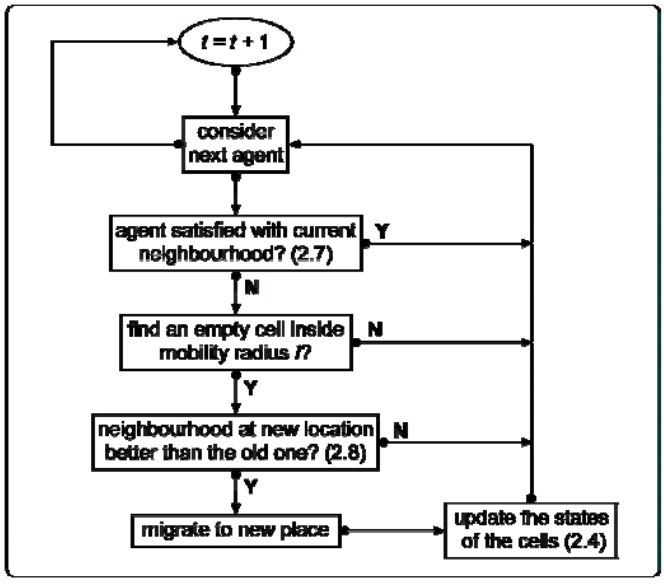

Abb. 05: Flussdiagramm für das FACS Modell der Wohnortdynamik.

4 KONTROLLPARAMETER

In der Sprache der Synergetik ist ein Kontrollparameter ein einzelner Parameter, der einen systemweiten Phasenübergang hervorrufen kann oder das makroskopische Verhalten eines Systems bestimmt (Portugali, 2000, pp. 55-56). Wie von Hermann Haken, dem Begründer der Synergetik, gefordert, besteht die zentrale

Methodologie der folgenden Untersuchung darin, nach qualitativen Veränderungen auf der makroskopischen Ebene Ausschau zu halten (Haken, 1996). Durch systematisches Verändern der Kontrollparameter wird die Dynamik des Segregationsmodells überprüft. Die betrachteten Parameter sind im Einzelnen der Toleranzschwellenwert, die Nachbarschaftsgröße, der Mobilitätsradius, die Anzahl der Gruppen und die Gesamtzahl der Agenten im System, welche der Dichte an Agenten innerhalb des gegebenen Raums von 116x116= 13.456 Zellen entspricht. Im Normalfall wird das System mit 5% leeren Zellen initialisiert um sicherzustellen, dass für die Migration der Agenten ausreichend leere Orte vorhanden sind. Das bedeutet, dass bei den folgenden Simulationen m=12.783 verwandt werden, sofern nichts gesondert auf eine andere Konfiguration hingewiesen wird.

Die Regeln für das Verhalten der Agenten, welche im 3. Abschnitt definiert wurden, beruhen ausschließlich auf der lokalen Umgebung eines Individuums welches keinerlei Wissen über den globalen Zustand des Systems hat. Der jeweilige Status eines Agenten, also seine Gruppenzugehörigkeit, wird durch verschiedenen Farben gekennzeichnet (Abb. 06), wodurch im Verlauf der Simulation emergierende Strukturen beobachtet und interpretiert werden können. Allerdings ist die subjektive visuelle Interpretation der resultierenden Strukturen zum einen nicht präzise genug und zum anderen zu aufwändig, wenn hunderte von Simulationsdurchläufe miteinander verglichen werden müssen. Folglich ist es sinnvoll zwei quantitative Methoden einzuführen, um die Eigenschaften der resultierenden globalen Strukturen messen und vergleichen zu können. Die erste Methode zählt die Cluster durch rekursives addieren der Agenten desselben Typs, welche in einer von Neumann Nachbarschaft direkt benachbart sind. Die zweite Methode misst die Ungleichverteilung der Agenten in einem bestimmten Gebiet. In der Literatur existieren für dieses Maß mehrere gut ausgearbeitete Varianten (Kalter, 2000; Meng, Hall, & Roberts, 2006), welche auch direkt in GIS angewandt werden können (Wong, 2003). Ein allgemeines und weit verbreitetes Maß ist der Dissimilaritätsindex (ID), der auf Duncan und Duncan (1955) zurückgeht und die Verteilung zweier Gruppen in einer Population vergleicht. Ich verwende im Folgenden eine Modifikation des ID, den Segregationsindes (IS), welcher die Verteilung einer Gruppe im Verhältnis zur Gesamtpopulation angibt. Im Rahmen dieses Beitrags kann ich nicht näher auf die Details dieser Messung eingehen und verweise auf die einführenden Internetseiten von Breßler und Harsche (2004). Die Werte für den IS können zwischen 0 für eine Gleichverteilung und 100 für eine maximal Separierung der Population liegen.

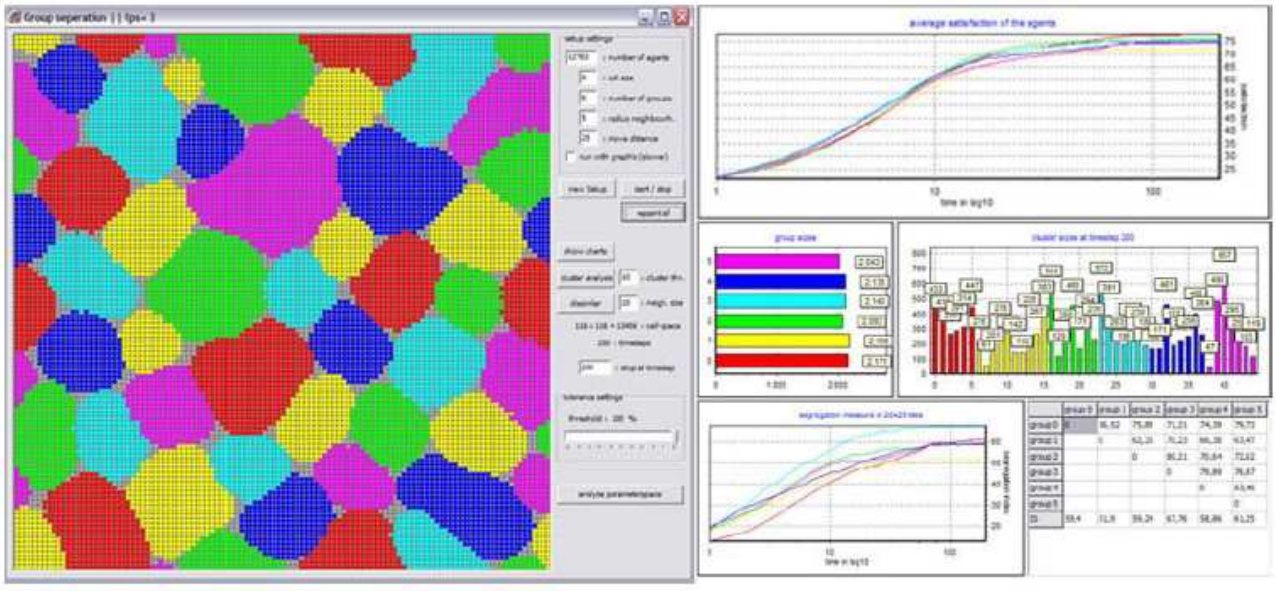

Abb. 06: Das Programmfenster links zeigt die farbigen Agenten und das Benutzerinterface. Auf der rechten Seite sind verschiedenen Diagramme zur Darstellung des IS und der Anzahl an Clustern abgebildet.

4.1 **Der Toleranzschwellenwert Ψ**

Der erste Parameter dessen Auswirkungen untersucht werden ist der Toleranzschwellenwert Ψ. Unser Interesse besteht darin, nach qualitativen Veränderungen auf der makroskopischen Ebene Ausschau zu halten (Haken, 1996) und darüber hinaus die quantitativen Messungen des IS und der Anzahl an Clustern auf der Makroebene zu vergleichen, während der Toleranzwert Ψ schrittweise erhöht wird. Eine Simulation wird bis zu einem festgelegten Zeitschritt ausgeführt. Anschließend werden die Messungen durchgeführt und die

Simulation wird erneut gestartet. Abb. 07 zeigt die Analyse für Ψ im Bereich von 10 bis 95 mit Inkrement 5. Die anderen Parameter werden nicht verändert und sind eingestellt mit g=6 verschiedenen Gruppen, Nachbarschaftsgröße k=5 und Mobilitätsradius l=55. Für jeden Wert Ψ wird die Simulation 10-mal mit den gleichen Einstellungen bis Zeitschritt 200 durchlaufen, bei welchem sich das System nicht mehr verändert. Bei t=200 werden der IS und die Anzahl der Cluster geplottet. Wie zu erwarten nimmt die Anzahl der Cluster ab und der IS steigt an, wenn die virtuellen Bewohner immer intoleranter gegenüber Mitgliedern anderer Gruppen werden. Die Diagramme zeigen außerdem, dass die räumlichen Effekte sich nicht weiter unterscheiden, sobald der Toleranzwert größer als 50 wird. Die Ergebnisse dieser Analyse sind nicht besonders überraschend und wurden zumindest qualitativ bereits für viele ähnliche Simulationsmodelle beschrieben (Hegselmann & Flache, 1998). Was passiert aber, wenn wir in der gleichen Weise die Variation der Nachbarschaftsgröße untersuchen.

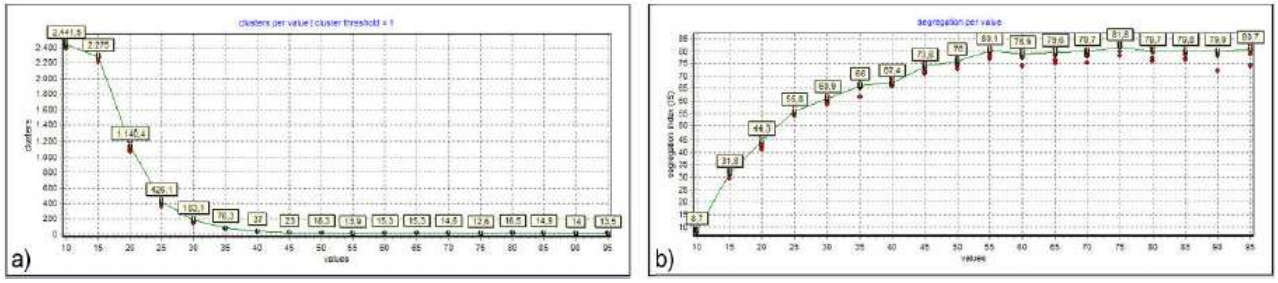

Abb. 07: Analyse des Toleranzschwellenwertes Ψ. *a)* zeigt die Anzahl der Cluster und *b)* den IS für jeden Wert Ψ. Die Linie verbindet die Durchschnittswerte der zehn Berechnungen je Ψ.

4.2 **Die Nachbarschaftsgröße *k***

Das Vorgehen für die Analyse der Nachbarschaftsgröße k ist das gleiche wie für den Toleranzschwellenwert. Der untersuchte Bereich für k reicht von 1 bis 12, jeweils erhöht um 1, mit 10 Berechnungen pro k-Wert und den Einstellungen für die anderen Parameter mit g=6, Ψ=100 und l=55. Die Ergebnisse der Analyse sind in Abb. 08 dargestellt, wo wieder der IS und die Anzahl der Cluster nach jeweils 200 Zeitschritten geplottet wurden. Interessanterweise lässt sich der gleiche Effekt wie bei der Erhöhung des Toleranzwertes für die Erhöhung der Nachbarschaftsgröße beobachten. Der Grund dafür liegt darin, dass bei einer Betrachtung einer größeren Anzahl an Zellen die Wahrscheinlichkeit abnimmt, genügend gleichartige Nachbarn zu finden. Mit anderen Worten nimmt die Wahrscheinlichkeit ab, dass ein Agent mit seiner Nachbarschaft zufrieden ist, je größer die betrachtete Nachbarschaft wird. Für ein besseres Verständnis dieses Zusammenhangs können wir uns eine Zelle mit einer Nachbarschaft von nur einer anderen Zelle bei einem Toleranzschwellenwert Ψ=100 vorstellen. In diesem Fall hängt die Wahrscheinlichkeit für die Zufriedenheit $\tilde{n}$ mit der Nachbarschaft nur von der Anzahl der Gruppen g ab und entspricht ρ=1/g. Wenn nun die Anzahl der Zellen z erhöht wird, die wir für die Nachbarschaft $U(H)$ betrachten und die Zelle H selbst ausschließen, verringert sich die Wahrscheinlichkeit mit $\rho = (1/g)z$, unter der Annahme, dass alle Zellen besetzt sind. Im Hinblick auf die verschiedenen Bevölkerungsdichten könnte dieser Effekt ein erster Hinweis auf Unterschiede der Sozialstrukturen in ländlichen und städtischen Siedlungen sein.

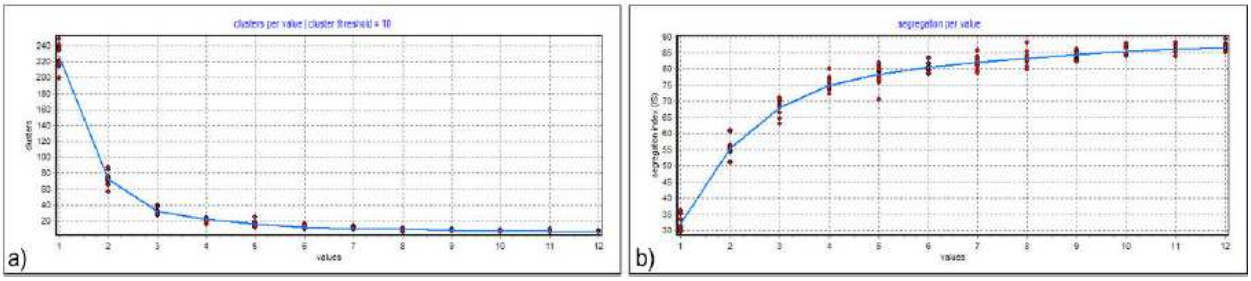

Abb. 08: Analyse der Nachbarschaftsgröße k. *a)* zeigt die Anzahl der Cluster und *b)* den IS für jeden Wert k.

4.3 **Die Dichte – Anzahl Agenten *m***

Als letzter Kontrollparameter soll die Dichte der Agenten im System betrachtet werden. Die Initialisierung erfolgt mit $m(0)$=100 zufällig verteilten Agenten. Pro Zeitschritt werden dann 10 Agenten hinzugefügt, bis die maximale Anzahl mit m=12.783 Agenten erreicht ist. Die Einstellungen für die anderen

Kontrollparameter sind g=6, k=5, and l=55. In dieser Untersuchung sind wir an den Effekten interessiert, die durch einen Anstieg der Dichte bei verschiedenen Toleranzschwellenwerten Ψ auftreten. Für Ψ werden Werte von 10 bis 60, inkrementiert mit 10 betrachtet. Das linke Diagramm in Abb. 09 zeigt die Entwicklung der durchschnittlichen IS Werte von 10 Berechnungen pro Ψ-Wert während einer kontinuierlichen Erhöhung der Dichte in einem System.

