FP 7 Research Project

SUME
Sustainable Urban Metabolism for Europe
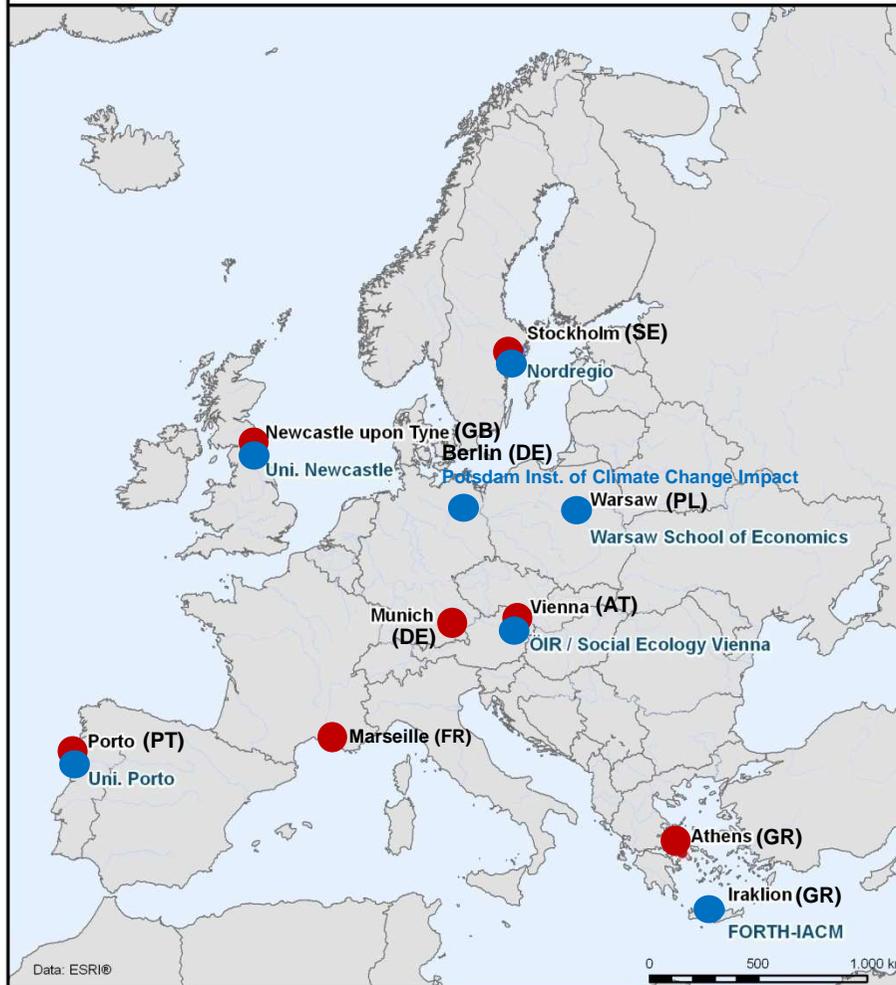
Ursula Mollay, Barbara Saringer-Bory

May 18th, 2011

Essen, Germany
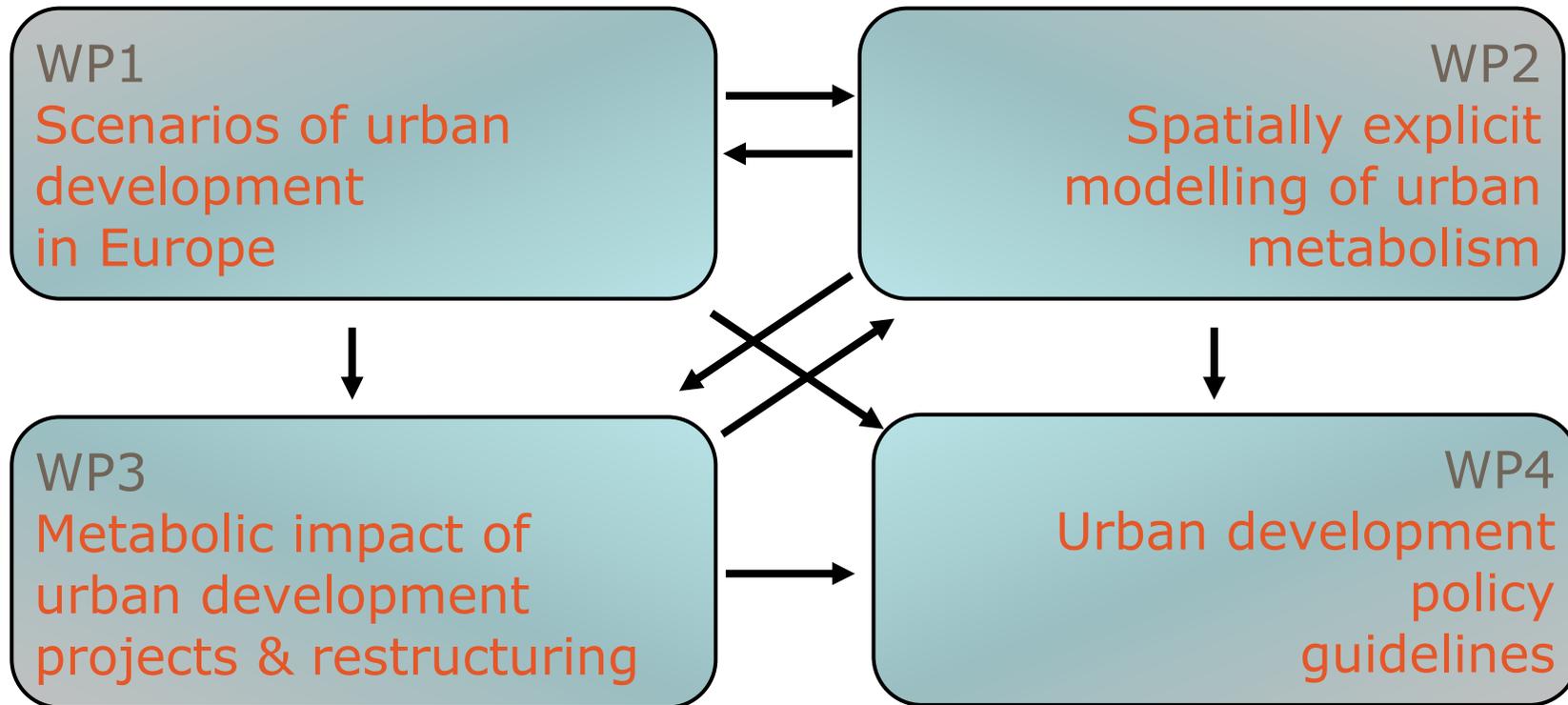
SUME Project Partners & Case study cities

Stockholm (SE)
Nordregio

Newcastle upon Tyne (GB)
Uni. Newcastle
Berlin (DE)
Potsdam Inst. of Climate Change Impact
Warsaw (PL)
Warsaw School of Economics

Munich (DE)
Vienna (AT)
ÖIR / Social Ecology Vienna

Porto (PT)
Uni. Porto
Marseille (FR)

Athens (GR)
Iraklion (GR)
FORTH-IACM

Data: ESRI®

500   1.000 km

● Scenario Cities (Countries)

● SUME Project Partner

ÖIR
Austrian Institute for Regional
Studies and Spatial Planning
Project co-ordinator

Citta
FEUP

Newcastle University

P I K

SZKOLA GLOWNA HANDLOWA W WARSZAWIE

TUDelft Delft University of Technology

social ecology vienna iff

FORTH
Foundation for Research & Technology, Hellas

NORDREGIO
Nordic Centre for Spatial Development

INSTITUTE OF AUTOMATION
CHINESE ACADEMY OF SCIENCES

SUME – project: Workpackages

WP1
Scenarios of urban development in Europe

WP2
Spatially explicit modelling of urban metabolism

WP3
Metabolic impact of urban development projects & restructuring

WP4
Urban development policy guidelines

SUME scenario approach

Urban development scenarios 2050: Inputs and guiding principles

- Spatial development paths for different cities, 2000 – 2050

- Main drivers:
  population and job change (projections), development of living space per capita

- Spatial disaggregation level (ca. 150-700 cells)

