REAL CORP 2018

23rd International Conference on Urban Planning and Regional Development in the Information Society
GeoMultimedia 2018

Paper Title: The Inclusive Role of Ekistics Elements in Earmarking Innovation Zones through a Balanced Distribution of Smart Development and Local Expression: Case of Kolkata Metropolitan Area (KMA)

4-6 April 2018
TU Wien (Vienna University of Technology),
Vienna, Austria

Presented by: Prerna Mandal
Co-author: Joy Sen
Dept. Of Architecture & Regional Planning, Indian Institute of Technology Kharagpur, India

Contents:

- Introduction

  - Research motivation

  - Interpretation of smart development globally and acknowledging it as per local expression

  - Understanding the concept of Innovation Zones

  - Understanding the concept of Ekistics

- Induction of metropolitan approach

  - Case of Kolkata Metropolitan Area (KMA)

- Results and Discussion

  - Assessment of potential clusters

- Conclusion

Introduction
Research Motivation

"Progress is more plausibly judged by the reduction of deprivation than by the further enrichment of the opulent."-Amartya Sen

▪The UN predicts that by 2050 the world's urban population will be as vast as the world's total population in 2002.

▪The urban population of India has increased from 222 million (i.e., 26% of the population) in 1990 to 410 million (32%) in 2014 and is predicted to reach 814 million (50%) by 2050.

▪India ranks second in the world in terms of urban population size. Present urbanization rate of India is lower in comparison to China (54%), Indonesia (53%), Mexico (79%), Brazil (85%) and Russia (74%) (Randhawa & Kumar, 2017)
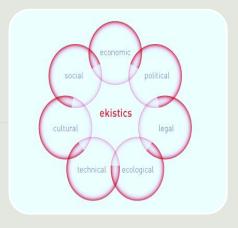
image sourse: http://www.un.org/sustainabledevelopment/sustainable-development-goals/

Department of Architecture and Regional Planning,
Indian Institute of Technology Kharagpur, India

23RD INTERNATIONAL CONFERENCE ON URBAN PLANNING AND REGIONAL DEVELOPMENT IN THE INFORMATION SOCIETY GEOMULTIMEDIA 2018

REAL CORP 2018

3

Rapid urbanization

Demands

Infrastructure and economic development in metropolitan area.

Urbanization in India

Dual Character

- Decelerating at the macro level
- Growing in class I cities, higher rate in metropolitan area
(Kundu, 2001)

Need to plan and manage the complexity and Multidimensional frameworks of metropolitan development

Policymakers, stakeholders and other actors

Suggests to adopt

A holistic approach

For the holistics approach

Study has adopted
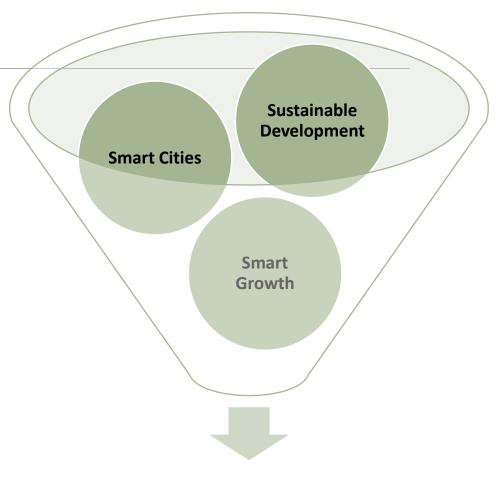
Concept of Ekistics introduced by C.A. Doxiadis

Interpretation of smart development globally and local expression

▪Focus increased on concepts based on the terms- smart, sustainable, liveable or inclusive development.