Bei einem geringen Toleranzschwellenwert Ψ=10 (die rote Linie) führt der Anstieg der Agentendichte zu einer Abnahme des IS, was einer Gleichverteilung der Agenten verschiedener Gruppen entspricht. Die Abnahme des IS kann durch die Meßmethode erklärt werden, da bei einer geringen Dichte die betrachteten Gebiete nur von wenigen Agenten, oder im Extremfall von nur einem besiedelt sind, was zu relativ hohen Werten für den IS führt. Daher beginnen alle Kurven bei einem Wert von ca. 40 für den IS. Bei zunehmender Dichte wird daher bei geringen Toleranzschwellenwerten ein abnehmender IS gemessen. Bei Ψ=20 bleibt der IS annähernd konstant aber bereits ab Ψ=30 (die blaue Linie in Abb. 09) steigt der IS mit zunehmender Dichte an. Eine höhere Dichte bedeutet mehr Agenten in der betrachteten Nachbarschaft weshalb es, den Feststellungen des Abschnitts zur Nachbarschaftsgröße entsprechend folgerichtig ist, dass der IS ansteigt. Dennoch zeigt das Diagramm in Abb. 09, dass der IS-Gradient schneller steigt, je höher der Toleranzschwellenwert ist. Die Erklärung hierfür liegt in der höheren Wahrscheinlichkeit ρ, bei einem geringeren Toleranzschwellenwert Ψ eine zufriedenstellende Nachbarschaft zu finden. Unter der Annahme, dass alle Zellen besetzt sind und eine relativ große Nachbarschaft betrachtet wird, kann die Wahrscheinlichkeit $\tilde{n}$ annähernd angegeben werden mit

$$\rho = \left(\frac{1}{g}\right)^{\left(Z \cdot \frac{\Psi}{100}\right)}. \qquad (9)$$

Der hier beschriebene Effekt, ausgelöst durch die Erhöhung der Dichte an Agenten, kann als weiterer Hinweis für die Interpretation der Unterschiede ländlicher und städtischer sozialer Organisationsformen dienen. Der rote Graph in den beiden Diagrammen auf der rechten Seite von Abb. 09 zeigt die absolute Anzahl an migrierenden Agenten. Bei dem oberen Diagramm ist die Entwicklung des Systems bei einem Toleranzschwellenwert Ψ=40 geplottet. Die Migrationsrate bleibt hier über die gesamte Zeitperiode relativ konstant. Bei Ψ=60, dem Diagramm unterhalb, steigt die Migrationsrate bei einer Dichte von ungefähr 80% bei t=1100 dramatisch an. Der plötzlich auftretende Anstieg der Migrationsrate bei einer kritischen Dichte könnte ein Hinweis auf einen Phasenübergang des Systems sein. Dieses Phänomen wird im nächsten Abschnitt unter Anwendung einer anderen Methode beleuchtet.

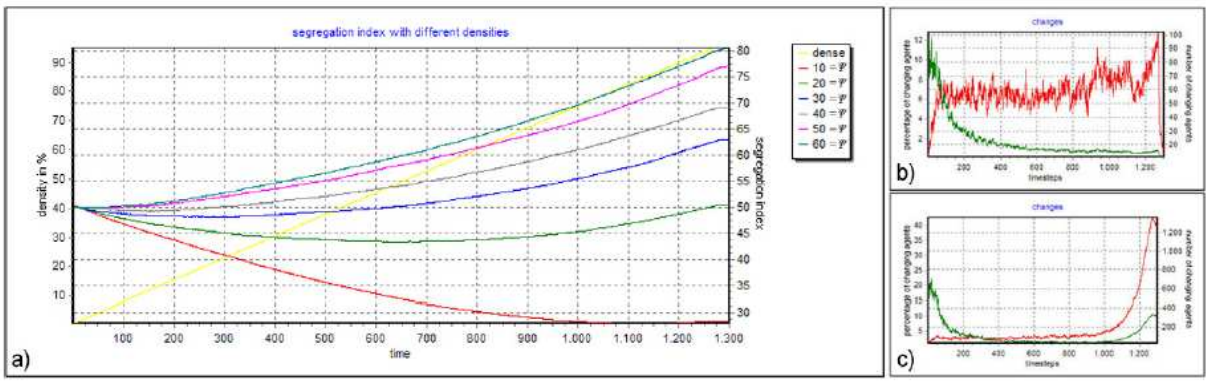

Abb. 09: Analyse einer steigenden Agentendichte. *a)* Die gelbe Diagonale zeigt die lineare Zunahme der Anzahl an Agenten in % im Verlauf der Zeit und ist an der linken Achse orientiert. Die anderen farbigen Linien geben die Verläufe des IS bei verschiedenen Ψ-Werten wieder und sind an der rechten Achse orientiert. *b)* zeigt die absolute (rot, rechte Achse) und relative (grün, linke Achse) Migrationsrate bei Ψ=40 und *c)* bei Ψ=60.

5 PHASENÜBERGÄNGE

Was bedeuten Phasenübergänge im Kontext des präsentierten FACS Modells? Das Prinzip eines Phasenübergangs lässt sich beispielhaft an einem Glas mit Wasser bei Zimmertemperatur veranschaulichen. Wenn die Raumtemperatur herabgesetzt wird, lässt sich keine sichtbare Auswirkung auf das Wasser beobachten. Es bleibt dieselbe Flüssigkeit mit augenscheinlich unveränderten Eigenschaften. Sobald die Temperatur aber unter 0°C fällt, verändert sich das Wasser plötzlich. Die Wassermoleküle beginnen zu

kristallisieren und das Wasser wird nach einer Weile bei konstanter Temperatur unter 0°C vollständig zu Eis transformiert. Der Temperaturabfall $\Delta T = 1°C$ hat einen unvermittelten Phasenübergang von Wasser zu Eis bewirkt und bei einer weiteren Abkühlung lässt sich keine sichtbare Veränderung erkennen.

Im Fall des FACS Modells interessieren uns nun die IS Werte anstelle des Aggregatszustands des Wassers und statt der Temperatur werden die Toleranzwerte geändert (Abb. 10). Das erste Experiment wird mit den Kontrollparametern g=2, k=5, l=55, und Ψ=0 gestartet. Sobald während fünf Zeitschritten keine Veränderung der Migrationsrate auftritt, kann angenommen werden, dass sich das System in einem stabilen Zustand befindet und der Toleranzschwellenwert Ψ wird um eins erhöht. Die Randbedingung ist bei dieser Untersuchung kein Torus mehr, sondern der zelluläre Raum endet an den vier Seiten, wodurch die Zellen an den Rändern weniger Nachbarn haben. Nachdem das System vor der nächsten Erhöhung des Toleranzschwellenwerts einen stabilen Zustand erreicht hat, wird der IS geplottet (Abb. 10b und e). Die Abb. 10a zeigt einen deutlichen Phasenübergang zwischen Ψ=37 und Ψ=38: Der qualitative Zustand des Systems verändert sich von einer Gleichverteilung zu einer stark segregierten Struktur. In Abb. 10c ist die zeitliche Entwicklung dargestellt. Die rote Linie zeigt die Werte des aktuellen Toleranzschwellenwertes und der grüne Graph stellt die Anzahl migrierender Agenten dar. Der Bereich des Phasenübergangs ist klar zu erkennen: bei Ψ=37 hat das System seinen kritischen Zustand erreicht. Wird der Toleranzschwellenwert von 37 auf 38 erhöht, nimmt die Migrationsrate durch einen exponentiellen Rückkoppelungsprozess lawinenartigen zu. Die Migrationswelle hält 200 Zeitschritte an bevor das System einen neuen Gleichgewichtszustand erreicht. Ein weiterer Anstieg von Ψ hat so gut wie keine Auswirkungen mehr – entsprechend der einleitenden Analogie des Verhaltens von Wasser.

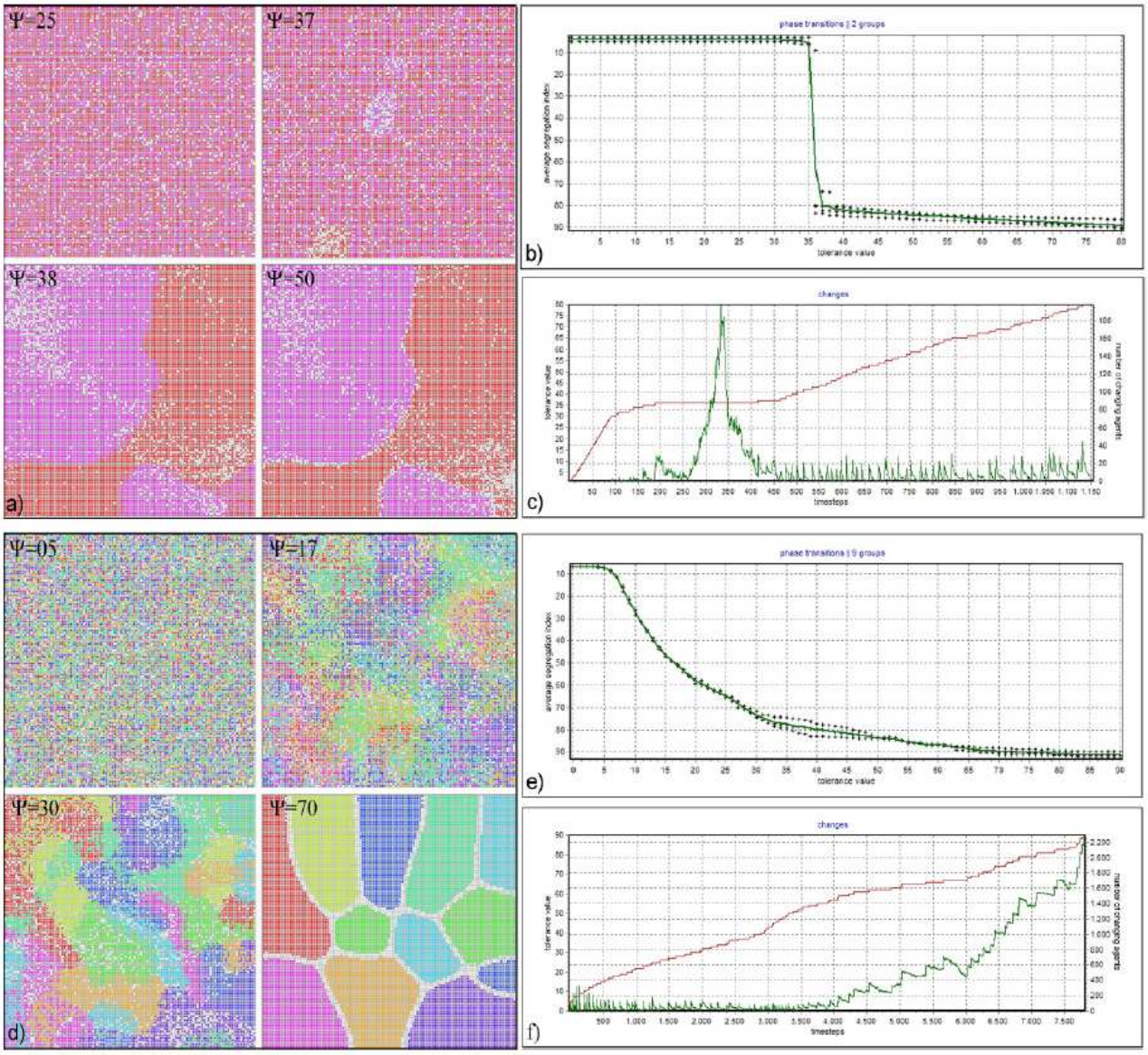

Abb. 10: Phasenübergänge mit 2*(a, b, c)* und 9*(d, e, f)* Gruppen. Die Diagramme zeigen die Entwicklung der beiden Systeme in Abhängigkeit der schrittweisen Erhöhung des Toleranzschwellenwerts Ψ.

Wiederholt man das Experiment mit mehr Bevölkerungsgruppen *g*=9 und den gleichen Einstellungen für die Kontrollparameter, findet der Phasenübergang kontinuierlich über einen wesentlich größeren Zeitraum statt und es gibt keine so plötzliche Veränderung des IS (Abb. 10e). Allerdings lässt sich hier während des lang-

sameren Übergangs zwischen den Phasen eine andere interessante qualitative Beobachtung machen (Abb. 10d, Ψ=17 und Ψ=30): Agenten verschiedener Gruppen arrangieren sich untereinander und bilden räumliche Gemeinschaften. Verschiedenen Gruppen separieren sich von anderen Gruppen und es kommt zu einer Art lokaler Kooperationen und der Organisation symbiotische Mischgruppen.

Am Ende dieses Abschnitts möchte ich die Analysen in vier Stabilitätsdiagrammen zusammenfassen, von denen jedes von einem anderen Kontrollparameter abhängt (Abb. 11). Die dargestellten Flächen zeigen den Verlauf der Phasenübergänge von einer anfänglichen Gleichverteilung der Agenten verschiedener Gruppen hin zu stark segregierten Strukturen. Der Toleranzschwellenwert ist jeweils der x-Achse und der entsprechende IS ist der y-Achse zugeordnet. An den z-Achsen sind jeweils die Anzahl der Gruppen, die Nachbarschaftsgröße, der Mobilitätsradius und die Anzahl der Agenten orientiert (Abb. 11a, b, c, d).

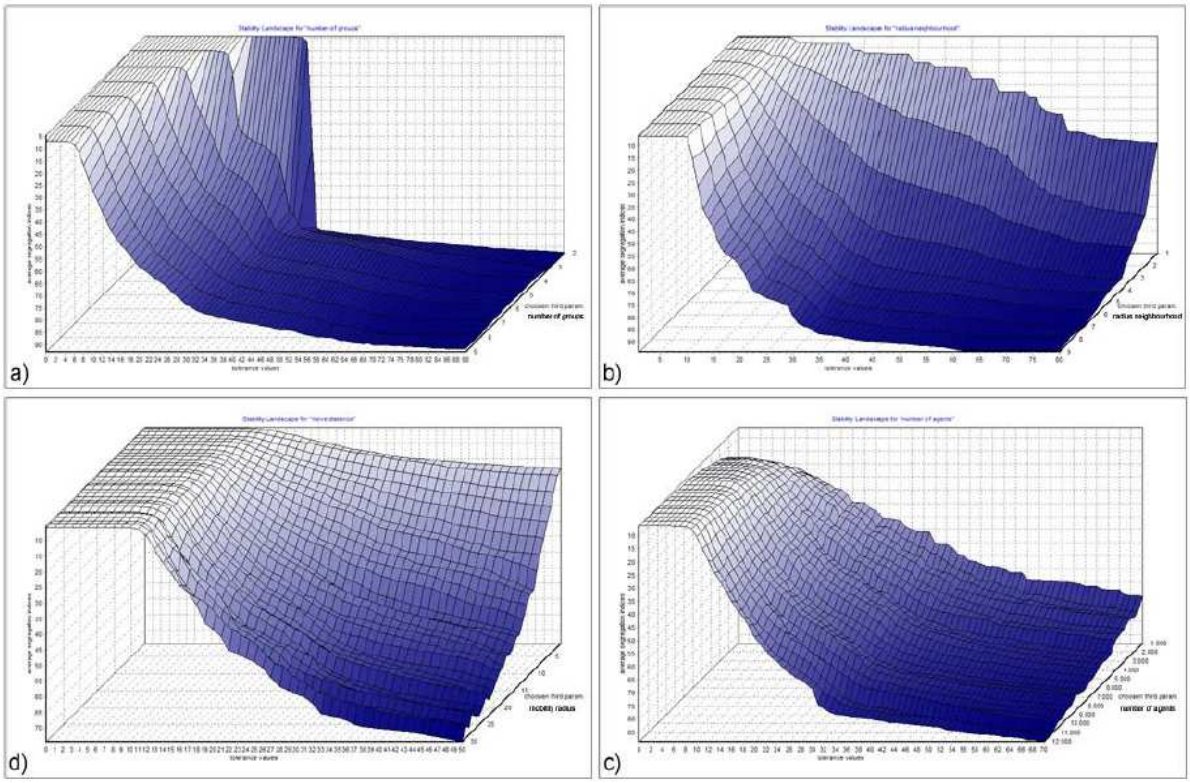

Abb. 11: Stabilitätsdiagramme. Die x-Achse stellt den Toleranzschwellenwert Ψ und die y-Achse den IS dar. Die z-Achse zeigt *a)* die Anzahl der Gruppen *g*; *b)* die Nachbarschaftsgröße *k*; *c)* die Anzahl der Agenten *m*; und bei *d)* den Mobilitätsradius *l*.