- Inputs:
  Land use, densities and building typologies, protected areas and restrictions, infrastructure plans, larger development projects, development plans
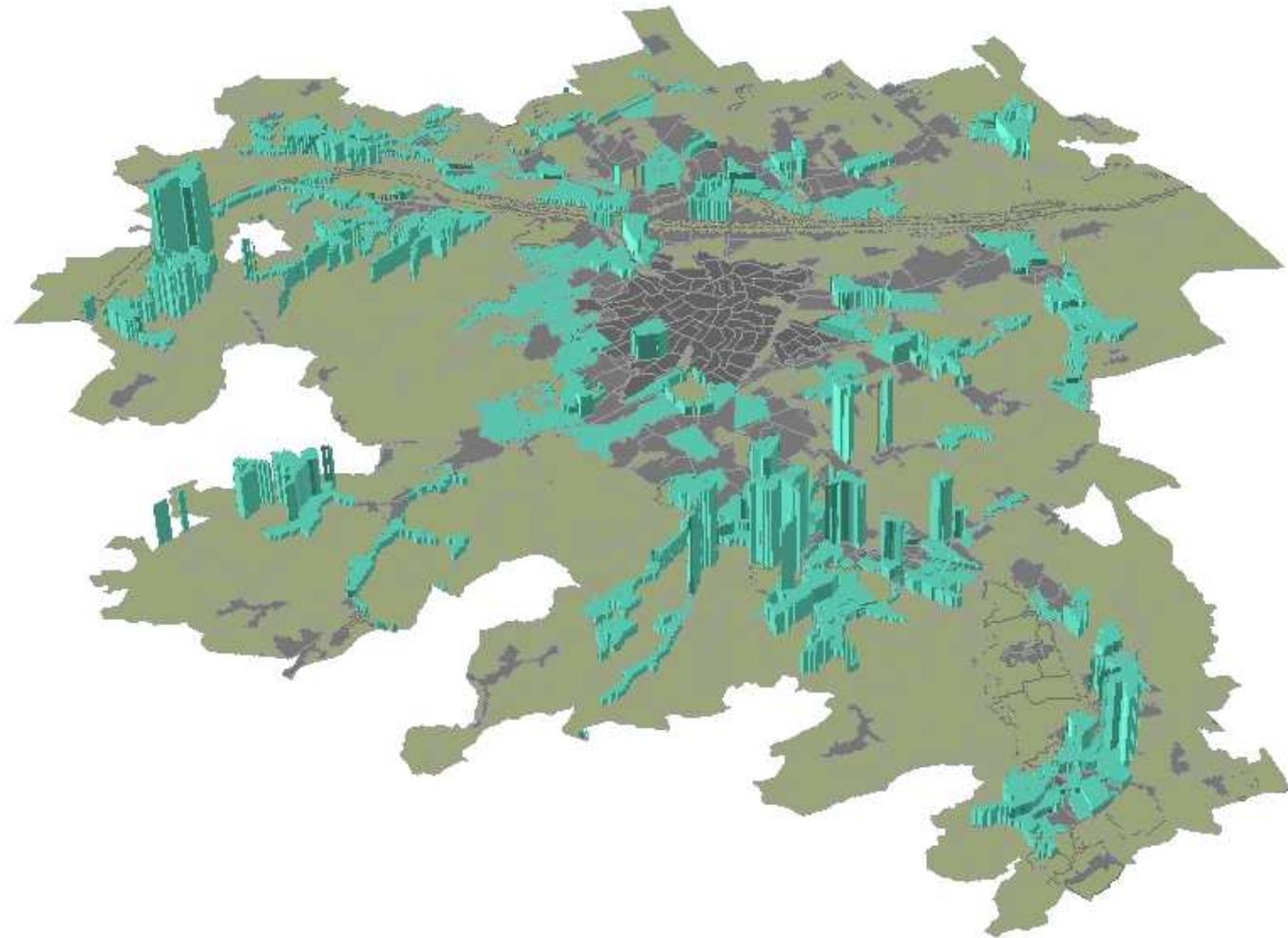
Example Vienna:
Scenario building process

Short-medium term projects
(according to urban development plans)
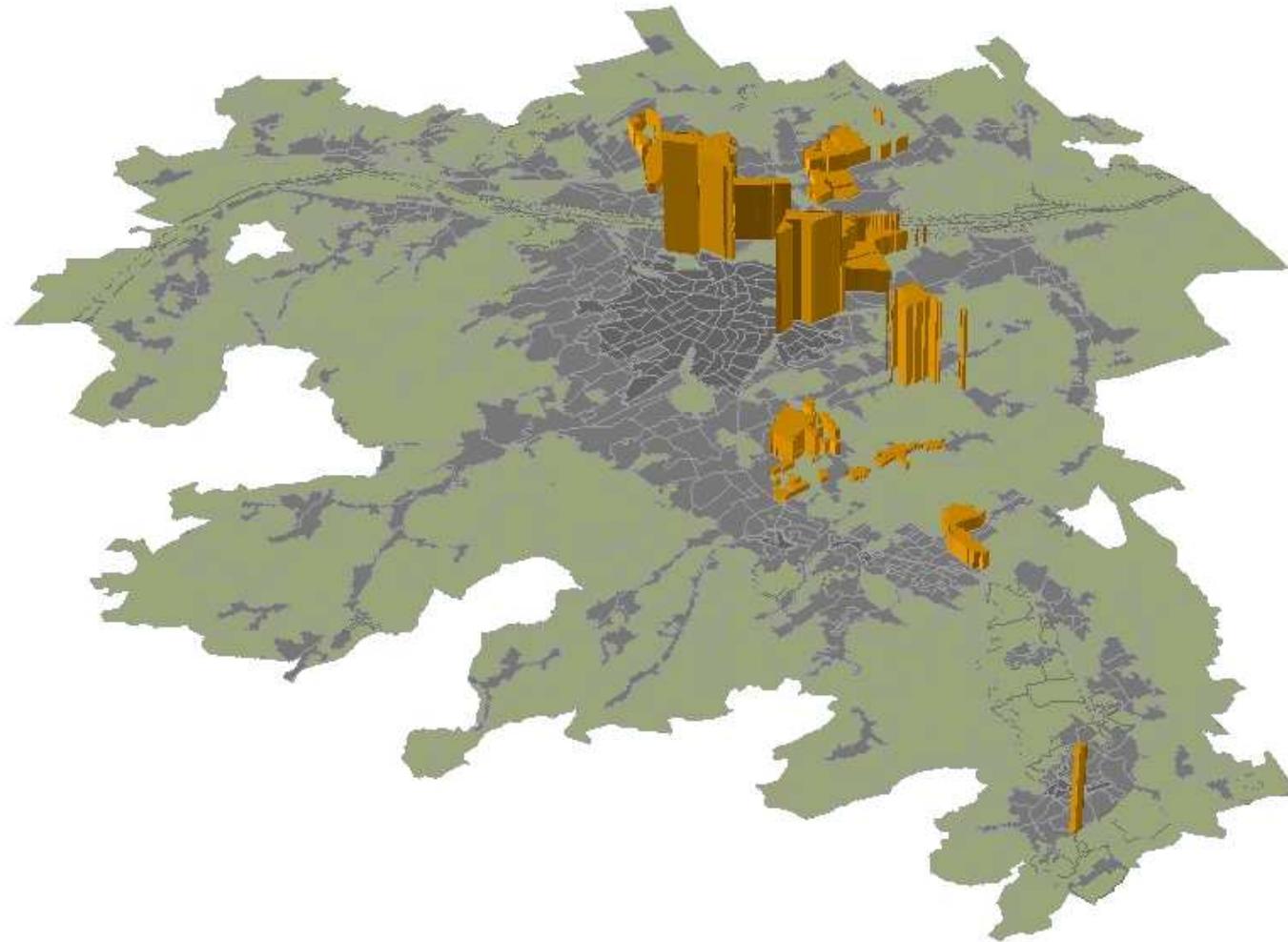
Medium-long term development axes
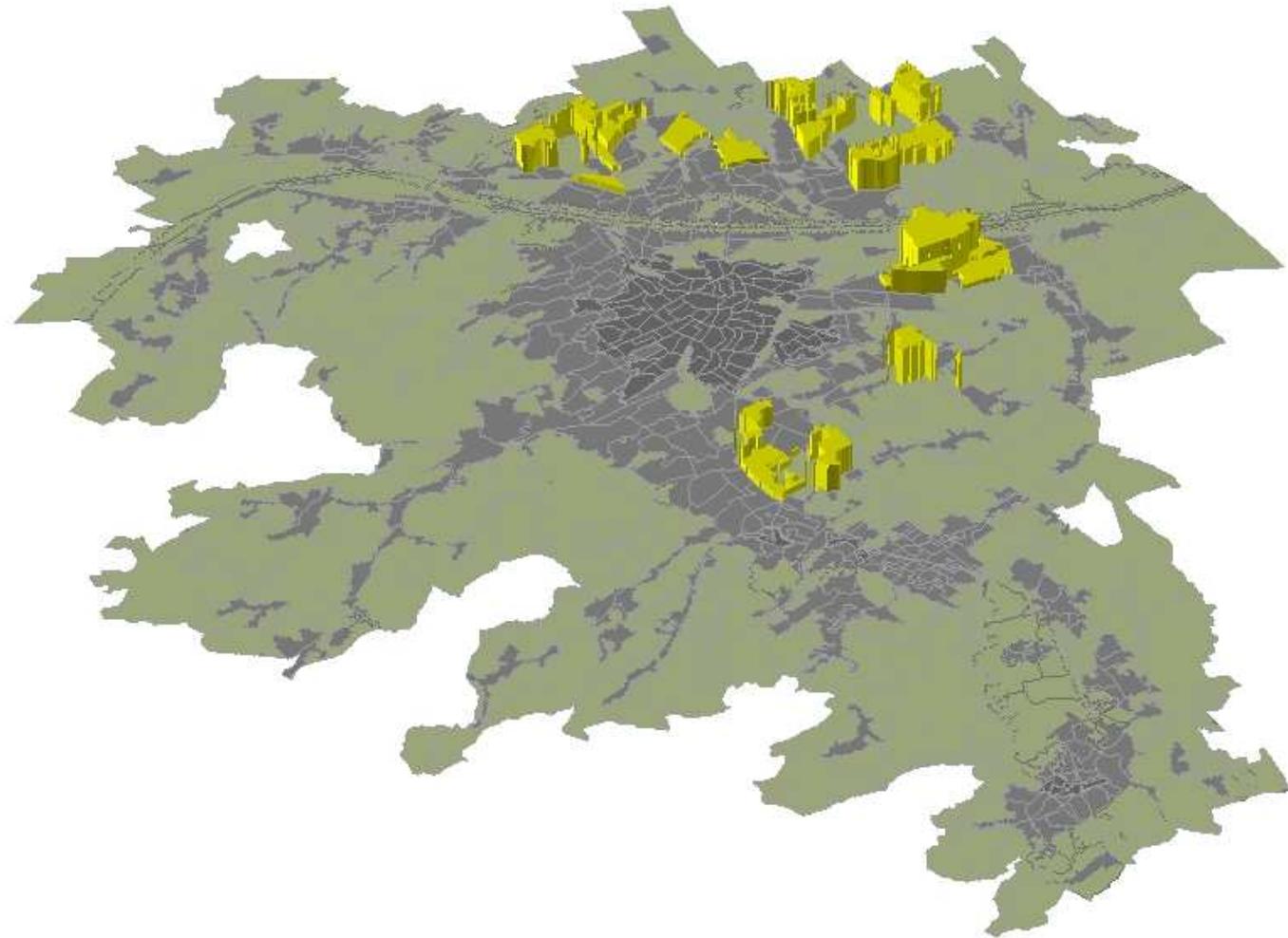
Allocation of population according to city-typical densities