▪In context of Smart development, some concepts suggest it as the coherence of infrastructure, the significance of learning, innovation, and networks (Allwinkle & Cruickshank, 2011)

▪While some regard it as the incorporation of Information and Communication Technology (ICT) into day to day life and state function (Komninos, 2011).
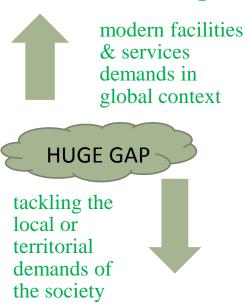
Smart Cities

Sustainable Development

Smart Growth

Smart Development

What is important here to realize…

- Approach promising to be a good fit of the model by being smart and sustainable, often remains to be a poor fit in practice while dealing with the urban local issues.

modern facilities & services demands in global context

HUGE GAP

tackling the local or territorial demands of the society

Doxiadis' suggested- Integration of local expression in the global conception to provide solution in terms of inclusiveness of the context-specific development of people, infrastructure, and its environment

While dealing the people, infrastructure, and its environment, the idea of development based on the concept of innovation has both scientific and practical significance for the socio-economic and physical growth of an urban area.

local expression - particularity of the context, i.e., specific development needs of each nation-state, emphasizing on the spatial logic of practice in developing areas (Khan Mahsud, 2010).
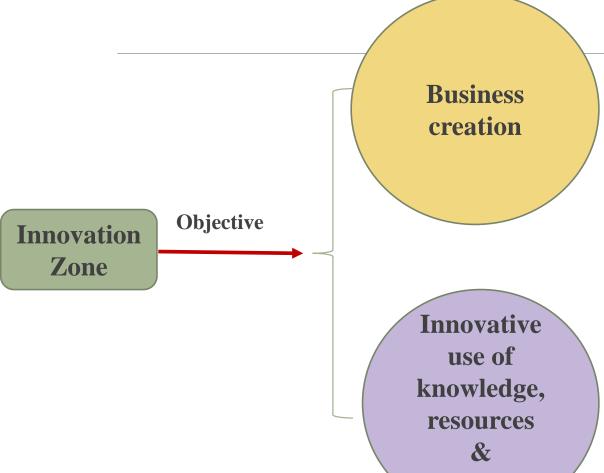
Understanding the concept of Innovation Zones…

*image source: https://www.edie.net/news/6/edie-Live-seeks-emerging-sustainability-solutions-for-2016-Innovation-Zone-Competition/

▪The concept of Innovation Zone came from the development of clusters. Common knowledge groups or clusters are formed by an organized and geographical mixture of firms having similarity in highly harmonizing capabilities for common research and development.

▪Since 1980, the concept of clusters and network has been a central idea for the increase of competitiveness, innovation and economic growth (Maskell et al, 2003).

▪The collective nature of the learning processes inside those special places characterized by intense local collaborations and interpersonal interactions that are the industrial districts/milieus and the cities, where the learning process embeds into the dense fabric of small and medium enterprises (SMEs) and into the local labor market (Camagni and Capello 2002; Keeble and Wilkinson 1999)

Innovation Zone →(Objective)

Business creation

"It is a ubiquitous phenomenon in the modern economy. In practicality all parts of the economy, and at all times, it is expected to find on-going processes of learning, searching and exploring, which results in new products, new techniques, new forms of organization and new markets"

Innovative use of knowledge, resources & legislations

The location of the innovation zones are characterized by strategic position with high level of infrastructure and play a very important role in the efficiency and effectiveness of zones.

(Mikroglou & Khan, 2009)

▪Recently in India NITI Aayog has launched **Indian Innovation Index in 2017**, in regard to the success of **Global Innovation Index since 2007 .**

  ▪ works on a set of indicators to assess a nation's capacity for innovation and its global ranking.

But prior to the analysis of the capacity and need of innovation, study for existing indicators with holistic model and elements to envisage the potentials and strength of areas to become innovative further is required.

NITI Aayog- National Institution for Transforming India: where 'NITI' means 'policy' and 'Aayog' means 'commission', it is the premier policy 'Think Tank' of the Government of India, providing both directional and policy inputs.

What to learn from different examples…

*image source: https://canvas.harvard.edu/courses/8651

Department of Architecture and Regional Planning,
Indian Institute of Technology Kharagpur, India