6 **DISKUSSION**

Für das agentenbasierten Modell der Wohnortdynamik habe ich mich bemüht, ein möglichst einfaches Simulationsmodell herzustellen, welches die wesentlichen Prinzipien so transparent wie möglich beschreibt. Bereits bei diesem einfachen Modell stellt sich heraus, dass die Interaktionen der wenigen Kontrollparameter einige Schwierigkeiten bei der Interpretation der Ergebnisse bereiten. Der Grad der Entmischung mehrere Bevölkerungsgruppen, der mittels des IS gemessen wurde, kann von allen Kontrollparametern abhängen, wie in Abb. 11 gut nachvollzogen werden kann. Die Erhöhung des Toleranzschwellenwertes kann bei bestimmten Systemzuständen die gleiche Wirkung haben, wie eine Veränderung des Mobilitätsradius, der betrachteten Nachbarschaftsgröße, der Anzahl der Bevölkerungsgruppen oder der Anzahl der Agenten. Alle Parameter können eine Auf- oder Abwärtsbewegung auf den visualisierten Flächen in Abb. 11 bewirken. Es können demnach lediglich Aussagen darüber gemacht werden, welche Auswirkung die Veränderung eines Parameters haben kann. Wenn wir allerdings fragen, wie eine Struktur zustande gekommen ist, die wir in der Wirklichkeit beobachten, dann lässt sich schwer sagen, welche der vielen möglichen Parameterkonstellationen dafür in Frage kommen. Der Umstand, dass verschiedenen Anfangszustände zu dem selben Ergebnis führen können wird mit dem Begriff Equifinality bezeichnet.

Mit einer zweiten Schwierigkeit werden wir konfrontiert, wenn wir uns an das in der Einleitung beschriebene Verhalten chaotischer Systeme erinnern, welche trotz determinierter Regeln zu unvorhersehbaren Ergebnisse führen können. Dies würde bedeuten, dass eine Simulation die mit den gleichen Parametereinstellungen mehrmals hintereinander ausgeführt wird jedes Mal verschiedene Resultate liefert. Da ich für das oben dargestellte Simulationsmodell mit Zufallsprozessen, sogenannten Monte-Carlo-Verfahren gearbeitet habe, ist es nicht verwunderlich, dass jede Simulation ein anderes Ergebnis hat. Da wir es allerdings bei einer Stadt mit einem offenen System zu tun haben, welches sich nicht im Gleichgewicht befindet, lässt sich mit einiger Gewissheit sagen, dass hier die Phänomene des deterministischen Chaos' zum tragen kommen, welche wir bereits skizziert haben. Unbedeutende Veränderungen der Anfangsbedingungen oder kleinste Abweichungen während eines Prozesses können enorme Auswirkungen auf die Ergebnisse haben. Wenn ein System bei gleichen Ausgangsbedingungen verschiedene Ergebnisse liefert, wird dieser Vorgang als Multifinality bezeichnet. Bei den oben beschriebenen Untersuchungen wurde dieser Schwierigkeit begegnet, indem das Messverfahren des IS nur die aggregierte Eigenschaft der globalen Strukturen wiedergegeben hat, ohne auf

Unterschiede im Detail einzugehen. Konfigurationen mit den gleichen IS Werten können demnach völlig verschiedene räumliche Organisationsformen aufweisen.

Die Aussage, dass die Parameter, die für eine Simulation verwandt wurden Schlussfolgerungen für Prozesse zulassen, die uns in der Wirklichkeit interessieren ist aufgrund der Effekte der Equi- und Multifinality nicht zulässig. Aus diesen Gründen haben Versuche, ein Simulationsmodell zu validieren, indem bestimmte Zustände der Vergangenheit in irgendeiner Form reproduziert werden, eine relativ geringer Überzeugungskraft. Das oft beschworene Potential der Simulationsmodelle bei der Unterstützung politischer oder administrativer Entscheidungen durch die Interpretation der Kontrollparameter eines Szenariomodells kann erst genutzt werden, wenn Strategien zur Lösung der oben beschriebenen Probleme gefunden werden.

Welche prinzipiellen Möglichkeiten sind nun vorstellbar, die Aussagen von Modellen zu überprüfen? Bei den traditionellen LSUM wurde einer Entwicklung, die sich aus der Vergangenheit bis in die Gegenwart mit ausreichend Daten belegen ließ nachvollzogen. Wenn ein Simulationsergebnis die Zustände der Wirklichkeit reproduzierten kann, wurde dies als Beleg gewertet, dass die Simulationsmechanismen geeignet sind. Die bereits genannten Argumente lassen allerdings keine sicheren Aussagen darüber zu, ob man hinreichend viele, bzw. alle wesentlichen Mechanismen berücksichtigt hat, und ob die Annahmen über deren Zusammenwirken stimmen. Lee (1973) hat diese Beweise für die Validität eines Modells als eine der sieben Sünden des Modellierens, der „Tuningness“ beschrieben. Eine mögliche Lösung beschreiben Batty und Torrens (2005), der zufolge eine zweite Validierung desselben Modells in einem anderen Kontext, einer anderen Stadt, mit den Einstellungen der ersten vorgenommen werden muss. Dieses Verfahren ist allerdings in der Praxis kaum durchführbar.

Eine Strategie, um auf die Sensitivität der Modelle bei den Veränderungen der Anfangsbedingungen zu reagieren, besteht darin, möglichst sinnvolle Heuristiken für die Parameterwahl und die Modellstruktur zu wählen. Dafür ist es erforderlich, den konkreten Zweck und Einsatzbereich einer Simulation zu bestimmen (Batty & Torrens, 2005). Bei konkreten Szenarien ließen sich dann Aussagen über die Aussichten einer Planungsmaßnahme im Sinne eines stabilisierenden oder destabilisierenden Eingriffs in ein komplexes System machen.

In der Einleitung des Texts habe ich auf Heraklit verwiesen, nach dessen Sichtweise sich die Welt fortwährend verändert und nichts bleibt wie es ist. Am Ende des Beitrags soll nun sein Gegenspielers Parmenides zu Wort kommen. Nach Parmenides ist das wahre Sein, die Substanz, das "Es" einheitlich, ewig, unvergänglich, unteilbar, unbeweglich und die Veränderungen der Dinge sind subjektiv. Im Rückblick auf die beschriebene Methode der agentenbasierten Simulation lässt sich in den Regeln der Agenten eine gewisse Unveränderbarkeit entdecken, die über verschiedenen Parametereinstellungen zu unterschiedlichsten Ergebnissen führen können, selbst aber immer gleich bleiben. Und selbst wenn die Agenten in die Lage versetzt werden, ihr Verhalten zu anzupassen, die Regeln also einem adaptiven Prozess struktureller Veränderung unterzogen werden (Holland, 1992), so gibt es doch wieder feststehende Regeln für diesen Adaptionsvorgang. Der Vergleich mit den unveränderlichen Mechanismen der biologischen Evolution, welche dennoch eine unendliche Vielfalt an Formen und Strukturen hervorbringt liegt nahe.

Der unbestreitbare Wert von Simulationsmodellen liegt in ihrem Potential, Zusammenhänge aufzudecken und dadurch Diskussion mittels abstrakter Szenarien zu befruchten, sowie in pädagogischen Anwendungen. Auch können kritische Zuständen oder mögliche Veränderungen eines Systems abgeschätzt werden. Bis Simulationen allerdings brauchbare Prognosen liefern können, sind noch schwerwiegende Fragen zu klären, von denen ich einige angeführt habe. Abschließend möchte ich eine Einsicht von Rainer Hegselmann (1996) wiedergeben, dass wir die Welt mit Simulationen nicht vollständig verstehen werden, aber ohne Simulationen werden wir sie noch weniger verstehen.

ANMERKUNGEN

Mein ausdrücklicher Dank gilt der Landesgraduiertenförderung Baden-Württemberg für die Gewährung eines zweijährigen Promotionsstipendiums sowie dem DAAD für ein Aufstockungsstipendium, welche mir die Arbeit an diesem Thema ermöglicht haben. Für wertvolle Anregungen möchte ich Herrn Prof. Dr. Franck danken. Das Simulationsprogramm des beschriebenen Modells ist im Internet als ausführbare Windowsdatei frei erhältlich unter: http://www.entwurfsforschung.de/RaumProzesse/Segregation.htm

REFERENZEN

Batty, M., & Torrens, P. M. (2005). Modelling and prediction in a complex world. *Futures, 37*, 745-766.

Benenson, I. (1998). Multi-Agent Simulations of Residential Dynamics in the City. *Computers, Environment and Urban Systems, 22*(1), 25-42.

Benenson, I., & Torrens, P. M. (2004). *Geosimulation – Automata-based modeling of urban phenomena*. Chichester: John Wiley & Sons.

Benevolo, L. (2000). *Die Geschichte der Stadt*: Campus Verlag.

Bertalanffy, L. v. (1948). *General System Theory* New York Wiley & Sons

Breßler, C., & Harsche, M. (2004). Einführung in die Kultur- und Sozialgeographie. Retrieved 2006/11/12, from http://www.mygeo.info/skripte/skript_bevoelkerung_siedlung/

Duncan, O. D., & Duncan, B. (1955). A Methodological Analysis of Segregation Indexes. *American Sociological Review, 20*, 210–217.

Epstein, J. M., & Axtell, R. (1996). *Growing Artificial Societies: Social Science from the Bottom Up*. Cambridge, MA: MIT Press.

Haken, H. (1996). *Principles of Brain Functioning: A Synergetic Approach to Brain Activity, Behaviour and Cognition*. Berlin: Springer.

Hegselmann, R. (1996). Solidarität unter Ungleichen. In R. Hegselmann & H.-O. Peitgen (Eds.), *Modelle Sozialer Dynamiken. Ordnung, Chaos und Komplexität* (pp. 105-128). Wien: Hölder-Pichler-Tempsky.

Hegselmann, R., & Flache, A. (1998). Understanding Complex Social Dynamics: A Plea for Cellular Automata Based Modelling. *Journal of Artificial Societies and Social Simulation, 1*(3).

Holland, J. H. (1992). *Adaption in Natural and Artificial Systems: An Introduction with Applications to Biology, Control, and Artificial Intelligence* (2 ed.): MIT Press.

Kalter, F. (2000). Measuring segregation and controlling for independent variables [Electronic Version] from http://www.mzes.unimannheim. de/publications/wp/wp-19.pdf.

Lee, D. B. (1973). A requiem for large scale modeling. *Journal Of The American Institute Of Planners, 39*(3), 163-178.

Meng, G., Hall, G. B., & Roberts, S. (2006). Multi-group segregation indices for measuring ordinal classes. *Computers, Environment and Urban Systems, 30*, 275–299.

Mumford, L. (1961). *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace & World.

Peitgen, H.-O., Jürgens, H., & Saupe, D. (2004). *Chaos and Fractals: New Frontiers of Science* (2 ed.). New York: Springer.

Portugali, J. (2000). *Self-Organization and the City: Springer Series in Synergetics*. Berlin Heidelberg: Springer.

Prigogine, I. (1998). Zeit, Chaos und die zwei Kulturen. In H.-J. Krug & L. Pohlmann (Eds.), *Selbstorganisation: Jahrbuch für Komplexität in den Natur-, Sozial-, und Geisteswissenschaften* (Vol. 8. Evolution und Irreversibilität, pp. 13-13). Berlin: Duncker und Humblot.

Schelling, T. (1969). Models of segregation. *American Economic Review, 59*, 488-493.

Wegener, M. (1994). Operational Urban Models – State of the Art. *American Planning Association Journal, 60*(1).

Wegener, M. (2005). Urban Land-Use Transportation Models. In D. Maguire, M. Batty & M. F. Goodchild (Eds.), *GIS, Spatial Analysis and Modeling* (pp. 203-220). Redlands, CA: ESRI Press.

Wong, D. W. S. (2003). Implementing spatial segregation measures in GIS. *Computers, Environment and Urban Systems, 27*, 53–70.

REVITalisierung des ehemaligen Güterbahnhofs Stuttgart - Bad Cannstatt

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1 DIE LANDESHAUPTSTADT STUTTGART

Stuttgart ist eine Metropole mit rund 590.000 Einwohnern und ist das Zentrum einer Region mit 2,6 Millionen Einwohnern. Als eine der größten Wachstumsregionen in Deutschland muss Stuttgart dauerhaft neue Flächen für den Wohnungsbau erschließen. Um einer ihrer Haupteigenschaften als „Stadt im Grünen" gerecht zu werden, wird im Flächennutzungsplan 2010 ein besonderes Augenmerk auf die innerstädtische Flächenentwicklung gelegt. Demzufolge liegt der Schwerpunkt für Stadtentwicklung auf der Förderung großer aber auch kleinerer Projekte, die zu einem Strukturwandel innerhalb des Stadtgebietes beitragen. Es gibt eine Vielzahl von Flächen mit großem Entwicklungspotential, jedoch die drei größten innerstädtischen Stadtentwicklungsprojekte sind zurzeit das ehemalige Güterbahnhofareal in Bad Cannstatt (das lokale Modellprojekt für Stuttgart im REVIT - Projekt), „Stuttgart 21" und „City Prag".

2 GESCHICHTE, LAGE UND NUTZUNG DES AREALS

Der Güterbahnhof Bad Cannstatt wurde vor über 100 Jahren neu erschlossen. Mit dem fortschreitenden Ausbau des Bahnnetzwerks wurde auch der Güterbahnhof immer intensiver genutzt und dehnte sich weiter aus. In den späten 80er Jahren stellte die Deutsche Bahn den Betrieb auf dem Güterbahnhof ein, und das Grundstück wurde an verschiedene Unternehmen vermietet. Mit einer Fläche von rund 22 ha ist das Areal die größte zusammenhängende innerstädtische Brachfläche der Stadt Stuttgart. Im Jahr 2001 erwarb die Landeshauptstadt das Grundstück, nachdem sie das Potential für eine umfangreiche Entwicklung des Gebiets erkannt hatte: die zentrale Lage und die unmittelbare Nähe zu zahlreichen Freizeitangeboten und öffentlichen Veranstaltungsstätten. Große Sport- und Freizeitzentren, wie z.B. das Gottlieb-Daimler-Stadion, die Hanns-Martin-Schleyer-Halle und der Cannstatter Wasen, sowie die vor kurzem erbaute Porsche-Arena und das Mercedes-Benz Museum liegen in nächster Nähe des Güterbahnhofs. Auch die historische Altstadt von Bad Cannstatt, die Mineralquellen und Mineralbäder sowie der Rosensteinpark sind innerhalb eines Radius von zwei Kilometern um den Güterbahnhof gelegen. Das Areal wird von 20 Hauptmietern genutzt, die großen An- und Ablieferverkehr verursachen und große Flächen beanspruchen. Das Areal soll möglichst nachhaltig neu geordnet werden, dabei sollen sowohl die Interessen der Nutzer als auch die der Bewohner des angrenzenden Wohngebiets „Veielbrunnen" angemessen berücksichtigt werden. Eine verträgliche Mischung aus Wohnen und Dienstleistung sowie Flächen für nicht störendes Gewerbe im Einklang mit den umliegenden Sport- du Veranstaltungsangeboten ist vorgesehen. Damit ergänzt die Neuordnung des Güterbahnhofgeländes das im Norden angrenzende städtebauliche Sanierungsgebiet „Veielbrunnen" optimal. Mit den Mitteln aus dem europäischen Fonds für regionale Entwicklung (EFRE) in Höhe von rund € 2,2 Millionen trägt das REVIT - Projekt zur nachhaltigen Entwicklung des gesamten Stadtteils bei. Diese finanzielle Förderung für Planungsleistungen, Abbruchmaßnahmen, Altlastenuntersuchungen und –sanierung sowie Marketing trägt erheblich als Anschubfinanzierung zur Neuentwicklung des Areals bei.