Indication for remaining surplus of future population to be allocated outside the UMZ
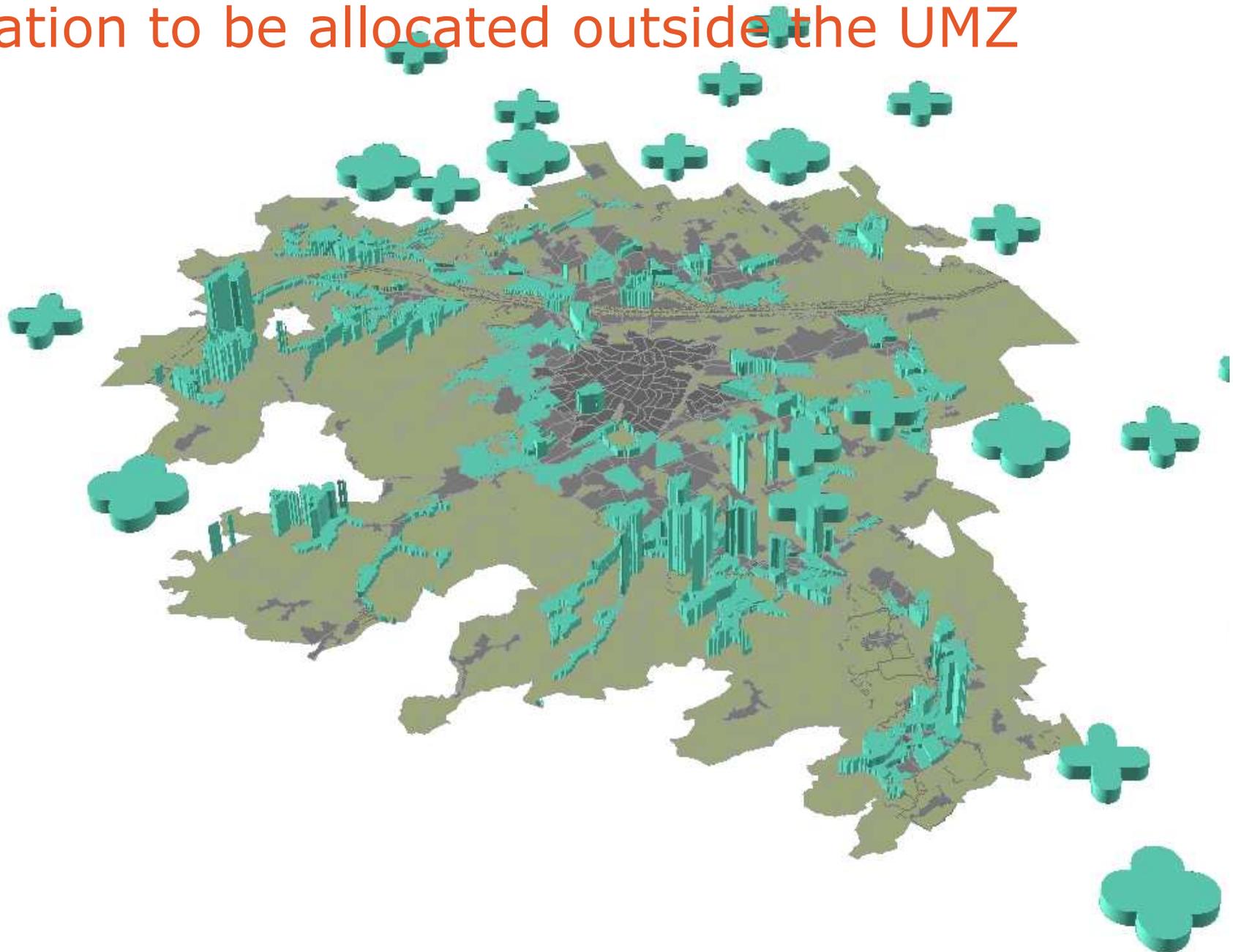
Urban development scenarios: Guiding principles

- **BASE scenario** as the continuation of current spatial trends (densities, spatial configurations)

- **SUME scenario** as a path of sustainable spatial planning – focusing on the interrelations between urban form and metabolic performance

- SUME – scenarios **4 planning principles**:
  - gradual step up of densities in existing urban fabric
  - where attractive public transport can be provided
  - mix of functions (esp. in public transport nodes)
  - potential of enforced thermal renovation and reconstruction
    (combining replacement activities with densification)

Scenarios 2050: Overview

- **Vienna**

- Athens

- Marseille

- **Munich**

- Newcastle upon Tyne

- **Oporto**

- **Stockholm**

Vienna

- ▶ 1.8 Mio. population

- ▶ → 2050: + 35 %

- ▶ Pop.+jobs/km2 in
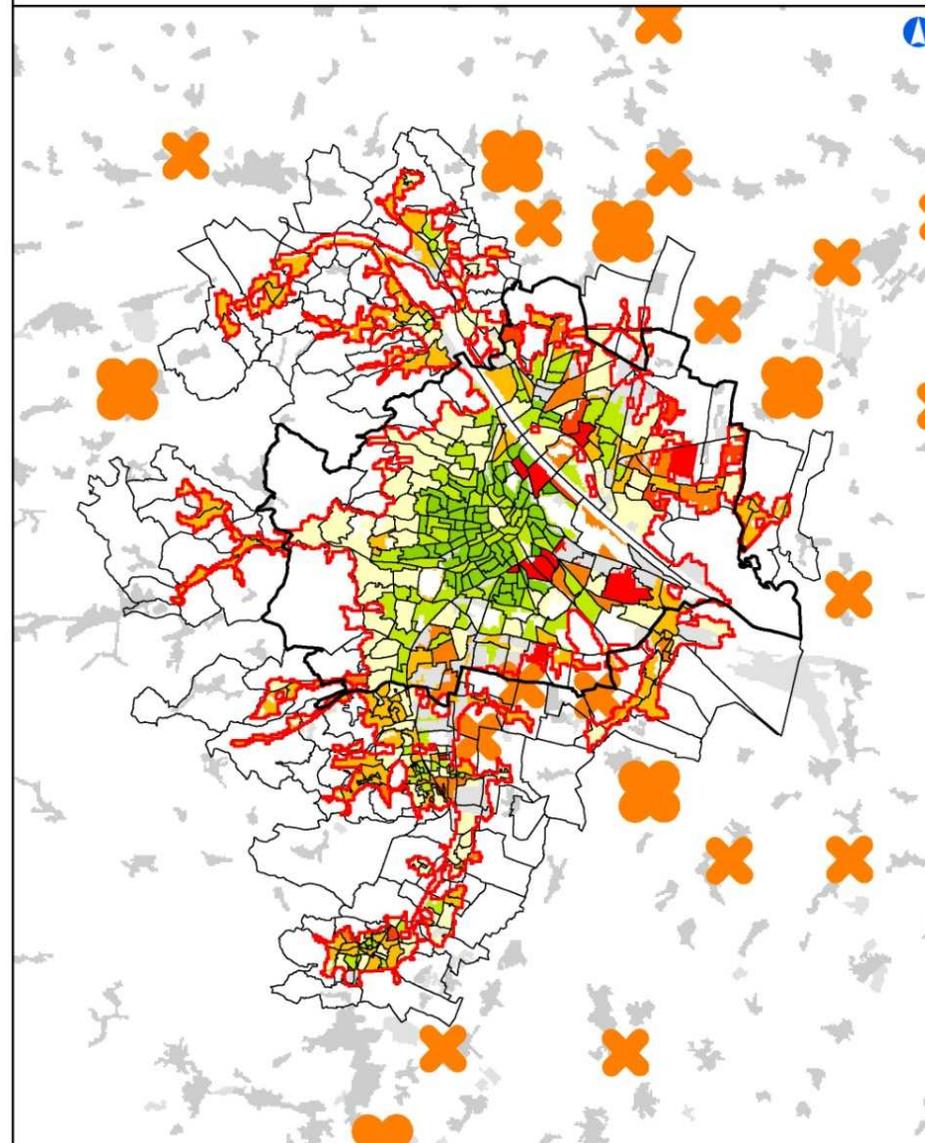 urban fabric: 7.251

Legend of City Details

Area
- 2a: Key Areas of Urban Development until 2025
- 2b: Long Term Options for Urban Development
- Supra Regional Green Areas, Protected Areas

Land Cover
[According Corine 2000]
- Urban fabric (outside UMZ)
- Industrial or commercial uses
- Water
- Others

Infrastructure
- Subway Network, Existing and Under Construction
- Subway Network, Projected
- Railway Network Existing and Under Construction
- Existing Motorway
- Road Network
- Motorways planned

Borders
- UMZ
- Administrative Border of the respective City
- National Borders

Sources
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www.openstreetmap.org
National Statistics of:
Greece, Switzerland, France, Germany,
United Kingdom, Portugal, Sweden, Austria

- ▸ **BASE** scenario 2050:
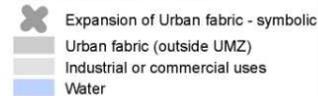
  urban fabric + 55%