23RD INTERNATIONAL CONFERENCE ON URBAN PLANNING AND REGIONAL DEVELOPMENT IN THE INFORMATION SOCIETY GEOMULTIMEDIA 2018

REAL CORP 2018

11

Learning from Innovation Zones and similar case studies

	Study area	Objective/focus	Findings/results	Source
London Case Study	London	A **set of control variables** for other characteristics potentially predictive of London's specialization in the activity is concerned.	• Factors significantly associated with a concentration of employment in London included: market areas; supply areas; market type; establishment size; product innovation; establishment function; product cycle	(Cooke, Uranga, & Etxebarria, 1997)
Newark Innovation zone	Newark	Growth **rate of employment** in all the sectors of the region.	• Higher employment growth rate. • Newark's rate is equal to, or even higher than the growth of the rest of the region	(Mikroglou & Khan, 2009)
European Regional Innovation Survey	Vienna, Stockholm, Barcelona, Alsace, Baden, Lower Saxony, Gironde, S. Holland, Saxony, Slovenia, S. Wales	Innovation survey and results based on **qualitative** and **quantitative** determinants for **innovation potential** of any region and their **linkages** and **network**	• The activities based on innovation and business innovation process can be observed as a **network process**. • **Interaction** with other stakeholders and partners, and business played a vital role.	(Sternberg, 2000)

Case studies (contd.)

	Study area	Objective/focus	Findings/results	Source
Nordic SMEs and regional innovation systems	13 Nordic regions (Oslo, Stockholm, Malmo /Lund, Aalborg, Jyvaskyla, Helsinki, Gothenburg, Linkoping, Stavanger, Horten, Jaeren, Salling, Icelandic regions	To explore the **existence of similarities and differences** between regional clusters of SMEs in different regions in the Nordic Countries	• **Social networking** arrangements proven to be successful for boosting & securing **social capital and trust**. • SMEs that draw on an analytical **knowledge base** and innovate through **science-driven R&D** tends to interact with global partners.	(Asheim & Coenen, 2005)
Regional innovative clusters	10 European regional clusters: ICT regional clusters in Finland, Ireland, Denmark, Spain, Flanders, and Netherlands; mature regional clusters: agro-food cluster (Norway) and construction clusters (Denmark. Netherland, Switzerland).	To seek the **significance** of **regional clusters** in **innovation policy.**	• Regional clusters in every country/region have **unique cluster blends**; • Regional clusters are in **variation** and have **selection environments** that are inherently different; • Regional clusters may **go beyond geographical levels**.	(Doloreux & Parto, 2005)

Understanding the concept of Ekistics

Definition: Ekistics is the **science of human settlements**, and as such is concerned with the myriad of social, economic, cultural, technical, administrative, and other problems of human communities of all sizes and types. (Khera, 1973)

- Main object of ekistics is to develop insights into the physical distribution, form and structure of settlements, taking into account the variety of functions that they provide (Peponis, 1968; Papaioannou, 2013; Zhang, 2017).

- Research suggests that in context of 'sustainable communities', reviewing the steps of Doxiadis' efforts to develop an integral science of human settlement which has considerable positive impact (Fookes, 2008).

- Researchers argued that it is within natural (eco-)systems that settlements are made, and that, therefore, human settlements must operate within their constraints. (Khan Mahsud, 2010)
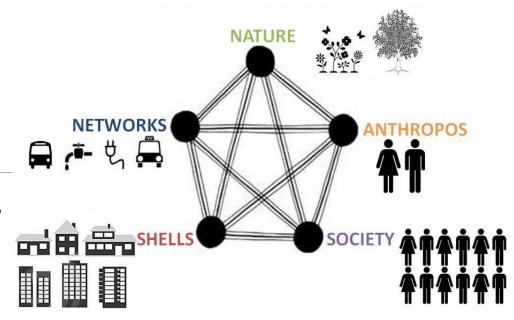
Foundation of Ekistics Elements

In this study the focus is on the five elements of Ekistics given by **C. A. Doxiadis**, which are as follows:

Nature:
- Provides foundation for the settlement
- Framework within which settlement functions.
- It consists of geological and topographical resources,

soil and water resources, plant and animal life, and the climate.

Human:
- Major manipulator
- Directed by moral values, manipulates in an

attempt to satisfy his biological and emotional needs and his senses.

Society:

- Formed by human
- Consists of factors as population composition and **density**, social stratification, cultural patterns, **education**, **health and welfare**, **economic development**, law, and administration.