3 RAHMENPLAN MERCEDESSTRASSE

Mitte 2004 wurde das Konzept für einen Rahmenplan für den ehemaligen Güterbahnhof und die angrenzende Umgebung entwickelt. Dieser Rahmenplan Mercedesstraße stellt ein einheitliches Konzept dar und integriert die Revitalisierung des Güterbahnhofs gemeinsam mit den zahlreichen Einrichtungen, einschließlich des Sanierungsgebiets, in der Umgebung. Der Rahmenplan mit den Schwerpunkten Wohnen, gewerbliche Nutzung und qualifizierte Abrundung zum angrenzenden Wohngebiet Veielbrunnen wurde im Juni 2005 vom Gemeinderat beschlossen und bildet die Basis für alle weitere Aktivitäten zur Entwicklung des neuen Stadtquartiers. Es handelt sich um ein Stadtfeld mit besonders hoher Planungs- und Entwicklungsdynamik, das eine hohe politische Aufmerksamkeit besitzt. Übergreifendes Ziel ist die Neuordnung des Stadtfeldes, der Entwurf neuer Stadtkoordinaten, die Erarbeitung alternativer Nutzungsüberlegungen und das Erstellen eines leistungsfähigen Verkehrsnetzes. Dazu prüft die Stuttgarter Straßenbahnen AG (SSB) die Möglichkeit eines Schienenverkehrsanschlusses, um die Anbindung an den öffentlichen Personennahverkehr zu verbessern.

4 ERSTES ENTWICKLUNGSKONZEPT – WEITERENTWICKLUNG DES RAHMENPLANS

Basierend auf dem Rahmenplan wurde ein Konzeptentwurf für den ersten potentiellen Bauabschnitt entwickelt. Dieses Konzept wurde vom Amt für Stadtplanung und Stadterneuerung der Stadt Stuttgart in die Weiterentwicklung des Rahmenplans integriert. Diese Weiterentwicklung dient als Grundlage für die folgende Bebauungsplanung.

5 WIRTSCHAFTLICHE MACHBARKEITSSTUDIE – EIN ZENTRALER PLANUNGSSCHRITT

Sobald die gesamten Ergebnisse der Machbarkeitsstudie zur marktwirtschaftlichen Optimierung des gesamten Planungskonzeptes vorliegen, kann die Planung und Umsetzung der Neuentwicklung fortgeschrieben und ein Aufstellungsbeschluss in den gemeinderätlichen Gremien gefasst werden. Der westliche Teil des Güterbahnhofs soll als erster Bauabschnitt bereits 2008 entwickelt werden.

6 DIE REVITALISIERUNG HAT BEGONNEN – BETRIEBSVERLAGERUNGEN UND RÜCKBAUARBEITEN

Mit einem Baggerbiss am 6. September 2004 leitete der zuständige Bürgermeister die ersten Abbrucharbeiten ein. Das Projekt wird vom lokalen REVIT - Team bearbeitet, das aus einer interdisziplinären Projektgruppe (IPG) besteht, in der alle involvierten Ämter der Stadt Stuttgart vertreten sind.

Auf dem Güterbahnhofgelände arbeiten derzeit 461 Menschen, zumeist in Bereichen der Industrie. Es gab zahlreiche Verhandlungsgespräche mit den ansässigen Unternehmen, deren Mietverträge oft noch bis 2016/2017 laufen. Obwohl sich die Suche nach geeigneten Ersatzstandorten zunächst schwierig gestaltete, speziell im Fall von Recyclingunternehmen, konnten die Unternehmen größtenteils auf Stuttgarter Gemarkung umgesiedelt werden. Das Mauerwerk der vorhandenen Gebäude ist jedoch zum Großteil durch Asbest, Teer und Holzschutzmittel belastet und muss vor dem Start des Abbruchs untersucht werden. Auch die Rückbauarbeiten selbst müssen unter fachlicher Aufsicht durchgeführt werden. Somit sind erste vorzeitige Rückgaben von Schlüsselflächen bereits erfolgt und die Freimachung des ersten Bauabschnitts für die Neuordnung des Geländes fast abgeschlossen.

7 ALTLASTENUNTERSUCHUNG UND –SANIERUNG

Da das Projektgelände inmitten des Heilquellenschutzgebietes Stuttgart-Bad Cannstatt und Stuttgart-Berg liegt, unterliegt das Grundwasser einem besonderen Schutz durch strikte Vorschriften. Auf der Grundlage einer historischen Erhebung untersuchte das Amt für Umweltschutz systematisch die 42 Altlastenverdachtsflächen. Auf dem gesamten Gelände wurden im Boden Mineralölverunreinigungen, lokal auch Schwermetalle und chlorierte Kohlenwasserstoffe (Lösungsmittel) sowie im Gleisbereich Herbizide nachgewiesen. Die einzige sanierungsbedürftige Grundwasserverunreinigung befindet sich im Bereich eines Schrottplatzes. Hier besteht eine zusammenhängende, ca. 6.000m$_2$ große Mineralölverunreinigung im Grundwasserschwankungsbereich mit aufschwimmender Ölphase. Mögliche Sanierungsmaßnahmen für die ungesättigte Bodenzone sind Aushub oder die Einkapselung des verunreinigten Bereichs. Ergänzend wird für die gesättigte Bodenzone das neu entwickelte „**O**n-site **S**eparation and **B**iological **O**xidation“ [OSBO] Verfahren in einer Pilotanwendung zur Dekontaminierung des Bodens angewandt und trägt zur Verbesserung der Nachhaltigkeit der Sanierung bei. Im OSBO-Verfahren werden Schadstoffe durch mechanischen Energieeintrag gelöst, um sie gezielt erfassen und der biologischen Grundwasserreinigung zuführen zu können.

8 KAMPFMITTELRÄUMUNG

Das Gebiet des ehemaligen Güterbahnhofs Bad Cannstatt war während des zweiten Weltkriegs besonders heftigen Bombenangriffen durch die Alliierten ausgesetzt, da der Bahnhof für logistische Zwecke benutzt wurde und neben einer Fahrzeugproduktionsstätte (dem heutigen Daimler-Chrysler) lag. Bisher erfolgt die Kampfmittelräumung nur von Fall zu Fall, durch flächige Umlagerung der oberen Bodenschichten und die Abtragung Munitionsresten. Dies ist die einzig sichere Art, eine vollständige Kampfmittelfreiheit zu gewährleisten. Diese Maßnahmen sind sehr arbeits- und kostenintensiv und deshalb zur Räumung größerer Areale nicht geeignet. Die Kosten für die Entsorgung des kontaminierten Aushubs und die Anlieferung von Ersatzmaterial kommen noch hinzu. Kampfmittelaltlasten sind aus den vorgenannten Gründen ein großes

monetäres Hemmnis bei der Entwicklung und Revitalisierung solch großer Brachflächen. Sie nicht zu beseitigen ist jedoch nicht praktikabel, da ein Kampfmittelverdacht sowohl für Investoren als auch für die Vermarktung einer Brachfläche ein unkalkulierbares Risiko darstellt.

Für die Revitalisierung des ehemaligen Güterbahnhofs Bad Cannstatt wurde daher in Zusammenarbeit mit dem Kampfmittelbeseitigungsdienst Baden-Württemberg eine neuartige Vorgehensweise entwickelt. Zunächst werden Versuchsfelder in der Größe von jeweils 10m2 angelegt, auf welchen die Durchführbarkeit verschiedener geophysikalischer Messmethoden geprüft wird. Diese Testfelder werden gleichmäßig auf das gesamte Areal verteilt, um repräsentative Ergebnisse sicherzustellen. Für jedes Testfeld wird die jeweils optimale Maßnahme zur Kampfmittelräumung erarbeitet. Nach der Interpretation und Auswertung der Ergebnisse wird für jedes Testfeld das geeignetste technische Verfahren beschrieben und die damit verbundenen Kosten kalkuliert. Dadurch werden sowohl die effiziente Kampfmittelbeseitigung als auch die nötige Planungssicherheit gewährleistet. In der Folge wird jede einzelne Teilfläche des Güterbahnhofgeländes in Übereinstimmung mit den von der Stadt Stuttgart vorgegebenen Prioritäten bearbeitet werden.

9 MARKETING – IMAGEBILDUNG UND EINBETTUNG IN DAS KONZEPT NECKARPARK

Die in der wirtschaftlichen Machbarkeitsstudie bereits vorhandenen Ansätze zum Imagewechsel und der Attraktivitätssteigerung des ehemaligen Güterbahnhofgeländes sind durch ein detailliertes und schlüssiges Marketingkonzept zu ergänzen. Strategien zur Zielgruppen orientierten Vermarktung sowie Empfehlungen zur Gegeneinwirkung auf eine mögliche negative Veränderung der sozialen Struktur, sollen noch im Rahmen der transnationalen Zusammenarbeit im REVIT Projekt entwickelt werden. Das zu erstellende Marketingkonzept soll zur direkten Ansprache von Zielgruppen auf die endgültige Nutzungskonzeption abgestimmt werden. Die Marketingkonzeption wird in das Marketing des direkt angrenzenden Neckarparks integriert. Nirgends in Stuttgart wurden in den letzten Jahren so viele Bauprojekte realisiert, wie im Neckarpark. Dennoch kann das gemeinsame Auftreten der dort ansässigen Institutionen noch verbessert werden. Das Mercedes-Benz Museum, die Hanns-Martin-Schleyer-Halle, die Porsche-Arena, das Carl Benz Center und der VFB Stuttgart planen eine Zusammenarbeit mit Werbeagenturen, der Gastronomie und Hotels. Das Projekt soll national und international von Stuttgart-Marketing vermarktet werden. Der erste Schritt erfolgte im Jahr 2006 mit der Einführung eines Parkleitsystems für das gesamte Gebiet. Am 22. Juli 2007 wird das Neckarpark Festival stattfinden, auf dem sich alle ansässigen Institutionen der öffentlichen Bevölkerung präsentieren. Eine weiter entwickelte Abstimmung der Aktivitäten und Veranstaltungen ist mit der Einführung einer gemeinsamen Datenbank geplant. Zusätzlich dazu soll eine Kundenkarte mit Vergünstigungen eingeführt werden.

10 NACHHALTIGKEIT – WORKSHOP „RICHTLINIEN UND ZIELE FÜR EINE NACHHALTIGE STADTENTWICKLUNG“

Im Oktober 2005 besuchten über 100 Teilnehmer den Planungsworkshop „Richtlinien und Ziele für eine nachhaltige Stadtentwicklung“, der unmittelbar angrenzend an das Güterbahnhof Areal in einem denkmalgeschützten Gebäude stattfand, das künftig das Stuttgarter Stadtarchiv beherbergen wird. Ziel des Workshops war es in Zusammenarbeit mit politischen Entscheidungsträgern, Interessengruppen und verwaltungsübergreifend die vorhandenen Konzepte für die Entwicklung des Areals zu evaluieren. Während die Ziele eher allgemein definiert wurden (z.B. Einsparung fossiler Energien), boten die konkreten Indikatoren (z.B. „30 % unter dem gesetzlichen Energieerhaltungsstandard“) die Möglichkeit einer messbaren Überwachung und Kontrolle der Zielerreichug.

Der öffentliche Workshop wurde von Stadtplanern, Architekten, Investoren, Bauträgern, Projektentwicklern, Vertretern von Unternehmen und Bürgervereinigungen, Bezirksbeiräten und Gemeinderäten, Verwaltung und interessierten Bürgern besucht. Das Ergebnis war ein erster Entwurf des Grundsatzpapiers „10 Prinzipien für eine nachhaltige Entwicklung“. Dieses Dokument ist nun die Basis für den weiteren Planungsprozess und wird in naher Zukunft wahrscheinlich vom Ausschuss für Umwelt und Technik des Stuttgarter Gemeinderats als Grundlage für städtebauliche Verträge beschlossen. Die Veranstaltung war ein voller Erfolg für die Stadtverwaltung, da die Themen der nachhaltigen Entwicklung nun fester Bestandteil des Dialogs und der Entwicklung des ehemaligen Güterbahnhofareals sind. Darüber hinaus wurde das Bewusstsein von Politikern, Öffentlichkeit und am Planungsprozess beteiligten Experten für eine nachhaltige

Entwicklung immer mehr geschärft, da sie selbst innerhalb des Workshops die Prioritäten in Bezug auf Ziele und Indikatoren der Nachhaltigkeit mitbestimmen konnten. Die Ergebnisse dieses Pilotworkshops wurden schriftlich festgehalten. Sie sind in einem Handbuch nachzulesen. Die Erfahrungen und Empfehlungen, die sich aus dem Workshop ergeben haben, sollen den Projektpartnern aus den Niederlanden, Großbritannien und Frankreich als Hilfe bei der Durchführung öffentlicher Veranstaltungen zu diesem Thema dienen. Natürlich muss bei der Umsetzung dieser Erfahrungen und Empfehlungen berücksichtigt werden, dass sie eventuell auf die administrativen, politischen und planerischen Rahmenbedingungen des jeweiligen Landes angepasst werden müssen.

11 **ZUSAMMENFASSUNG**

Der ehemalige Güterbahnhof Bad Cannstatt verfügt über ein enormes Entwicklungspotential. Das Vorhaben wird unter anderem mit neuen Gebäuden und neuen Wohnbauten einen bedeutenden Beitrag zur Stadtentwicklung im Herzen Stuttgarts leisten. Das Gesamtprojekt ist bisher schneller vorangeschritten als geplant; Schlüsselgrundstücke konnten vor dem geplanten Zeitpunkt baureif werden. Die Hälfte der Fläche, also rund 10 ha, werden zu Beginn der ersten Bauphase in 2008 revitalisiert sein. Auch die noch in 2007 frei zu räumenden Flächen werden kampfmittelfrei übergeben. Eine verträgliche Mischung aus Wohnen, Dienstleistung und Gewerbe wird auf der Fläche entstehen. Diese werden mit den Sport- und Veranstaltungsflächen in unmittelbarer Nähe harmonisieren und ein einheitliches Gesamtgefüge bilden. Für das Revitalisierungsprojekt am ehemaligen Güterbahnhof Bad Cannstatt wurden „10 Grundprinzipien der nachhaltigen Entwicklung" erstellt. Diese stellen die Basis für eine weitere Beteiligung von Interessengruppen während des Planungsprozesses und der Entwicklung des Geländes dar. Geplant ist ein neues Stadtquartier, mit bis zu 400 Wohneinheiten. Die bestehenden Konzepte werden weiterentwickelt, um die sich ergebenden wirtschaftlichen und gewerblichen Möglichkeiten zu optimieren. Die Stadt Stuttgart überprüft derzeit, ob ein Teil der Projektfläche für ein Fußballmuseum genutzt werden kann, nachdem der Deutsche Fußballbund zu Vorschlägen für eine Nutzfläche von 4.500 m² aufgerufen hat.