▶ **SUME** scenario 2050:

urban fabric + 14%

Vienna: Change of population and workplace density 2001 - SUME
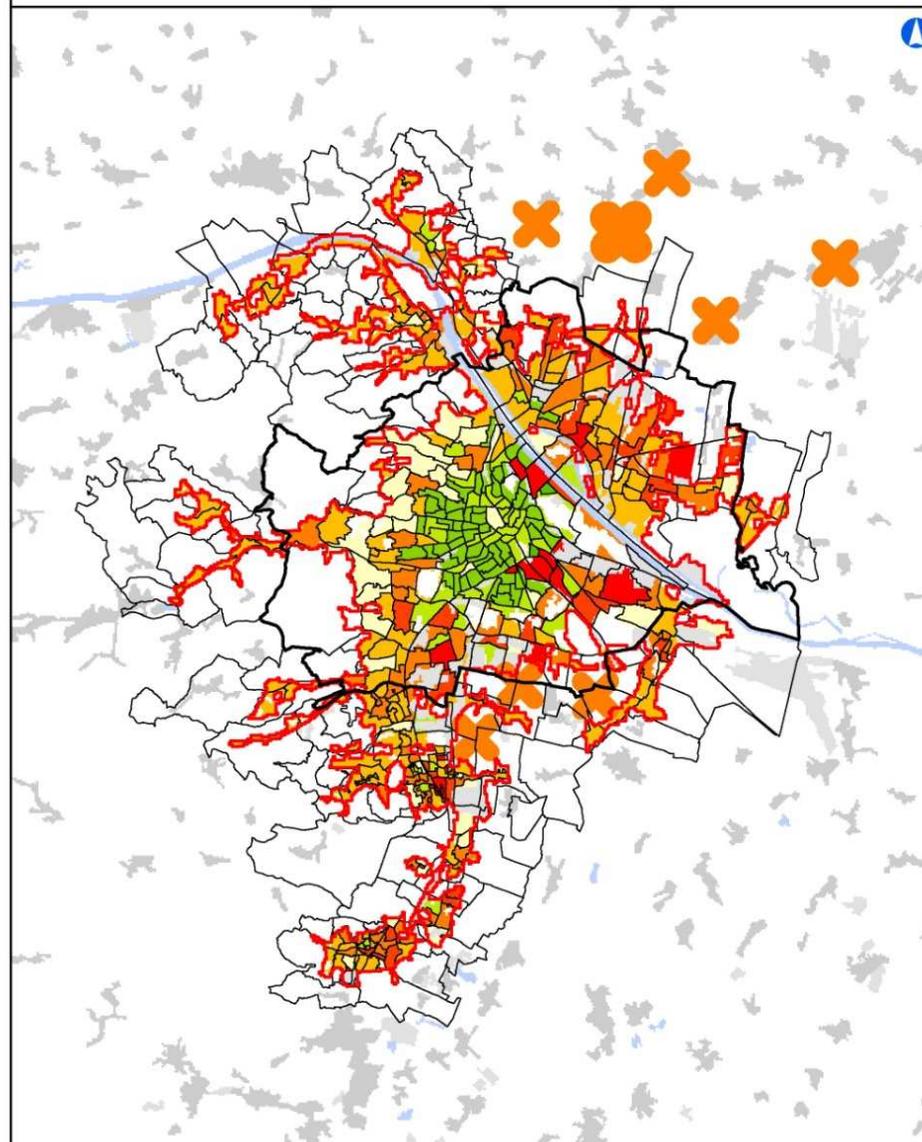
Change in density

- < -7.500
- -7.500 - -5.000
- -5.000 - -2.500
- -2.500 - 500
- -500 - 500
- 500 - 2.500
- 2.500 - 5.000
- 5.000 - 7.500
- > 7.500

Corine Land Cover 2000

Expansion of Urban fabric - symbolic
Urban fabric (outside UMZ)
Industrial or commercial uses
Water

Divisions

Administrative Border of Vienna
Administrative subdivisions
UMZ
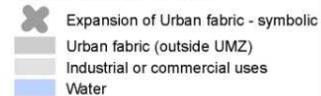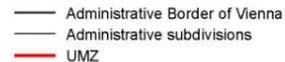
Sources
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Statistik Austira

Munich

- ▶ 1.7 Mio. population

- ▶ → 2050: + 18 %

- ▶ Pop.+jobs/km2 in urban fabric: 8.759

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▸ **BASE** scenario 2050:

urban fabric + 41%

Munich: Change of population and workplace density 2008 - BASE
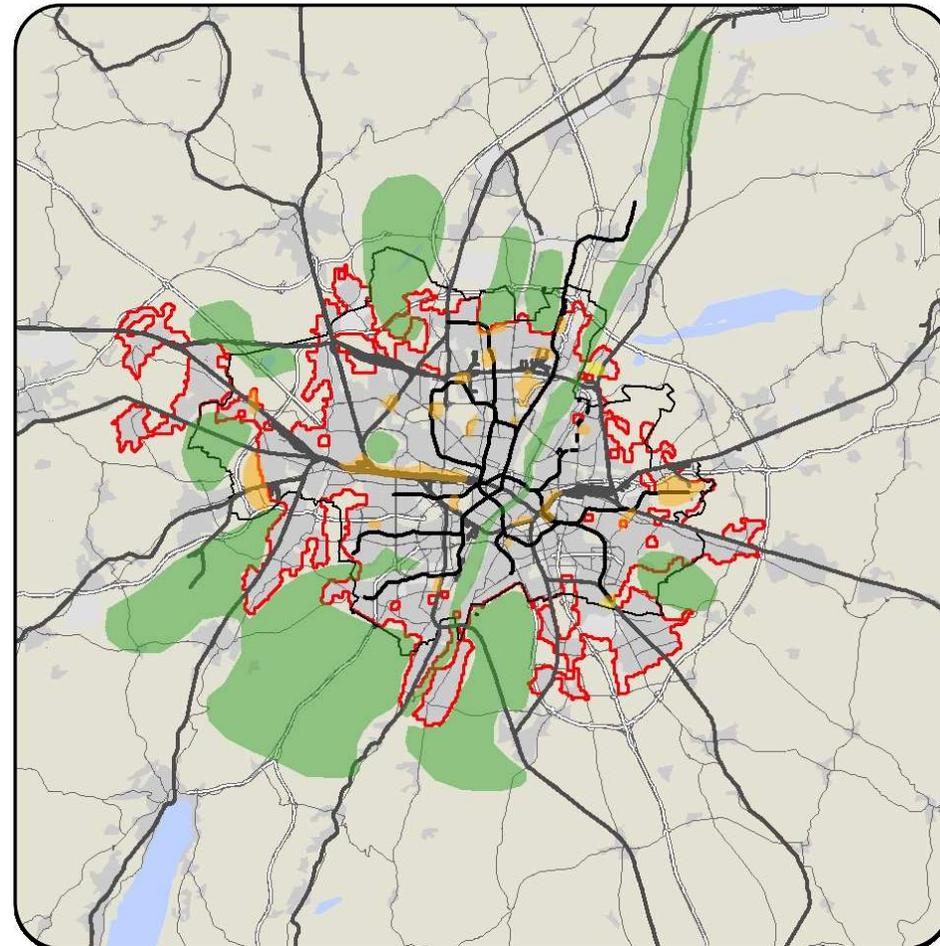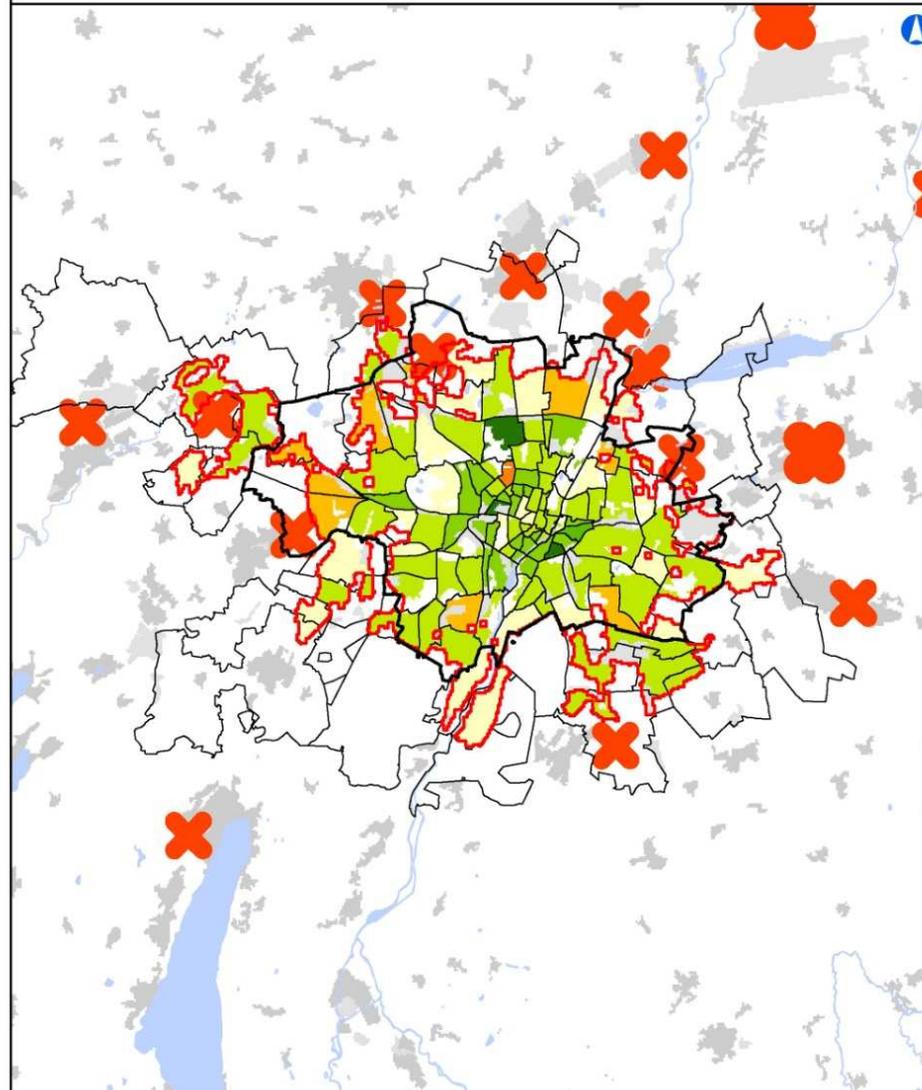
Change in density
- < -7.500
- -7.500 - -5.000
- -5.000 - -2.500
- -2.500 - 500
- -500 - 500
- 500 - 2.500
- 2.500 - 5.000
- 5.000 - 7.500
- > 7.500