Shells:

- Structures created by human
- Purpose: **housin**g, community services, shopping, **recreation**, civic and **business needs**, **industry**.
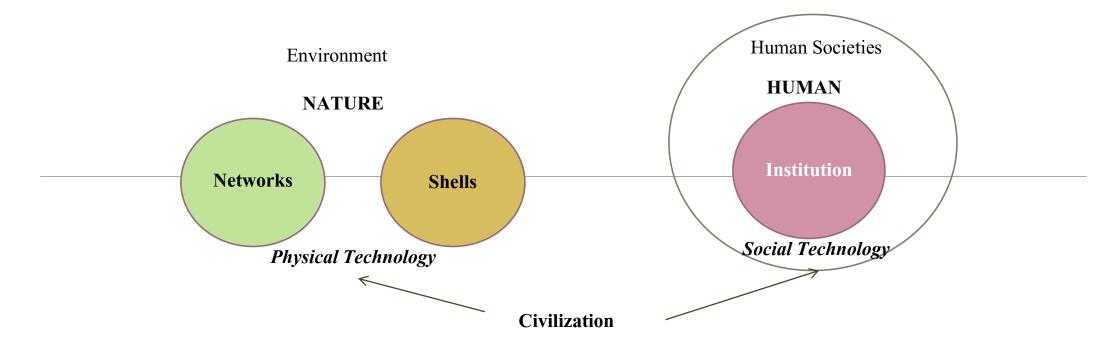
Networks:

- Natural and man-made links
- Facilitate the functioning of the settlements
- Water and power supply systems, sewage and drainage, and communication and transportation systems.

Inclusive nature of Ekistics in smart development

- In context of 'sustainable communities and development', reviewing the steps of Doxiadis' efforts to develop an integral science of human settlement has considerable positive impact. (Fookes, 2008)

- Ekistics' relation with business and government study has shown the need of a universal application to major plans and action of industry and government (Khera, 1973).

- Planners can adapt the ekistics framework to society's needs, as well as the global view for the urban development (Gottmann, 1976). Some concepts of ekistics have already been successfully employed in several major European cities (A. Doxiadis, 1969; C. a Doxiadis, 1970).

- Objective of ekistics is to achieve a balance among these elements in the dimensions of time, space, and scale.

- The disbalance among other elements seems to have been caused by the exceptional increase in population; tremendous rate of urbanization; increase in the average per capita income; the unexpected technological progress; and the social and political influences that these forces have had on the life of human (Kunzmann & Wegener, 1991; J. Peponis, Hadjinikolaou, Livieratos, & Fatouros, 1989).
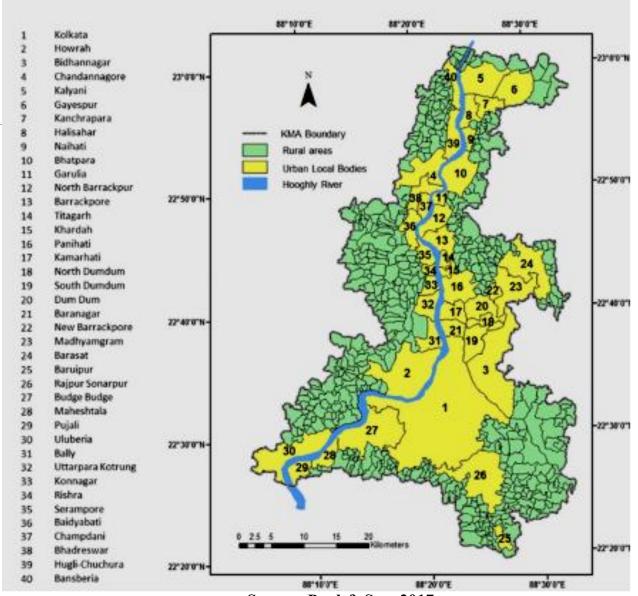
Ekistics elements revisited

- Here, one set comprises of nature and human (initially known as anthropos) which is naturally formed, and other set comprising of shells, networks, and society modified as institutions, which is culturally formed interconnected through natural function i.e., ecological aspect, and cultural function i.e., economic, social and political

Induction of metropolitan approach
Case of Kolkata Metropolitan Area (KMA)

- List of Urban Local Bodies under KMA

- Demarcation of rural areas, urban local bodies and the partition formed by the river Hooghly into East bank and West bank is highlighted.