10 Grundprinzipien der nachhaltigen Entwicklung
REVIT – Projektgebiet, Stuttgart

Revitalisierungsprojekte sollten:

1) eine gesunde Mischung für multifunktionale Nutzung bieten,
2) ausgewogene soziale Strukturen aufweisen,
3) Standorte für Wohnnutzung stärken,
4) wirtschaftliche Elemente stärken,
5) auf hohe Qualität bei der Gestaltung der Gebäude und der Umgebung achten,
6) attraktive öffentliche Grünflächen schaffen,
7) Verkehrsanbindung auf allen Ebenen gewährleisten,
8) die Lärmbelastung reduzieren,
9) den Energie- und Wasserverbrauch verringern / die Verwendung von erneuerbarer Energie und Regenwasser fördern
10) fortlaufend Interessengruppen beteiligen.

Non:conform vor Ort: nach drei Tagen ist alles anders!

Roland GRUBER

noncon:form vor Ort
NACH DREI TAGEN IST ALLES ANDERS!

nonconform vor Ort_Der Offene Ideen Stammtisch
Die Ideen der anwesenden Bevölkerung sind die Basis für noncon:form vor Ort

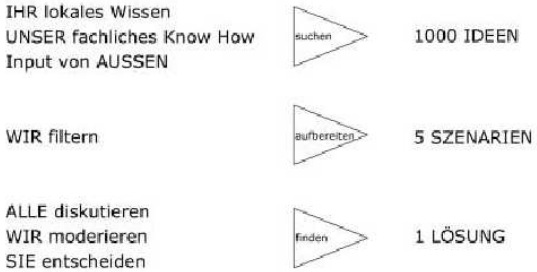
„noncon:form vor Ort" installiert direkt beim Die direkt Beteiligten in die architektonische Zukunftsentwicklung miteinzubeziehen stellt eine außerordentliche Herausforderung im Planungsprozess dar. Zugleich wird die Aufgabe des Architekten als reiner Objektplaner hinterfragt und das Aufgabengebiet um die Tätigkeit des Moderators und Kommunikators im Vorfeld von Bauaufgaben erweitert. Auftraggeber ein temporäres Büro. Der gemeinschaftliche kreative Prozess wird mithilfe von spezifischen Moderationstechniken, Events und Befragungen aktiv gesteuert. Das Ziel ist ein realisierbares Ergebnis. noncon:form sieht in dieser Vorgangsweise großes Entwicklungspotenzial. Die Partner Roland Gruber, Elisabeth Leitner, Peter Nageler, Caren Ohrhallinger und ihr Team verstehen sich dabei als Ideenmanager.

Das Architekturbüro noncon:form hat unter dem Titel „noncon:form vor Ort" ein neues Modell für die Ideenfindung von Zukunftsprojekten in Gemeinden und Unternehmen entwickelt.

Die Kernidee ist dabei, dass sowohl der Auftraggeber als auch dessen Umfeld in den Planungsprozess eingebunden werden. Bei öffentlichen Aufträgen etwa können das die Einwohner einer Gemeinde sein, bei privaten Aufträgen die Mitarbeiter eines Unternehmens oder die Mitglieder einer Organisation.

Das nonconform Team vor Ort: 3 Tage intensives Arbeiten
vlnr_Roland Gruber_Evrim Erkin_Elisabeth Leitner_Caren Ohrhallinger_Eldin Bilalic_Peter Nageler

noncon:form vor Ort
Wie funktioniert´s im Detail?



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DIE IDEE ENTWICKELT SICH IM GEMEINSAMEN PROZESS

Normalerweise entsteht eine architektonische Idee nach dem Briefing allein im stillen Kämmerlein. Der augenscheinlichste Unterschied zu dieser traditionellen Herangehensweise besteht darin, dass das Team von „noncon:form vor Ort" eigens für den Prozess der Vorbereitung und Ideenfindung anreist und ein temporäres Büro einrichtet. Live und gemeinsam mit allen Beteiligten vor Ort werden die Ideen entwickelt.

Damit wird die Ideenfindung transparent, prozesshaft und gemeinschaftlich. Auftraggeber und beteiligtes Umfeld können in jeder Phase eing reifen und mitwirken. Das fördert das Vertrauen der Auftraggeber, Beteiligten und Betroffenen in die entwickelten Ideen und sie können sich damit identifizieren.

Fallweise können auch externe ExpertInnen wie LandschaftsplanerInnen, SoziologInnen, VerkehrsexpertInnen, PhilosophInnen etc. mit ins Team von „noncon:form vor Ort" geholt werden. Gerade bei sehr vielschichtigen Aufgabenstellungen und Gegebenheiten ist dies nötig.

Die Bevölkerung entwickelt Ideen und präsentiert diese dem Plenum

In Ideengläsern werden schon im Vorfeld im gesamten Ort Ideen gesammelt

In der Schlußabstimmung entscheidet sich die Bevölkerung für die beste Idee, die in weiterer Folge für die Zukunftsentwicklung des Ortes verbindlich ist

WIE FUNKTIONIERT „NONCON:FORM VOR ORT" KONKRET?

In mehreren Veranstaltungen und Besprechungen vor Ort werden das lokale Know-how sowie ein möglichst breiter Input von außen gesammelt und mit dem Fachwissen der ArchitektInnen kombiniert. Dazu bedient sich „noncon:form vor Ort" verschiedenster Methoden wie beispielsweise die für Großgruppen bereits vielfach erfolgreich eingesetzte Konferenzmethode des Open Space.

So wird aus der Summe der Eindrücke, Vorgaben und Gegebenheiten eine Vielzahl an Ideen herausgefiltert. Je nach Projekt werden daraus drei bis fünf Szenarien entwickelt. In einem offenen Diskussionsprozess einigt man sich im Anschluss auf ein Szenario, das „noncon:form vor Ort" gemeinsam mit den Auftraggebern und Beteiligten zu einer gangbaren Lösung ausarbeitet.

Die Architekten von nonconform arbeiten LIVE vor Ort

DER VORTEIL

Die Vorteile sind sowohl für die Auftraggeber als auch für alle anderen Beteiligten und unmittelbar Betroffenen vielfältig und offensichtlich: Schon im Vorfeld kann in den kreativen Prozess eingegriffen werden, kreative Irrläufe lassen sich vermeiden.

Die Methode ist zeitsparend und reduziert den Kommunikationsaufwand beträchtlich. Sie verhindert Missverständnisse und Kommunikationsfehler. Bei herkömmlichen Planungsprozessen kommt es oft im Nachhinein zu Diskussionen und Konflikten. Hier aber kann das durch die transparente und nachvollziehbare Ideenfindung vermieden werden. Dass die Architekten physisch in das lokale Umfeld eingebunden sind, optimiert die Projektarbeit und die effiziente Durchführung vor Ort.

Die kreative Arbeit der ArchitektInnen wird live miterlebt. So kann bereits der Prozess medial begleitet und kommuniziert werden.

ZIELGRUPPEN

„noncon:form vor Ort" richtet sich insbesondere an zwei Zielgruppen.

Zum einen an Bauherren der öffentlichen Hand. Vor allem Gemeinden, die im regionalen Wettbewerb stehen, erhalten Zukunftsstrategien mit spannenden und realisierbaren Lösungen. Etwa nach dem Motto: „Das Ortszentrum muss leben!"

Zum anderen an Unternehmen und private Investoren, die ihren Mehrwert nach außen kommunizieren wollen. Dadurch erlangen sie Wettbewerbsvorteile und eine neue Positionierung. Oder sie wollen die Architektur und im weiteren Sinne Gestaltung als notwendiges Konzept in ihr (Bau-)Vorhaben integrieren.









MOLLN
ORTSZENTRUM NEU

Referenzprojekt MOLLN

Unter dem Thema „Das Zentrum von Molln 2015" wurden innerhalb weniger Tage mit mehr als hundert Personen Gespräche geführt, Ideen aus der Bevölkerung gesammelt und schließlich entwickelten die noncon:forms vor Ort drei unterschiedliche Szenarien, wie das Zentrum von Molln im Jahr 2015 ausgerichtet sein kann. Nach der Szenarienpräsentation und einem intensiven und offenen Diskussionsprozess wurde die Bevölkerung zur Abstimmung eingeladen.

Mehr als 100 Personen quer durch die Gemeinde (vom Bürgermeister und den anderen Gemeindevertretern, über Unternehmer und Pfarrer bis zu Arbeiter, Jugendliche und Hausfrauen) entschieden sich auf eine Lösung – Molln ist NATUR - die alle wesentlichen Entscheidungen in Molln für die nächsten Jahre beeinflussen wird.

Vizebürgermeister Josef Illecker: "Ich würde sagen, die noncon:forms sind richtige Stimulatoren. Es wurden uns die Augen geöffnet, auf welchen selbstverständlichen Schätzen wir eigentlich sitzen, die man im Zuge der eigenen Betriebsblindheit nicht mehr wahrnimmt. Durch die intensive Einbindung der Bevölkerung und durch ihre motivierende Art der Architekten, wurde In der Woche eine Energie erzeugt, die mit Sicherheit noch sehr lange anhalten wird!"

Mit der Realisierung der ersten kleineren Projekte, die während der Tage entstanden sind, wird sofort begonnen, da genug Energie in der Bevölkerung freigesetzt worden ist. Größere und langfristig konzipierte Projekte werden in weiteren Detailschritten nach demselben Muster „realisierungsfit" gemacht. Damit ist das planen für die Schublade endgültig Geschichte.

Aus den Ideen der Bevölkerung werden Szenarien entwickelt. Diese werden leicht verständlich und sehr anschaulich in Bildern dargestellt.

Nach einer offenen Diskussion haben alle Anwesenden bei einer Abstimmung über die zukünftige Entwicklung des Ortes mitzubestimmen.

HAAG 007
DIE RÜCKKEHR DES LEBENS

Referenzprojekt STADT HAAG

Stadt Haag ist eine Kleinstadt im Mostviertel in Niederösterreich mit 5000 Einwohnern. Der Gebäudeleerstand im Zentrum wird zunehmend größer. Es braucht neue Strategien für das Aussterben des Ortszentrums. Gemeinsam mit engagierten Bürgern wurde ein Entwicklungsprozess in Gang gebracht und konkrete Projekte wurden entwickelt und werden seid 2000 regelmäßig umgesetzt.

Das Ergebnis des Prozess ist ein Projekt mit dem Titel „Haag 007 – Die Rückkehr des Lebens" und besteht aus vier Modulen:

- Hauptplatzgestaltung NEU
- Sommertheater am Hauptplatz
- Hotel am Hauptplatz
- Theater mit der Ars Electronica

Daten:

- 350 m2 Nutzfläche bei Tribüne
- 2.700 m2 Hauptplatzfläche
- 0,5 Mio EUR Nettobaukosten Tribüne

Hauptplatzgestaltung Stadt Haag, Wettbewerb 2000, Siegerprojekt von noncon:form, Realisierung 2006-08

Hotel am Hauptplatz in Stadt Haag, Idee zur Neubespielung von Leerstand im Ortszentrum, derzeit in Arbeit

Tätigkeiten von noncon:form

Entwicklung:

- „nonconform vor Ort" (Moderation, Prozessleitung)
- Kommunikationsbegleitung (Symposion in Vorbereitung)

Theater:

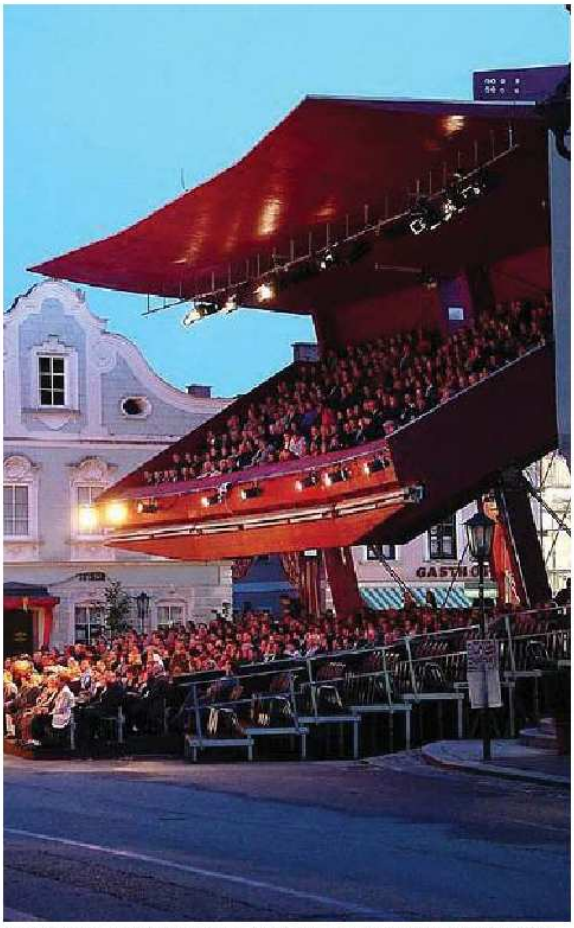
- 1.Preis Wettbewerb (1999, Realisierung 2000), Planung, Ausschreibung, künstlerische Oberleitung,

Hauptplatz:

- 1.Preis Wettbewerb (2000, Realisierung 2006-07)
- Planung, Ausschreibung, künstlerische Oberleitung,

Hotel:

- Bebauungsstudie, Abstimmung mit Tourismus- und Finanzierungsexperten, Mitglied der Projektenwicklungs ARGE



Temporäres Sommertheater, in Stadt Haag Tribünenkonstruktion von noncon:form, Siegerprojekte des Wettbewerb 1999, jährlich Aufführung seit dem Jahr 2000

WOHNEN UND ARBEITEN AUSSERHALB VON BALLUNGSZENTREN

Referenzprojekt PÖLLA

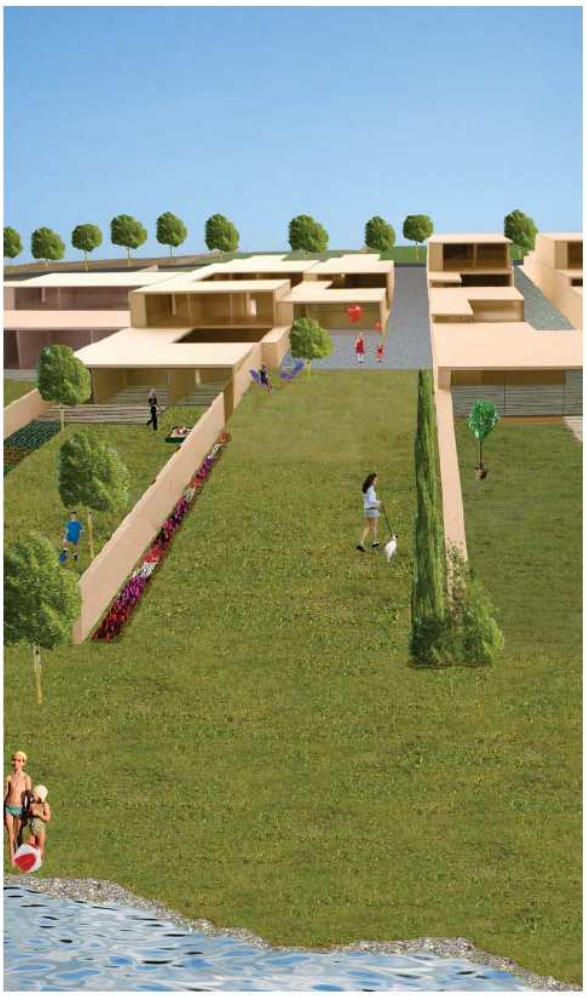
Die Waldviertler Gemeinde Pölla plant Initiativen für eine positive Gemeindeentwicklung. Im Zentrum der Überlegungen: eine Siedlungsstruktur, die als Alternative zum freistehenden Einfamilienhaus richtungweisend sein soll. Zweck des Projektes ist es, neue Zielgruppen anzusprechen, die aufgrund veränderter Arbeits- und Lebensrhythmen einen neuen Lebensmittelpunkt suchen. Die Funktionen Wohnen, Arbeiten und Freizeit vermischen sich ebenso wie ländliche und städtische Lebensmuster.