Corine Land Cover 2000
- Expansion of Urban fabric - symbolic
- Urban fabric (outside UMZ)
- Industrial or commercial uses
- Water

Divisions
- Administrative Border of Munich
- Administrative subdivisions
- UMZ
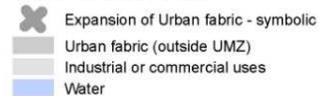
Sources
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www.openstreetmap.org
Statistik Austria

▶ **SUME**
scenario
2050:

**urban
fabric
+ 13%**

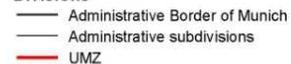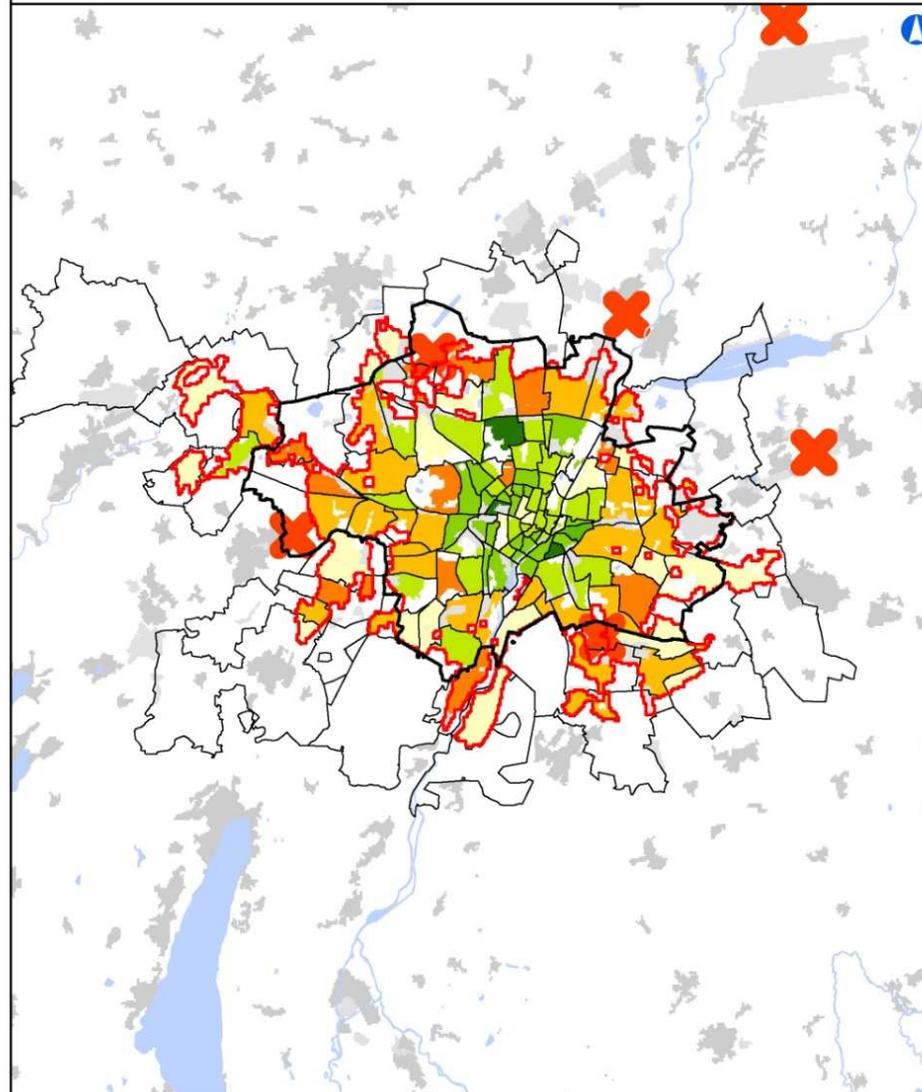Munich: Change of population and workplace density 2008 - SUME

Change in density
- < -7.500
- $-7.500 - -5.000$
- $-5.000 - -2.500$
- $-2.500 - 500$
- $-500 - 500$
- $500 - 2.500$
- $2.500 - 5.000$
- $5.000 - 7.500$
- > 7.500
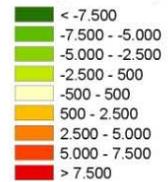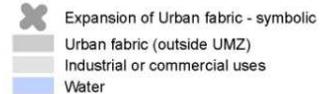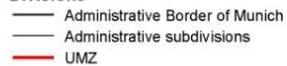
Corine Land Cover 2000
- Expansion of Urban fabric - symbolic
- Urban fabric (outside UMZ)
- Industrial or commercial uses
- Water

Divisions
- Administrative Border of Munich
- Administrative subdivisions
- UMZ

Sources
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www.openstreetmap.org
Statistik Austira

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Oporto

▶ 1.3 Mio. population

▶ → 2050: - 4 %

▶ Pop.+jobs/km2 in urban fabric: 5.403

Legend of City Details

Area
- 2a: Key Areas of Urban Development until 2025
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- Supra Regional Green Areas, Protected Areas

Land Cover [According Corine 2000]
- Urban fabric (outside UMZ)
- Industrial or commercial uses
- Water
- Others

Infrastructure
- —— Subway Network, Existing and Under Construction
- ----- Subway Network, Projected
- —— Railway Network Existing and Under Construction
- —— Existing Motorway
- —— Road Network
- ----- Motorways planned

Borders
- —— UMZ
- —— Administrative Border of the respective City
- —— National Borders

Sources
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National Statistics of:
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▶ **BASE** scenario 2050:

urban fabric + 0%

Oporto: Change of population and workplace density 2001 - BASE
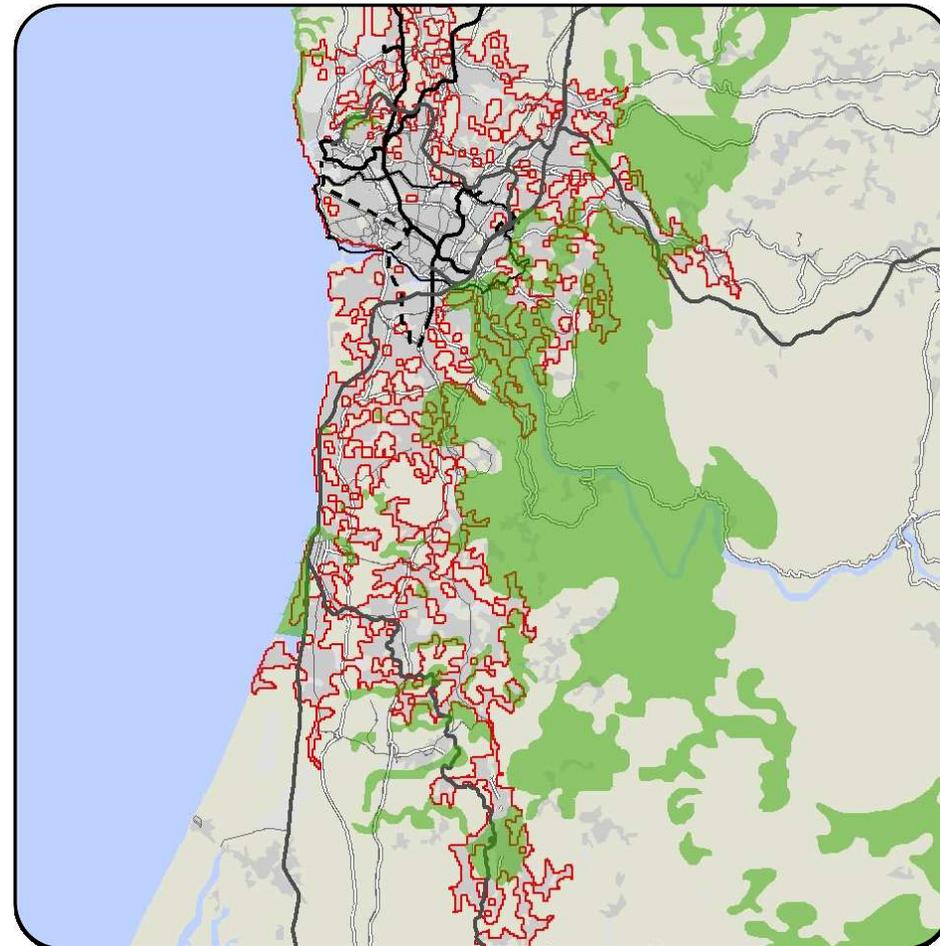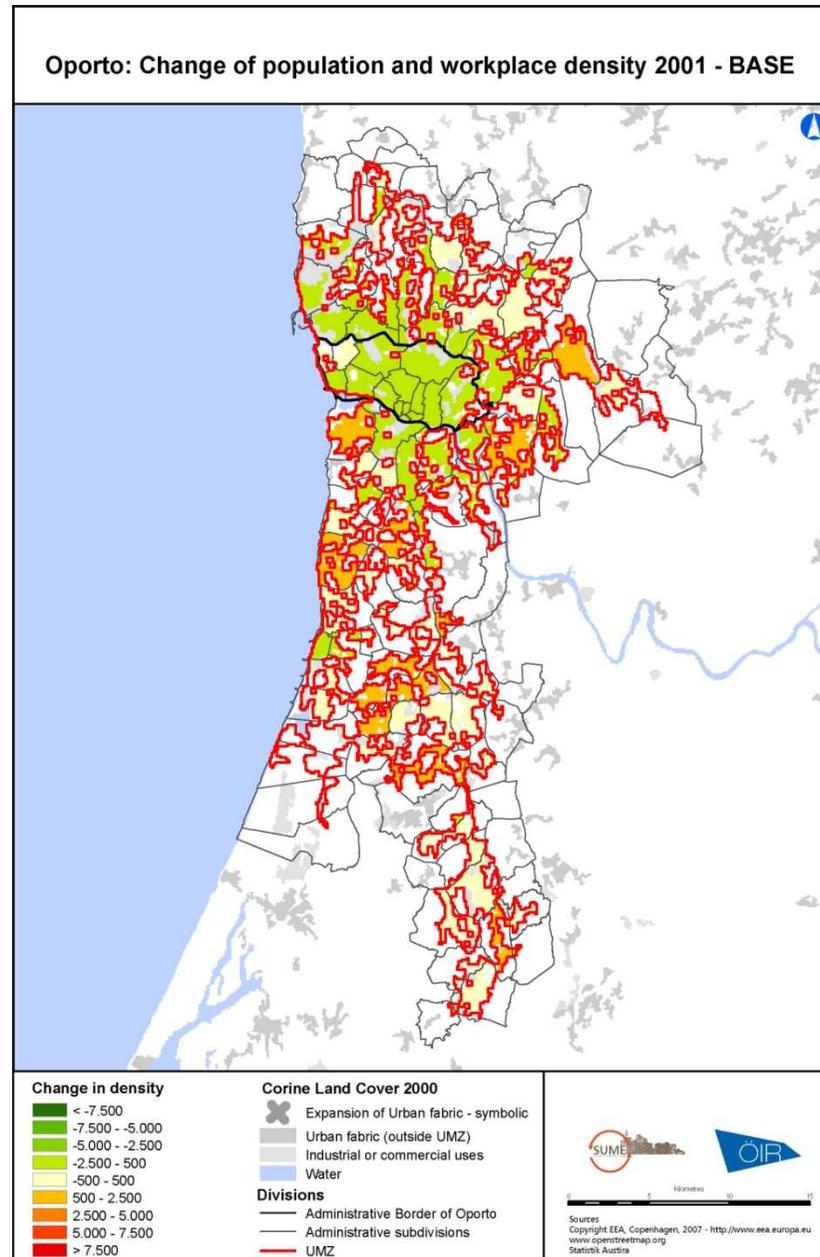
▶ **SUME** scenario 2050:

urban fabric + 0% PT-focus

Oporto: Change of population and workplace density 2001 - SUME
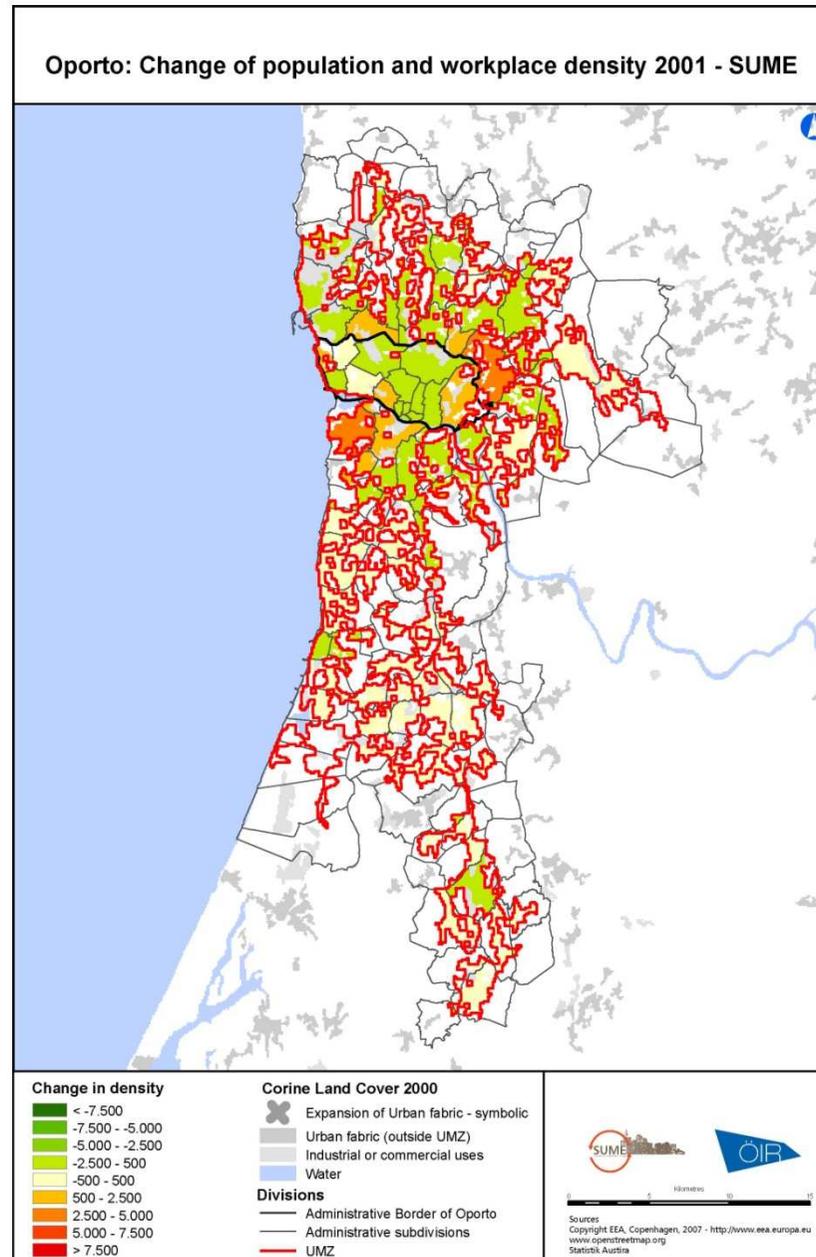
Stockholm

- 1.3 Mio. population

- → 2050: + 44 %

- Pop.+jobs/km2 in urban fabric: 5.278

Legend of City Details

Area

- 2a: Key Areas of Urban Development until 2025
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- Supra Regional Green Areas, Protected Areas

Land Cover [According Corine 2000]

- Urban fabric (outside UMZ)
- Industrial or commercial uses
- Water
- Others

Infrastructure

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---- Subway Network, Projected
— Railway Network Existing and Under Construction
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BASE scenario 2050:

urban fabric + 47%

Stockholm: Change of population and workplace density 2001 - BASE

Change in density
- < -7.500
- -7.500 - -5.000
- -5.000 - -2.500
- -2.500 - 500
- -500 - 500
- 500 - 2.500
- 2.500 - 5.000
- 5.000 - 7.500
- > 7.500

Corine Land Cover 2000
- Expansion of Urban fabric - symbolic
- Urban fabric (outside UMZ)
- Industrial or commercial uses
- Water

Divisions
- Administrative Border of Stockholm
- Administrative subdivisions
- UMZ

Sources
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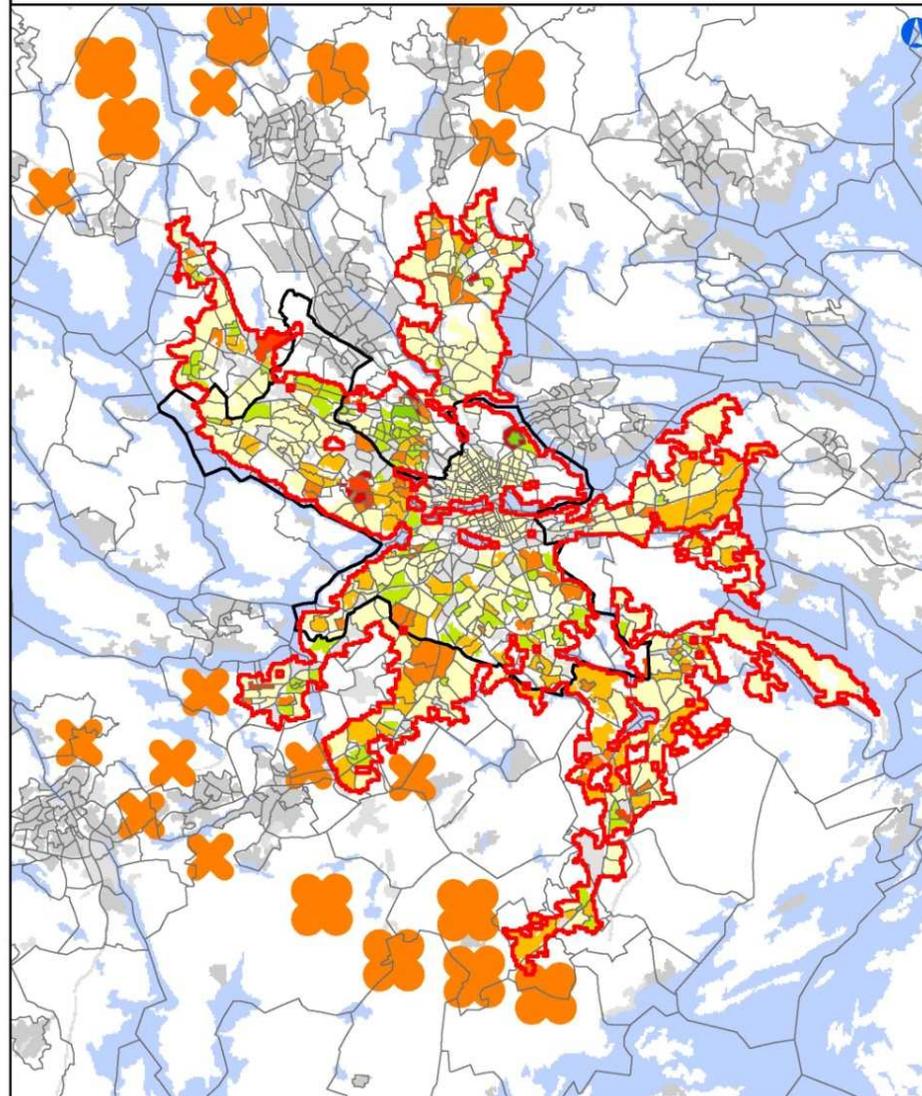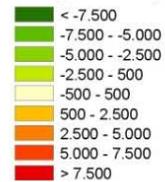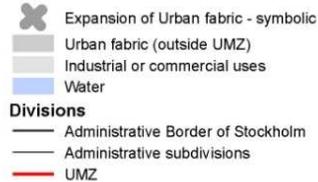
▶ **SUME** scenario 2050:

urban fabric +20%

Stockholm: Change of population and workplace density 2001 - SUME
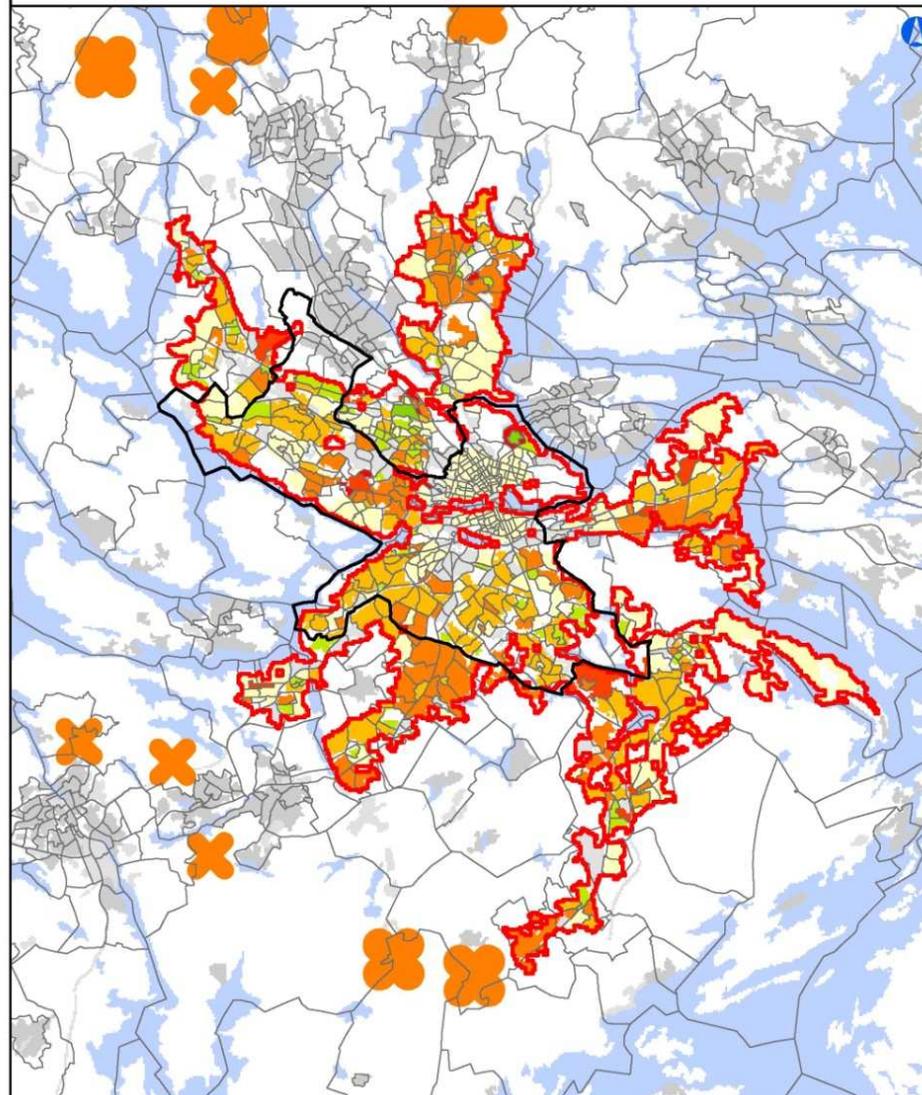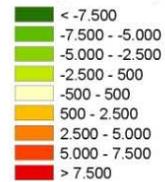
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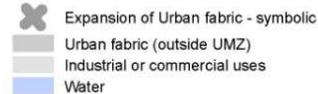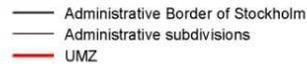
Urban spatial development:
BASE and SUME scenarios

Scenarios BASE and SUME:
Growth of "urbanized zones" 2000 – 2050

	Density: pop.+ jobs./km2 urban fabric 2000	Popula-tion in UMZ 2050 (Mio.)	Population change 2000-2050 in %	Growth of ‚urbanized zone' in % 2000 - 2050	
				BASE	SUME
Vienna	7 251	2,4	+35%	+54%	+14%
Munich	8 759	2,0	+17%	+41%	+18%
Stockholm	5 278	1,8	+44%	+50%	+22%
Porto	5 403	1,3	-4%	+0%	+0%
Athens	18 584	3,7	+9%	+24%	+0%
Marseille	9 312	1,1	+19%	+35%	+0%
Newcastle	6 700	1,1	+12%	+8%	+0%
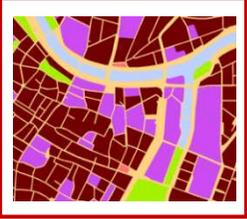
COOPERATION

Scenarios BASE and SUME:
Growth of "urbanized zones" 2000 – 2050

Vienna
- Population Change: 35%
- BASE: 54%
- SUME: 14%

Munich
- Population Change: 17%
- BASE: 41%
- SUME: 18%

Stockholm
- Population Change: 44%
- BASE: 50%
- SUME: 22%

Porto
- Population Change: -4%
- BASE: 0%
- SUME: 0%

Athens
- Population Change: 9%
- BASE: 24%
- SUME: 0%

Marseille
- Population Change: 19%
- BASE: 35%
- SUME: 0%

Newcastle
- Population Change: 12%
- BASE: 8%
- SUME: 0%

Axis: -10% 0% 10% 20% 30% 40% 50% 60%

□ **Population Change 2000-2050**

□ **BASE**

Growth of urbanized zone in % 2000-2050

□ **SUME**

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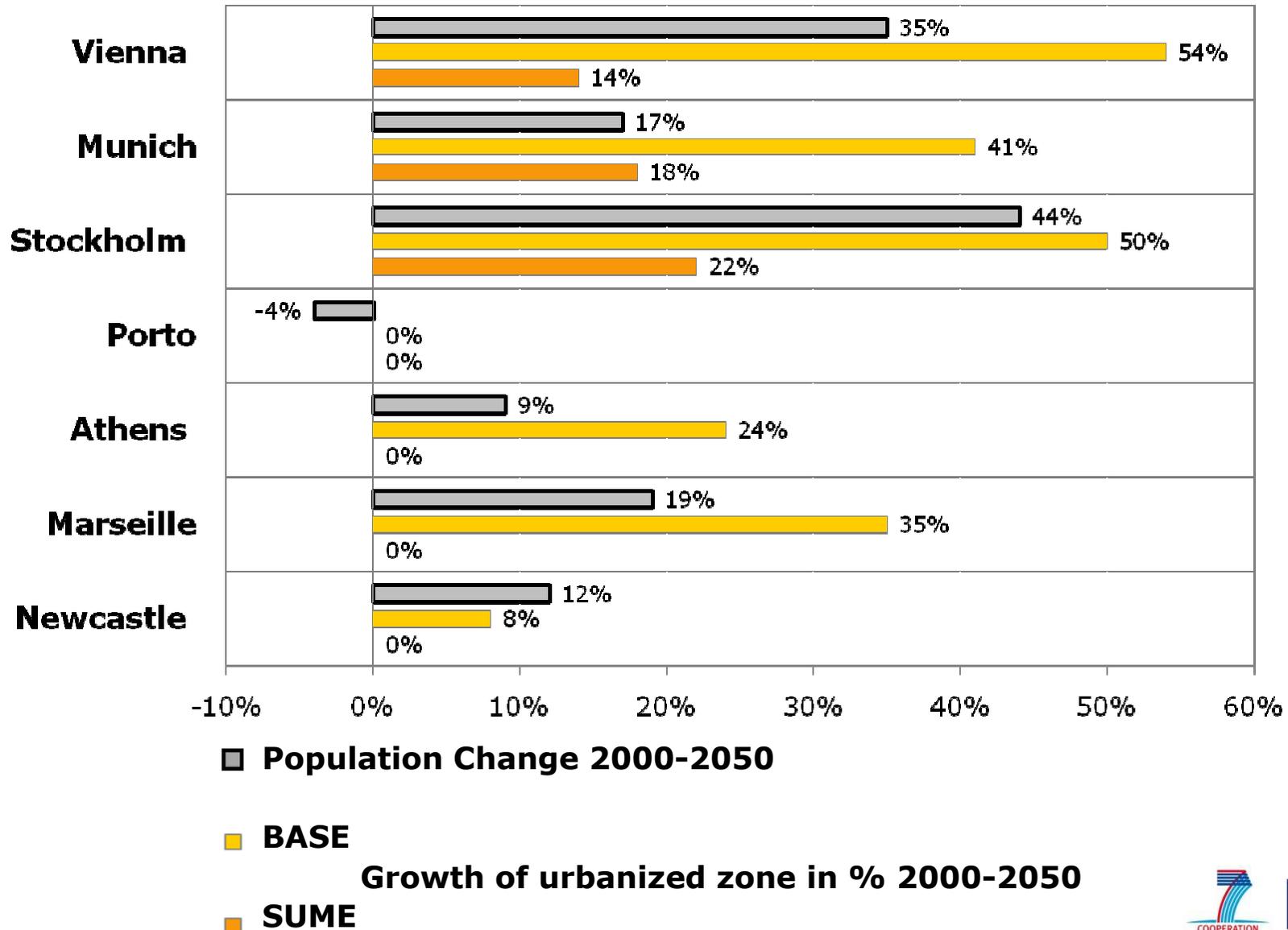
Urban form and diversity:
Impact on transport ($\rightarrow$ energy)