Das Ergebnis ist ein Wohnkonzept, das aus der Tradition des verdichteten Ortsverbundes von Waldviertler Gemeinden entwickelt worden ist und die Vorteile von Offenheit und Dichte vereint.

Als Zielgruppen wurden einerseits Wohnungssuchende aus der Region und andererseits Kreativschaffende in Wien definiert.

Neben der Entwicklung des Masterplanes und der Suche nach Immobilienvermittlern und Bauträgern war es wichtig, mit der Kommunikation des Projektes neue Wege zu gehen. Das bedeutet, dass Symposion und Ausstellungen zum Thema "Wohnen und Arbeiten außerhalb von Ballungszentren" sowohl in der Region als auch im Ballungsraum Wien - inmitten der Kreativwirtschaft - organisiert wurden.

Daten:
8.000 m2 Grundfläche
1.600 m2 Nutzfläche
Ca. 350.000 EUR pro Haus



Neben der Entwicklung des Masterplans für das Projekt "Wohnen und Arbeiten in Pölla" wird es auch mittels Ausstellung und Symposien kommuniziert

Das Modell:
Dunkle Baukörper = Arbeiten, Helle Bakörper = Wohnen

Modellpräsentation: V.l.n.r.: Bürgermeister Johann Müllner, Roland Gruber/noncon:form, ao.Univ.Prof. Erich Raith, Landesrat Wolfgang Sobotka

Die Besucher des Symposions "LandLuft - Wohnen und Arbeiten außerhalb von Ballungszentren" im Kultursaal Neupölla

DAS TOR ZUR DONAU

Referenzprojekt ORTH / DONAU

Orth an der Donau ist eine kleine Gemeinde mitten im Nationalpark Donau-Auen zwischen Wien und Bratislava. Sie erhält die einmalige Gelegenheit, ein Nationalpark Besucherzentrum unterzubringen. Das leerstehende, historische Habsburgerschloß, mitten im Ortszentrum wird damit mit neuem Leben gefüllt

Der Umbau des Schlosses nützt viele Synergien und setzt langfristige Impulse für das Ortszentrum, den Ort generell und die Region. Die historische Substanz wurde renoviert und die minimalen Eingriffen der Jetztzeit sind die Zeichen nach außen. Das Schloss ist nach dem Umbau mit folgenden Nutzungen gefüllt: Veranstaltungszentrum der Gemeinde, Bio-Restaurant, Tourismusinformation, Ausstellungen und Besuchertreffpunkt und Aussichtsturm, Innenhof zum spielen und verweilen.

Konzeption, Kommunikationskonzept während Bauphase, Planung, Ausschreibung, künstlerische Oberleitung, Realisierung (2003 - 2006 gemeinsam mit MAGK synn)

Die Abschlussrampen im Innenhof erfreuen sich bei der Jugend als ideales Spielobjekt

Der Aussichts- und Ausstellungsturm schließt den Hof ab. Die Sitzstufen sind ideal für Schülergruppen und Vorträge

Der Eingang zum Nationalpark- und Veranstaltungszentrum der Gemeinde Orth an der Donau beginnt mit einer dynamischen Schleife mitten am Hauptlatz des Ortes. Die Besucher werden förmlich in das Schloss geführt.

noncon:form vor Ort

nach 3 Tagen ist alles anders

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REFERENZEN

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Villa Pia, Wien (Wiener Holzbaupreis, Auszeichnung bei „Das Beste Haus")

Nationalpark Schloss Orth an der Donau: Besucher- und Veranstaltungszentrum, gemeinsam mit MAGK synn

Wählbar – temporäre Kommunikationsplattform für den Nationalratswahlkampf 2002

Ortskerngestaltung für die Stadt Haag/Niederösterreich

Strategieentwicklung zur Umnutzung einer Textilfabrik zu einer Kulturfabrik in Helfenberg/Oberösterreich

Ortskerngestaltung für Maria Saal/Kärnten

Strategieentwicklung für die Zukunft des Ortszentrums von Maria Saal/Kärnten

Hotel am Hauptplatz in Stadt Haag/Niederösterreich

Energieeffiziente Wohnbauten in Wien

Verdichtetes und energieeffizientes Wohnen in Starvanger/Norwegen

Wonderland – europäisches Architekturnetzwerkprojekt (Projektmanagement)

NONCON:FORM

Das 1999 von Roland Gruber und Peter Nageler gegründete und 2003 bzw. 2005 um die Partnerinnen Caren Ohrhallinger und Elisabeth Leitner erweiterte Unternehmen hat seinen Schwerpunkt in der Konzeption, Umsetzung und Kommunikation von zeitgenössischen Architekturprojekten im erweiterten Sinn. noncon:form ist sowohl als Ziviltechniker bei der Kammer für Architekten und Ingenieurkonsulenten als auch Gründungs- und aktives Mitglied der ig-architektur. Sie leiten einen Universitätslehrgang für Holzbaukultur und unterrichten an der Kunstuniversität Linz

Neben der klassischen Architektentätigkeit ist noncon:form in verschiedene Vortrags-, Entwicklungs- und Netzwerkprojekte involviert und stellt zum Beispiel die aktive Kernzelle des europäischen Ausstellungsprojekts WONDERLAND dar.

Die vier Partner von noncon:form haben neben ihrer klassischen Architekturausbildung auch Zusatzqualifikationen bzw. sammelten Erfahrung in den Bereichen Kultur- und Eventmanagement, Projektentwicklung, Wettbewerbsorganisation, Moderation, Seminarleitung, Jurysitzungen, Organisationsentwicklung, Prozessbegleitung sowie solares Bauen.

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Prüfkatalog zur Standortbeurteilung und Verkehrsfolgenabschätzung für verkehrsintensive Bauvorhaben

Michael M. BAIER

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1 BISHERIGE PRAXIS IN KOMMUNEN

Verkehrseffiziente Standortplanung und Ansiedlungspolitik mit dem Ziel, die durch städtebauliche Vorhaben an einem bestimmten Standort verursachten Verkehre rechtzeitig abzuschätzen und zu optimieren sowie die damit verbundenen Nutzungskonflikte so gering wie möglich zu halten ist in den meisten Kommunen bislang mehr Wunsch als Realität. In der Regel existieren weder konkrete Verfahrensweisen noch definierte Kriterien bezüglich der Anforderungen an Verkehrsgutachten für verkehrsintensive Bauvorhaben. Auf Grund der bisher fehlenden Verfahrens und Kriterienfestlegungen erfolgt häufig auch keine frühzeitige, systematische Berücksichtigung relevanter Stadtentwicklungs- und gesamtstädtischer Verkehrsplanungsaspekte.

Derartige Festlegungen erfolgen, wenn überhaupt, nur in einzelnen Fällen, etwa bei Vorhaben mit einem hohen Öffentlichkeitsinteresse und entsprechend engagiert geführten Debatten in der Politik und in den Medien. So wurden z. B. m München zur Standortfindung für das neue Fußballstadion verschiedene Beurteilungskriterien der verkehrlichen Erschließung (für den MIV einschließlich Parken, für den ÖPNV, für Fußwegeverbindungen) festgelegt, anhand derer die ebenfalls vorab ermittelten verkehrlichen Rahmenbedingungen (Kfz-Verkehrsaufkommen, Stellplatzbedarf, Fahrgastaufkommen im ÖPNV) überprüft wurden [1]. Solche Verfahrensweisen sind aber eher der Einzel als der Regelfall.

Weitergehende Ansätze bestehen derzeit z. B. in Österreich: Das Bundesland Salzburg hat in seinem aktuellen Landesmobilitätskonzept [2] die Erarbeitung einer Richtlinie für Verkehrsgutachten zu Großprojekten in das Maßnahmenprogramm aufgenommen. Ziel ist eine möglichst einheitliche Vorgehensweise bei Verkehrsgutachten, um problematische Standortentwicklungen oder gar Fehlentwicklungen zu verhindern, Maßnahmen zur Gewährleistung einer Verkehrsverträglichkeit zu ermöglichen und die Rechtssicherheit im Zusammenhang mit entsprechenden Bauvorhaben zu erhöhen. Dabei wird eine Zusammenarbeit mit den benachbarten deutschen Landkreisen Berchtesgadener Land und Traunstein angestrebt. In erster Linie soll ein einheitliches Verfahren zur Ermittlung und Beurteilung der verkehrlichen Auswirkungen von verkehrsintensiven Bauvorhaben festgelegt werden. Als Grundlage soll hierzu die neue RVS 01.02.13 [3] dienen. Damit wird im wesentlichen die Vorgehensweise zur Ermittlung des maßgeblichen Verkehrsaufkommens geplanter Nutzungen vorgegeben. Ob hiermit auch eine aktive Standortplanung möglich sein wird, bleibt abzuwarten.

Konkrete konzeptionelle Ansätze zur Steuerung stadtverträglicher und ökologisch wie ökonomisch nachhaltiger Standortplanungen existieren bislang nur in der Schweiz. Dort werden in diesem Zusammenhang einerseits Fahrleistungsmodelle, andererseits eine Fahrtenkontingentierung (Fahrtenmodelle) eingesetzt:

- Die Idee der Fahrleistungsmodelle besteht darin, für ein Gebiet maximal zulässige Fahrleistungen bzw.Fahrten im MIV festzulegen, diese regional oder lokal zu verteilen und somit besser auf Standorte abzustimmen, mit dem Ziel, die Ansiedelung von verkehrsintensiven Nutzungen an raumplanerisch erwünschten, gut erschlossenen Standorten zu ermöglichen, ohne insbesondere die Vorgaben der Luftreinhaltung zu verletzen. Hierdurch soll eine aktive Standortpolitik unterstützt werden, unter frühzeitiger Berücksichtigung von Umweltaspekten. Im Kanton Bern wurde z.B. die Entwicklung eines Fahrleistungsmodells im kantonalen Richtplan zur Raumordnung verankert und in Folge dessen ausgearbeitet [4].
- Bei Fahrtenmodellen wird bei der Bewilligung von Bauvorhaben anstatt der Stellplatzanzahl die Anzahl der höchstens zulässigen Fahrten festgelegt, um so einen direkten Einfluss auf das MIV-Aufkommen auszuüben, wobei vorhandene Kapazitätsreserven im Straßennetz und Umweltbelastungen berücksichtigt werden. Die Fahrtenkontingentierung ermöglicht der Verwaltung bereits eine Einflussnahme bei der Flächennutzungsplanung, gleichzeitig bestellt für die Bauträger eine hohe Flexibilität durch den möglichen Handel mit den Kontingenten. Beispiele lokaler

Fahrtenkontingentierungen für einzelne Einkaufszentren, Freizeiteinrichtungen usw. finden sich ebenfalls im Kanton Bern (beispielsweise in Biel/Bienne) sowie in Zürich [5], wo Fahrtenmodelle für größere Entwicklungsgebiete entwickelt wurden.

Die tatsächliche Umsetzung der Fahrleistungs- und Fahrtenmodelle und der damit verbundenen, gesetzten Ziele hängen von vielen Randbedingungen ab. Eine wesentliche Voraussetzung ist das Controlling während der Nutzungsphase realisierter Vorhaben.

2 DER BERLINER ANSATZ

Die Senatsverwaltung für Stadtentwicklung Berlin hat in ihrem integrierten Wirtschaftsverkehrskonzept [6] als einen von insgesamt fünf Handlungsbereichen die „Verkehrseffiziente Standortplanung und Ansiedlungspolitik“ identifiziert. Ziel ist. die durch Unternehmen bzw. Bauvorhaben an einem bestimmten Standort verursachten Verkehre rechtzeitig abzuschätzen und zu optimieren und die damit verbundenen Nutzungskonflikte so gering wie möglich zu halten. Als Lösungsstrategie wurde u. a. die Erarbeitung eines Prüfkatalogs zur Beurteilung der verkehrlichen Standorteignung und der Verkehrsfolgenabschätzung verkehrsintensiver Vorhaben festgelegt. Des Weiteren ist die Einführung einer regelmäßigen Verkehrsfolgenabschätzung vorgesehen. die durch den Prüfkatalog unterstützt werden soll.

Vor diesem Hintergrund wurde die BSV Büro für Stadt und Verkehrsplanung Dr.Ing. Reinhold Baier GmbH beauftragt einen entsprechenden Prüfkatalog zu erarbeiten. Dieser soll als möglichst knappes Regelwerk dazu dienen, den Standort eines geplanten Vorhabens aus verkehrlicher Sicht zu beurteilen bzw. die Anforderungen an die jeweils erforderlichen Nachweise zur Verkehrsfolgenabschätzung zu definieren sowie darüber hinaus eine standardisierte Vorgehensweise zur Überprüfung der Verkehrsfolgenabschätzung von Bauvorhaben beschreiben.

2.1 Rahmenbedingungen und Grundlagen

Voraussetzung war, dass die spezifischen Rahmenbedingungen in Berlin bezüglich der verwaltungsinternen Zuständigkeiten und Abläufe sowie der verfügbaren, gegebenenfalls notwendigen Datengrundlagen für eine Standortbeurteilung berücksichtigt werden. Deshalb erfolgte zunächst eine spezifische Analyse der bisherigen Praxis in Berlin sowie die beispielhafte Auswertung der Projektabläufe mehrerer in Planung befindlicher bzw. bereits realisierter Bauvorhaben, um eventuelle Probleme und Fragestellungen aufzuzeigen, für die Hilfestellungen in dem Prüfkatalog zu geben sind.

Zum einen zeigte sich, dass auch in Berlin die Aspekte der gesamtstädtischen Stadt und Verkehrsplanung in einem frühen Stadium der Projektentwicklung oftmals nicht berücksichtigt werden, da in der Regel von Investorenseite, soweit es sich um Fragen der verbindlichen Bauleitplanung oder der Baugenehmigung oder auch um Bauvoranfragen handelt, zunächst auf Grund der Zuständigkeiten die Ämter in den Bezirken angesprochen werden. Die Bezirksämter können, müssen sich aber keinen Rat bei der Senatsverwaltung für Stadtentwicklung einholen; hier gibt es keine vorgegebene, einheitliche Regelung bzw. Verwaltungsvereinbarung.

Zum anderen bestätigte die Auswertung der Projektabläufe, dass bei der Erstellung von Verkehrsgutachten für entsprechende Bauvorhaben keine einheitliche Vorgehensweise besteht: Die Schwerpunkte liegen in der Regel auf der Betrachtung der Anbindung Erschließung für den MTV und deren Auswirkungen auf den Verkehrsablauf im unmittelbar angrenzenden Straßennetz (Leistungsfähigkeit der Anschlussknotenpunkte und eventuell auch benachbarter Knotenpunkte) sowie im Hinblick auf die Luftschadstoff- und Lärmbelastung. Der Detaillierungsgrad der Untersuchungen und die hieraus resultierende Aussagentiefe ist dabei projektbezogen durchaus unterschiedlich und hängt vom Standort und den hiermit oftmals verbundenen Anforderungen seitens der Verwaltung ab, die jedoch auf Grund fehlender, definierter Kriterien im jeweiligen Fall individuell festgelegt werden.

2.2 Typisierung verkehrsintensiver Bauvorhaben

Da in Abhängigkeit der Charakteristika eines geplanten Bauvorhabens (Nutzungsstruktur, Einzugsgebiet. erwartetes Kunden und Besucheraufkommen usw.) durchaus unterschiedliche Ausprägungen der Verkehrsfolgen. z. B. hinsichtlich des hiervon betroffenen Straßennetzes. zu erwarten sind. wurden in einem ersten Schritt mögliche Vorhabenstypen definiert. Dies erfolgte u. a. in Anlehnung an bereits vorliegende Typisierungen von Einzelhandels und Freizeiteinrichtungen [7].

Vorhabenstyp	Charakteristika			
	Nutzungsstruktur	Kunden-/Besucher-aufkommen, Beschäftigtenzahl	Einzugsgebiet	Verkehrsmittelwahl (Kunden-/Besucher-verkehr)
Typ 1 Fachmarkt (mit spezifischem Warensortiment), Discounter	Einzelhandel Gesamtfläche: > 700 m², üblich 3.0005.000 m² (ggf.bis 15.000 m²)	Kunden/Besucher: < 5.000 pro Tag, bei großen Einrichtungen ggf. auch mehr Beschäftigte: < 100	ausschließlich bzw. überwiegende Nah-versorgung (< 5 km)	mittlerer MIV-Anteil (40-60 %), ggf. auch höher
Typ 2 Fachmarktzentrum (z. B. Bau- und Gartenmarkt, Möbelhäuser)	Einzelhandel, ggf. mit angeschlossener Gastronomie Gesamtfläche: > 20.000 m² (ggf. auch mehr)	Kunden/Besucher: 3.000-20.000 pro Tag, ggf. auch mehr Beschäftigte: 100-400	Bezirk, z. T. auch benachbarte Bezirke (5-15 km, ggf. mehr)	mittlerer bis hoher MIV-Anteil (50-100 %)
Typ 3 MultiCenter (z. B. Shopping Mall)	Einzelhandel, Dienstleistung, Büro, Gastronomie, Kino usw. Gesamtfläche: > 50 000 m²	Kunden/Besucher: > 30.000 pro Tag Beschäftigte: > 1.000	Berlin gesamt bzw. regional bis überregional	geringer bis mittlerer MIVAnteil (30-60 %), für einzelne Einrichtungen auch höher
Typ 4 Office-Center (z. B. Büropark), Business-Center (z. B. Gewerbepark)	publikumsorientierte Dienstleistung, unternehmensorientierte Dienstleistung, ggf. mit High-Tech-Produktion Gesamtfläche: >5ha	Kunden/Besucher: meist gering Beschäftigte: > 2.000, bei großen Büroparks auch deutlich mehr	Berlin gesamt bzw. regional bis überregional	geringer bis hoher MIV-Anteil (30-90 %), abhängig vom Standort
Typ 5 EventCenter (z. B. Musical-Theater, Sportarena)	Freizeiteinrichtung mit angeschlossener Gastronomie,... Gesamtfläche: von Nutzungsart abhängig	Kunden/Besucher: > 10.000 pro Tag. ggf. mit ausgeprägten Tagesspitzen Beschäftigte: < 200 (ggf. mehr)	Berlin gesamt bzw. regional bis überregional	geringer MIV-Anteil (20-30 %), ggf. hohes Reisebusaufkommen
Typ 6 Logistikzentrum (z. B. Güterverteilzentrum)	Transportgewerbe-anlage Gesamtfläche: von Nutzungsart abhängig	Kunden/Besucher: gering Beschäftigte: von Nutzungsart abhängig	Berlin gesamt bzw. regional bis überregional	hoher MIV-Anteil (90-100 %), Kunden-/Besucher-aufkommen aber vernachlässigbar

Tabelle 1: Definition von Vorhabenstypen

Im Ergebnis wurden sechs Vorhabenstypen definiert: diese sind in Tabelle 1 mit ihren jeweiligen Charakteristika beschrieben. Die Typisierung dient der groben Einordnung eines geplanten Bauvorhabens, dabei können die genannten Werte in Abhängigkeit der jeweiligen Nutzungsstruktur und auch des Standorts im Einzelfall durchaus abweichen. Eventuelle Abweichungen sind bei der Verkehrsfolgenabschätzung zu berücksichtigen.

2.3 Aufbau und Inhalt des Prüfkatalogs

Der Prüfkatalog bezeiht sich auf die Planungs-, die Bau- und die Nutzungsphase eines Vorhabens.

2.3.1 Prüfung in der Planungsphase

Die Prüfung in der Planungsphase ist zweistufig angelegt:

- Die 1. Stufe dient der Vorhabenstypisierung anhand spezifischer Charakteristika wie Nutzungsstruktur und Einzugsgebiet (vgl. Tabelle 1) für eine erste grobe Einordnung des geplanten Bauvorhabens im Hinblick auf die qualitative Beurteilung der Standorteignung aus verkehrlicher Sicht. Diese Beurteilung bezieht sich auf die Qualität des Kfz-Verkehrsablaufs, die Luftschadstoff und Lärmbelastung auf Grund des Kfz-Verkehrs, die Erschließungs- und Bedienungsqualität im ÖPNV sowie die Verkehrssicherheit im angrenzenden Straßennetz.
- Die 2. Stufe dient der Überprüfung vorgelegter Verkehrsgutachten und der hierin enthaltenen Nachweise zur Verkehrsfolgenabschätzung im Hinblick auf Vollständigkeit, Detaillierungsgrad und Aussagequalität. Hierzu werden nach Vorhabenstypen differenzierte Prüfwerte zur Ermittlung von Verkehrsaufkommen und Verkehrsmittelwahl oder auch der Bemessungsverkehrsstärke usw. angegeben.

Für die qualitative Beurteilung der Standorteignung eines geplanten Bauvorhabens in der 1. Stufe wird auf vorhandene Analysedaten und Informationen aus anderen Fragestellungen zurückgegriffen (z. B. den Umweltatlas Berlin). In Abhängigkeit davon können

- die verkehrliche Problemträchtigkeit und daraus abgeleitet die grundsätzliche Standorteignung beurteilt werden,
- die Anforderungen an Art und Umfang der detaillierten Untersuchungen im Rahmen der zu erstellenden Verkehrsgutachten, z. B. im Hinblick auf die räumliche Ausdehnung des Untersuchungsbereichs, festgelegt werden und
- der weitere Abstimmungsbedarf festgelegt werden sowie auch
- zugehörige Handlungsnotwendigkeiten und eventuell notwendige flankierende Maßnahmen (z. B. hinsichtlich Vermeidung zusätzlicher Lärm und/oder Luftschadstoffbelastung, Gewährleistung einer Mindestqualität des Kfz-Verkehrsablaufs) abgeleitet werden.

Die Überprüfung in der 2. Stufe erfolgt dann u. a. hinsichtlich

- Verkehrsaufkommen (Verkehrserzeugung und Verkehrsmittelwahl),
- Erschließungskonzeption für den Kfz-Verkehr (äußere und innere Erschließung, einschließlich des Schwerverkehrs z. B. für Anlieferung/Entsorgung), für den ÖPNV, für den Rad und Fußgängerverkehr.
- Stellplatzangebot,
- Luftschadstoff und Lärmbelastung im betroffenen Straßennetz und auf dem Vorhabensgebiet.

Zu den diesbezüglichen Prüffragen und definierten Anforderungen sind in mehreren Anlagen entsprechende Prüfwerte angegeben. Diese wurden auf der Grundlage von Regelwerken wie den neuen Hinweisen zur Schätzung des Verkehrsaufkommens von Gebietstypen [8], Angaben aus der Literatur, z. B. [9], sowie aus Erfahrungswerten aus den von der BSV Büro für Stadt und Verkehrsplanung Dr.Ing. Reinhold Baier GmbH erstellten Standortgutachten und bearbeiteten Planungsprojekten für verschiedene städtebauliche Großvorhaben (zu nennen sind hier u. a. MediaPark Köln. Neue Mitte Oberhausen. Europaviertel Frankfurt am Main. ICE-Terminal Köln-Deutz/Messe) abgeleitet. Die Prüfwerte sind teilweise ergänzend kommentiert.

2.3.2 Prüfung während der Bauphase

Die Prüffragen und definierten Anforderungen für die Bauphase beziehen sich auf die Abwicklung des Kfz-Verkehrs, des ÖPNV und des Rad und Fußgängerverkehrs. Hierbei erfolgt keine Differenzierung nach den Vorhabenstypen.

2.3.3 Prüfung nach Realisierung (Nutzungsphase)

Während der Nutzung der realisierten Einrichtung sollte im Sinne eines Controllings die Überprüfung der in der Planungsphase ermittelten Entscheidungsgrundlagen erfolgen. Folgende Aspekte sollten, in jeweils vorhabensspezifisch festzulegendem Turnus, betrachtet werden:

- Kfz-Verkehrsbelastungen im relevanten, maßgeblich betroffenen Straßennetz (Ermittlung der tatsächlichen Verkehrsqualitäten),
- Auslastung der gebauten bzw. in Anspruch genommenen Stellplätze (Ermittlung der tatsächlichen Parkraumnachfrage),
- Umweltbelastungen im relevanten, maßgeblich betroffenen Straßennetz (Ermittlung der tatsächlichen Luftschadstoff- und Lärmbelastungen),
- Verkehrssicherheit im relevanten, maßgeblich betroffenen Straßennetz (Ermittlung des tatsächlichen Unfallgeschehens).

Die hieraus gewonnenen Erkenntnisse sollten zur Erweiterung bzw. Konkretisierung der Prüfwerte herangezogen werden.

3 FAZIT

Die bisher erfolgte, exemplarische Anwendung des Prüfkatalogs zeigt, dass dieser eine standardisierte Überprüfung vorgelegter Gutachten zur Verkehrsfolgenabschätzung von Bauvorhaben und deren Ergebnisse auf Vollständigkeit, Detaillierungsgrad und Aussagequalität ermöglicht. Des Weiteren erlaubt der Prüfkatalog, den Standort eines geplanten Vorhabens aus verkehrlicher Sicht zu beurteilen bzw. die Anforderungen an die jeweils erforderlichen Nachweise zur Verkehrsfolgenabschätzung bereits frühzeitig festzulegen. Dadurch kann die gewünschte Verzahnung von Stadtentwicklungs-, Wirtschafts- und Umweltplanungen mit der Verkehrsplanung sichergestellt werden. Der Prüfkatalog stellt somit eine ideale Arbeitshilfe für die Verwaltung dar.

Ergänzend zu dem Prüfkatalog für die Verwaltung wurde hierauf aufbauend auch ein Anforderungskatalog für Verkehrsgutachten abgeleitet. Dieser soll Investoren bzw. deren Gutachtern als Arbeitshilfe dienen und somit zu einer Qualitätssicherung beitragen.

4 LITERATUR

1 Standortüberprüfung für ein neues Fußballstadion. Referat für Stadtentwicklung und Bauordnung der Landeshauptstadt München, Hauptabteilung I: Stadtentwicklungsplanung, München 2002

2 Mobilität mit Qualität Salzburger Landesmobilitätskonzept 20062015. Land Salzburg. Fachabteilung 67: Verkehrsplanung. Salzburg 2006

3 RVS 02.01.13 (Verkehrsplanung, Grundlagen, Verkehrsuntersuchungen): Verkehrserzeugung von Einkaufszentren und Multifunktionalen Zentren, Österreichische Forschungsgemeinschaft Straße, Schiene und Verkehr, Wien 2006

4 Richtplan Kanton Bern 2002 und Berner Fahrleistungsmodell (Grundlagen und Anwendung, Amt für Gemeinden und Raumordnung des Kantons Bern, Abteilung Kantonsplanung, Bern 2002/2005

5 Leitfaden Fahrtenmodell, Tiefbauamt der Stadt Zürich. Verkehrsplanung, und Umwelt und Gesundheitsschutz der Stadt Zürich. Umweltschutzfachstelle, Zürich 2006

6 Integriertes Wirtschaftsverkehrskonzept Berlin. Senatsverwaltung für Stadtentwicklung der Bundeshauptstadt Berlin. Berlin 2005

7 Arbeitspapier Nr. 49: Verkehrliche Wirkungen von Großeinrichtungen des Handels und der Freizeit. Ausgabe 1999, Forschungsgesellschaft für Straßen und Verkehrswesen, Köln 1999

8 Hinweise zur Schätzung des Verkehrsaufkommens von Gebietstypen, Ausgabe 2006, Forschungsgesellschaft für Straßen und Verkehrswesen, Köln 2006

9 Integration von Verkehrsplanung und räumlicher Planung, Teil 2: Abschätzung der Verkehrserzeugung durch Vorhaben der Bauleitplanung. Schriftenreihe der Hessischen Straßen und Verkehrsverwaltung. Heft 42 (Teil 2), Ausgabe 2000, Nachdruck 2005, Hessisches Landesamt für Straßen und Verkehrswesen, Wiesbaden 2000/2005

Walking –der unterschätzte Mode in Planung & Stadtraum. Planen ist nicht genug – Strategien zur Qualitätsverbesserungen der Bedingungen für Fußgängerinnen und Fußgänger und der Aufenthaltsqualität im öffentlichen Raum

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1 DIE PLATTFORM – VORHABEN VON WALK-SPACE.AT – DEM ÖSTERREICHISCHEN VEREIN FÜR FUSSGÄNGERINNEN

Planen ist nicht genug – der Fußgängerbereich mit seinen Umsetzungsdefiziten im Qualitätsbereich ist dafür ein gutes Beispiel. Die Vereinsarbeit stellt ein strategisches Projekt für sich selbst dar.
walk-space.at – der Österreichische Verein für Fußgängerinnen und Fußgänger wurde als gemeinnütziger, nicht gewinnorientierter Verein gegründet, um die Interessen der Fußgängerinnen und Fußgänger in Österreich zu vertreten: das „zu Fuß gehen" als integrierter Bestandteil des Gesamtverkehrs soll jene Wichtigkeit erlangen, die in einer mobilen Gesellschaft notwendig ist.
Gehen bewegt Österreich – beginnend bei den übergeordneten Entwicklungen, wie Klimawandel und Temperaturanstieg bis zu den Details an Kreuzungen, den bestehenden Querungsbedürfnissen, den Wartezeiten an Fußgängerampeln, dem Wunsch nach guten Netzen für Fußgängerinnen und Fußgänger, der Berücksichtigung der Umwegempfindlichkeit derselben bis zu dem Wunsch nach Qualitäten im öffentlichen Raum für die Bewohner der Städte und Gemeinden.
Das Vorbild dabei ist: Fussverkehr Schweiz (www.fussverkehr.ch).