The second challenge: Transport

Vienna (AT)

- 5 km catchment area
- 10 km catchment area
- subway network existing and under construction
- subway network, projected
- railway network existing and under construction
- existing motorways
- motorways projected
- road network
- administrative border Vienna
- Urbanized area
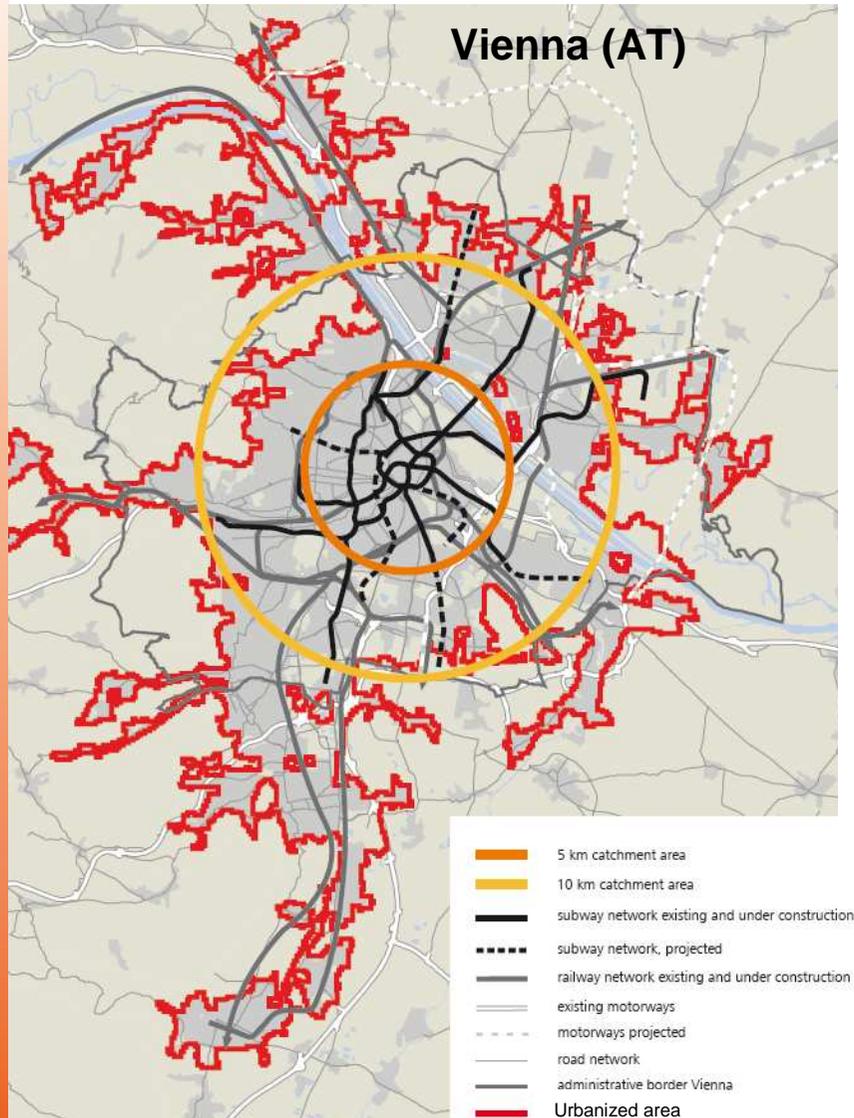
- The share of car use for daily trips is influenced by the accessibility of good quality public transport

- Growing cities tend to expand spatially, they loose in compactness and access to public transport lines

- ▶▶ <u>But:</u> Urban spatial development scenarios show the trends, SUME scenarios show the potential to improve accessibility

The potential to use public transportation, depending on spatial development 2000 – 2050: UDP indicator for BASE and SUME scenarios

UDP = Integrated public transport potential indicator: 12 = max., 3 = min.
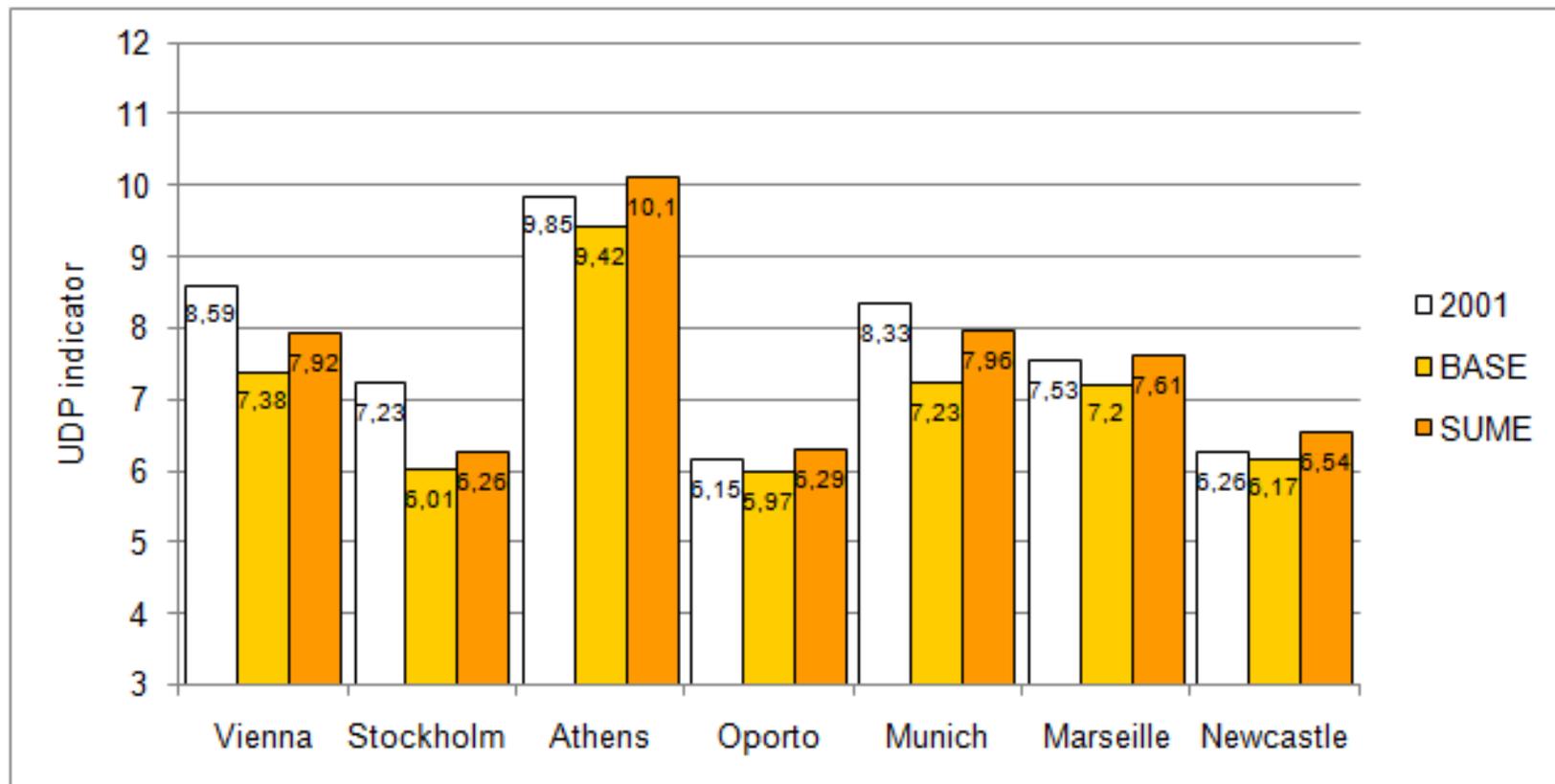
Urban development scenarios:
Key findings and conclusions

Spatial development – urban form

- BASE scenarios 2050 show urban spatial expansion faster than population dynamics, also in stagnant urban agglomerations

- Fast growing cities will show massive growth of their urban fabric, but they also have the greatest potential to focus the development

- Cities with low densities and high fragmentation need an approach with a high focus on public transport within city boundaries

- High density situations like in Athens raise the question for an alternative strategy: sustainability also needs open (green) space, and liveable densities

- The SUME-scenario development principles show large action space for cities over time, esp. in fast growing agglomerations (reducing land consumption)

Urban diversity patterns – transport

- The BASE scenarios indicate a substantial decline of urban form factors contributing to a sustainable transport system (deteriorating access to public transport), although expansions of the public transport system are included

- A SUME development strategy, including densification and a focus an good access to high-level public transport, will be essential to maintain current levels of accessibility

- Especially in growing cities (with rising standards of floor space) it will be necessary to implement intensified SUME-strategies in order to maintain today´s standards of accessibility

Key-strategies for urban development

- Re-development of existing urbanized areas with excellent public transport is the key to reduce large-scale future expansion and energy consumption

- A new policy-set beyond green-field and brown-field development is needed:
  - **Attractiveness**: better green area and open space quality in inner-city neighborhoods
  - **Densification strategies** and mobilizing building land in areas with lower densities and good access to public transport
  - Building and energy-oriented **renovation and reconstruction strategies**

- Large scale development-projects can give an impulse to form new centers to improve the overall urban diversity pattern

- Major efforts in coupling of policies for transport infrastructure and spatially focused housing, residential and economic development is needed → links between sectoral policies and between municipalities in agglomerations

Thank you.

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Barbara Saringer-Bory saringer@oir.at