1.1 Die konkreten Ziele von walk-space.at, dem österreichischen Verein für Fußgängerinnen und Fußgänger, sind zusammengefasst:

- Aufzeigen und promoten von guten Lösungen und Angeboten
- Qualitätsverbesserungen im öffentlichen Raum, speziell für Kinder, ältere Menschen und mobilitätseingeschränkte Personen
- Durchsetzung wirksamer Rechtsgrundlagen für Fuß- und Wanderwegenetze
- alltagstaugliche Gestaltungen der öffentlichen Räume
- Umsetzung der internationalen Charta für das Gehen im Sinne einer „inklusiven Mobilität", welche das zu Fuß gehen als bedeutsame Fortbewegungsform einschließt und lebenswerte Straßenräume schafft (http://www.walk21.com/charter/default.asp)
- Förderung der qualitätsvollen Planung, Schaffung und Erhaltung von Fußwegenetzen und Fußgängeranlagen - **Lobbyarbeit**
- bestehende Lücken im Bereich der transnationalen Information und des Austausches durch internationalen Erfahrungstransfer und durch verstärktes Einklinken in internationale Netzwerke schließen - **Vernetzung**
- walk-space.at agiert als **Kompetenzzentrum**, Know-how-träger sowie Anwalt für Fußgängerinnen und Fußgänger, ist parteipolitisch und konfessionell neutral, die Tätigkeit ist nicht auf Gewinn gerichtet.

1.2 Die Argumente:

Es braucht generell ein Umdenken aller Akteure – einen Wandel in den Köpfen:

- Der Rahmen: die Temperaturen steigen: +6,4 Grad bis 2100, Stichwort Klimawandel, wo ist der
- Winter hin?
- Es braucht Angebote zur „inkludierten Mobilität" aller Modes (Fuß, Rad, öffentlicher Verkehr,
- Individualverkehr
- mit begleitender Öffentlichkeitsarbeit: Fuß, Rad, Öffentlicher Verkehr, Individualverkehr – dies
- ändert das Verhalten der Verkehrsteilnehmer
- ein konkretes Programm dazu im Sinne eines „Masterplan Fußverkehr für Österreich"

1.3 Warum Qualitätsverbesserungen für Fußgängerinnen, Fußgänger und öffentliche Räume:

- Ziel ist der intelligente multimodale Benützer
- Fußgänger als gleichberechtigte Verkehrsteilnehmer - nicht als Störfaktor
- Wir wollen gute Lösungen & Ansätze sammeln und promoten
- Verkehrsverhalten ist primär Sozialverhalten

- Der Verkehr ist zu 80% Nahmobilität – besonders hier braucht es auch Verbesserungen für
- Fußgängerinnen und Fußgänger
- Ein Stadtumbau mit Qualitäten im öffentlichen Raum stärkt die Nahversorgung & die regionale
- Wirtschaft & schafft Jobs im jeweiligen Siedlungsbereich
- Die soziale und gesundheitliche Komponente: Qualitäten im öffentliche Raum ermuntern nach
- draußen zu gehen (Kommunikation ist physische Training, Bewegung ist körperliches Training)
- Lebenswerter Straßenraum reduziert den Wunsch, unbedingt woanders etwas machen zu wollen
- Die Raumstruktur am Anfang und am Ende der Wegekette ist entscheidend (Wohnen, Arbeiten,
- Einkaufen, öffentliche Einrichtungen, …)
- Qualitätsverbesserungen im Öffentlichen Raum sind besonders für eine kinderfreundliche
- Umgebung, Qualitäten für altere Menschen und mobilitätseingeschränkte Personen bedeutsam. Die
- Älteren – sie werden stark zunehmen - nur 10% davon werden gesund und fit sein.

1.4 Trends:

- Internationale und auch nationale Beispiele zeigen, bei geschickter Öffentlichkeitsarbeit lassen sich
- mit dem Thema lebenswerte Straßenräume Wahlen gewinnen – die Menschen honorieren das!
- Verkehrsstruktur und Qualitäten wirken auf das Verhalten, auf die Wahl der Modes
- Seniorinnen und Senioren lassen sich ungern als solche ansprechen – daher sind jetzt schon für die zukünftigen
- Älteren geeignete Angebote zu schaffen
- Derzeit zeigt sich oftmals ein Mobilitätsverzicht bei Älteren mangels Sicherheitsgefühl
- Die multimodale Nutzung in urbanen Räumen nimmt zu, wenn ein geeignetes Angebot vorhanden
- ist
- Der Fußgänger ist Kunde in Geschäften – ein bisher unterschätzter Faktor!
- Je besser die Qualität des Weges, desto kürzer wird subjektiv die Distanz empfunden
- Der demografischer Wandel bringt einen raschen Zuwachs der 50+
- Selbst auf Stadtteilebene existiert ein Nebeneinander von Schrumpfung – Wachstum, mit
- zunehmende Polarisierung
- Vereinzelungseffekte sind zunehmend feststellbar
- Suburbanisierung auch für Arbeitsbevölkerung und Freizeiteinrichtungen feststellbar
- Allgemein zunehmender Pendelverkehr
- Für Stadtentwicklungsplanung / Regionalplanung ist eine Koordination notwendig
- Ein aktives Mobilitätsmanagement mit Infrastrukturausbau guter Organisation und Information
- kann Verbesserungen bewirken.

2 DIE VORHABEN IM ÜBERBLICK:

2.1 Kompetenzzentrum:

Grundlagenarbeit, Recherche, Dokumentation, Archivierung von themenbezogenem Datenmaterial, Pressearbeit, Beratung / Infoline und Lobbyarbeit für die Anliegen der Fußgängerinnen und Fußgänger, Aufbau einer Fachbibliothek, Interpretation: Analyse für Fachstellungnahmen.

2.2 Austausch und internationale Kooperationen:

- Vernetzungstreffen der relevanten Akteure in Österreich
- Pro Jahr werden 3 Vernetzungstreffen an wechselnden Orten stattfinden.
- Ein erstes Vernetzungstreffen hat es am 21.2.2007 in Wien gegeben. Für Mai / Juni 2005 ist das nächste in Kärnten geplant.
- Vortrags- und Fachtagungsteilnahme in Österreich
- Internationale Tagungsteilnahme, Repräsentanz, Know-How-Transfer

2.3 Projekt „Gute Lösungen für Fußgängerinnen und Fußgänger in den Städten und Gemeinden Österreichs“ und zum walk-space- award 2008

walk-space.at sucht die besten realisierten Lösungen für Fußgänger und Fußgängerinnen und zur Qualitätsverbesserung im öffentlichen Raum und in den Städten und Gemeinden Österreichs. Die besten

Projekte werden gesammelt und auf der walk-space.at-homepage vorgestellt. Zusätzlich ist angepeilt, die besten Lösungen im Frühjahr 2008 in einer Ausstellung zu präsentieren und im Anschluss daran mit dem walk-space-award zu prämieren. Die Jury wird aus namhaften Vertretern und Vertreterinnen des Verkehrs- und Mobilitätsbereichs (PraktikerInnen, WissenschafterInnen, VertreterInnen aus der Verwaltung) bestehen. Bitte senden Sie ein qualitätsvolles, gelungenes Projektbeispiel aus ihrer Gemeinde oder Stadt bis zum 30.11.2007 an office@walk-space.at.
Inhalt: Kurze Projektbeschreibung 1 Seite DIN A4, ein - zwei Bilder welche die Situation jeweils vorher und nachher zeigen sowie einen kleinen Plan, Ansprechperson, e-mail-Kontakt oder Homepage,
Format: Text word-Datei und Bilder, Plan im jpg-Format.
In Zusammenarbeit mit dem Österreichischen Städtebund

2.4 Öffentlichkeitsarbeit:

- Herausgabe des elektronischer Newsletter walk-space.at
  Erscheint vieteljährlich mit den Hauptzielgruppen: Institutionen, Verwaltungen, Kommunen & Städte, Planerinnen und Planer & interessierte Öffentlichkeit und Bürgerinnen und Bürger ist Teil des Services für die Mitglieder von walk-space.at.
- Pressearbeit vor allem zu Projekten, Vorhaben, und Bewusstseinsbildung
- Homepage **www.walk-space.at**
  Der Inhalt ist gegliedert nach: AKTUELL, WISSEN, PROJEKTE & HINWEISE (Veranstaltungen, internationale Partner, etc.).
  Die Homepage wird unter anderem für Forschung und Wissenschaft die Möglichkeit geben, „Abstracts“ zum Thema zu „posten“. An einer Linksammlung wird schon gearbeitet.
  Diesbezüglich sind Sie herzlich eingeladen, Ihre Veranstaltung oder Ihre Forschungsergebnisse (Abstracts) an office@walk-space.at übermitteln.

2.5 Walk-space.at – Fachtagung Fußgänger in Österreich: geplant für 2008.

2.6 Siehe dazu Ankündigungen in späteren Newslettern bzw. unter www.walk-space.at. Interessierte Personen, die zu diesem Thema Beiträge liefern möchten, sind eingeladen Ihre Vorstellungen an fachtagung@walk-space.at zu übersenden.

3 UNTERSTÜTZENDE MITGLIEDSCHAFT UND BEITRAG ZUM AUFBAU DER INSTITUTION:

walk-space.at kann sich nur in dem Umfang für die Belange der Fußgängerinnen und Fußgänger einsetzen, wie Ideen und vor allem auch tatkräftige Unterstützung in ihn eingebracht werden: Sei es aus dem Kreis der Mitglieder oder von allen, die in diesem Bereich etwas in Bewegung bringen möchten.
Wenn Sie Hinweise oder Fragen haben, Informationen wünschen oder Ihre Mitarbeit anbieten wollen, nehmen Sie bitte Kontakt mit uns auf: office@walk-space.at . Natürlich können Sie bei uns auch Mitglied werden:
Die Einzelmitgliedschaft – auch für Schülerinnen, Schüler, Studierende, Paare und Familien, Kollektivmitgliedschaft (Firmen, Vereine) oder Fördermitgliedschaft unterstützt den Verein und dessen Aufbau, ermöglicht den Bezug des elektronischen Newsletters, bietet Infoservice zu Veranstaltungen und eine Erstberatung zu fußgängerrelevanten Fragen.
Speziell für Gemeinden und Städte gibt es ein Angebot in Form einer Institutionenmitgliedschaft (inkludiert Newsletter vierteljährlich, Erstgespräch für einen möglichen Fußgänger-Check, Strategieberatung, Ermäßigungen, Möglichkeit, sich bei walk-space.at Veranstaltungen zu beteiligen bzw. im Newsletter Projekte vorzustellen). Details dazu und zum Beitritt siehe www.walk-space.at.

4 INTERNATIONALES - BERICHT VON DER WALK21 – KONFERENZ IN MELBOURNE

Die siebente internationale Konferenz fürs gehen und lebenswerte Nachbarschaften vom 23. bis 25. Oktober 2006 in Melbourne und die Vorkonferenz in Sydney brachten eine Fülle an Wissen und Know-How - in Vortragsform und mittels „Walkshops” – Workshops in gehender Form - unter dem Motto:

- „Making it possible“,
- “Making the Choice“,
- „Making the case & making it happen“.

Die einzelnen Beiträge sind unter www.walk21.com abrufbar.

4.1 Strategieebene

Die Strategieebene betreffend sind bei der Pre-Conference in Sydney und der Hauptkonferenz unter anderem fürs zu Fuß gehen als bedeutsam genannt worden:

- Gehen ist Vergnügen & Notwendigkeit
- Fairer Zugang zum öffentlichen Raum für alle
- Physische Aktivitäten sind vor allem durch ein Netz an Parks & öffentlichen Räumen sowie einem qualitätsvollen Fußwegenetz erreichbar
- Die Fußwege sollen v.a. auch bei Planungen die Attraktionen verbinden
- Besonders für ältere Menschen gilt es ein Design zu entwickeln, das ihnen entspricht - Entfernungen sind besonders zu berücksichtigen
- Es geht darum, „open-entry-shops“ zu schaffen, besonders viele kleine Geschäfte
- Es gibt eine umfassende Beziehung zwischen gut designtem öffentlichen Raum und dem Gehen

- Sitzgelegenheiten im Freien, Coffe-shop-strategie
- Humanisierung von Straßen
- Dialog „Professionals“ und Nutzer / „Lokales Know-How“
- Soziale Interaktion durch Umgebungsqualität
- Ampeln: Rundum grün für Fußgänger
- Das Angebot wirkt auf Wahl des „Modes“
- Komfort: einladend, rasten möglich, Vergnügen
- Funktionswandel der Straße: wie Park


- Plätze machen – nicht Pläne
- Die Welt braucht weniger Verkehrs- mehr Transportplaner.

In Sydney hat die Stadtplanung besonders Walking-Gruppen unterstützt, welche ein dichtes Netz an urbanen Wanderwegen mit einem ausgeklügelten Beschilderung- und Markierungssystem samt Plänen versehen haben. Es geht um die „tägliche Reise“ mit hoher Erlebnis- und Aufenthaltsqualität.



4.2 Barometer, Barrieren, Wünsche

Interessant war auch eine Einschätzungsumfrage unter Experten weltweit zu Trends im Verhalten / Motive fürs Gehen in den letzten 10 Jahren:

- Gesundheit: +65%
- Qualität des öffentlichen Raumes: +45%
- Vergnügen. + 38%
- Besonders Fußwege der Männer, Schüler und zur Arbeit gehen zurück

Besonders attraktive Straßenräume machen einen hohen Anteil bei diesem „Barometer“ aus: 62%.
Es braucht vor allem:

- Information,
- lokale Strategien,
- Kampagnien,
- Aufmerksamkeit für das Thema.

Barrieren fürs zu Fuß gehen stellen beispielsweise die Angst der Eltern, persönliche Sicherheitsgefühle, eine Pro-Autopolitk sowie Gefahren und Sicherheitsfragen dar.
Entscheidend ist es, ob es gelingt den politischen Willen für:

- Geschwindigkeitsreduktionen
- Qualitätsvolle Öffentliche Räume
- mehr Platz
- Fußgängervorrangzonen / Begegnungszonen

zu gewinnen.
Die Wünsche der Menschen gehen jedenfalls in Richtung „Transformation der Straßen“ im Sinne einer „inkludierten Umwelt eines inkludierten öffentlichen Raumes“.

In Melbourne selbst ist es gelungen durch Attraktivierung des Zentrums mit Pflasterung, Baumpflanzungen, Beleuchtung, Verdreifachung der Anzahl der Cafes, Verandas, Gestaltung von Plätzen, Straßenbahn- und Busstationen und der angrenzenden Bereiche die Fußgängeranzahl in 10 Jahren zu verdoppeln.

4.3 Monitoring System

Besonders interessant ist auch das Melbourne Pedestrian Monitoring System, welches den Heartbeat der Stadt 24 Stunden am Tag mittels Infrarotcameras an 8 Stellen misst. So passieren täglich ca. 60.000 Menschen das Trottoir vor dem Rathaus, 700.000 Menschen gehen in der City täglich zu Fuß.
http://www.melbourne.vic.gov.au/info.cfm?top=91&pg=2297#pedestrian

4.4 Promoten

Aktionismus in positiver Art trägt zum Promoten des Anliegens bei – so hat am 29.10.2006 in Sydney der 7 Bridges-walk stattgefunden.
www.walktober.com.au

4.5 Charta

Die Charta fürs Zu Fuß gehen finden Sie unter:
http://www.walk21.com/papers/International%20Charter%20for%20Walking.pdf

- Unterschreiben Sie die Charta,
- schenken Sie Sie Ihren Freunden,
- gehen Sie 10.000 Schritte am Tag,
- werden Sie walk-space.at – Mitglied!

Links zum Beitrag:
http://www.walk21.com/conferences/melbourne.asp

walk-space.at
Der Österreichische Verein
für FußgängerInnen

www.walk-space.at