- Potential clusters will be formed based on the distribution of the indicators throughout the sub region.

1	Kolkata
2	Howrah
3	Bidhannagar
4	Chandannagore
5	Kalyani
6	Gayespur
7	Kanchrapara
8	Halisahar
9	Naihati
10	Bhatpara
11	Garulia
12	North Barrackpur
13	Barrackpore
14	Titagarh
15	Khardah
16	Panihati
17	Kamarhati
18	North Dumdum
19	South Dumdum
20	Dum Dum
21	Baranagar
22	New Barrackpore
23	Madhyamgram
24	Barasat
25	Baruipur
26	Rajpur Sonarpur
27	Budge Budge
28	Maheshtala
29	Pujali
30	Uluberia
31	Bally
32	Uttarpara Kotrung
33	Konnagar
34	Rishra
35	Serampore
36	Baidyabati
37	Champdani
38	Bhadreswar
39	Hugli-Chuchura
40	Bansberia

Source: Paul & Sen, 2017

Approach for assessing the Elements and its underlying Indicators

Likert –type scale	
1	Least Important
2	Somewhat Important
3	Moderately Important
4	Very Important
5	Extremely Important

The indicators with median values 3 or above are selected.

Nature	Human	Society	Shell	Network
Water resource	Temperature	Population Density	School	Road
Natural Heritage	Manpower	Pop. Composition	Hospital	Power supply
Open spaces	Creativity and Inherited Skill Knowledge	Education	Recreational facility	Water supply
		Economic equality	Market & shopping Centre	Communication System
		Technological acceptance	Commercial & business Centre	
			Transportation Center	
			Warehouse	
			Industry	
			Skill development center	

List of selected indicators

Results and Discussion…

*Image source: http://northbridgetimes.com/ireda-assistant-manager-result-2016-announced-www-ireda-gov-in/8605

Department of Architecture and Regional Planning,
Indian Institute of Technology Kharagpur, India

23RD INTERNATIONAL CONFERENCE ON URBAN PLANNING AND REGIONAL DEVELOPMENT IN THE INFORMATION SOCIETY GEOMULTIMEDIA 2018

REAL CORP 2018

21

Assessment of potential clusters

- k-mean for the cluster analysis was carried out. The number of clusters were given three for the k-mean cluster analysis. As the output was focused on three range of high, medium, and low groupings of ULBs
- Initial and Final Cluster Centers represent the Euclidean distances between the cluster centers. Greater distances between two cluster centers indicate more dissimilarities within the algorithm.
- In this analysis, the groups are formed purposely in according to the distances between them. The data were standardized before undergoing the analysis by calculating their Z- scores.
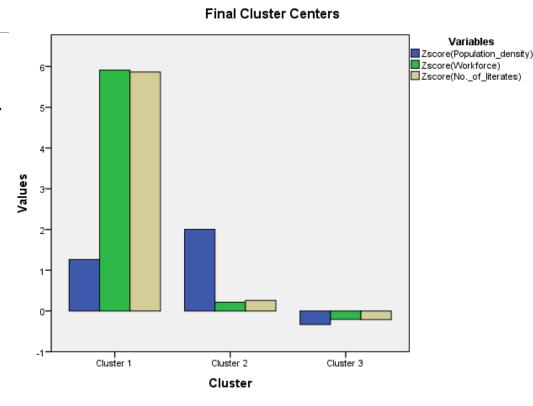
	Initial Clusters			Final Clusters		
	1	2	3	1	2	3
Population_density	1.26528	2.68526	-1.45453	1.26528	2.00455	-.33200
Workforce	5.91470	-.28325	-.33931	5.91470	.21563	-.20567
No._of_literates	5.86374	-.30096	-.36225	5.86374	.25942	-.21061

Initial and Final Cluster Centers

Assessment of potential clusters

- The significant difference in cluster one from the other two clusters is visibly high due to the high population size of Kolkata city. Since Kolkata is the core city on the west bank of the river Hooghly, with range of physical and social infrastructure as well as economic opportunities.
- Most of the ULBs with huge gap in meeting these physical, social, and economic infrastructure and opportunities fall in Clusters 2 and 3.
- This shows clearly the disbalance in the opportunities among the urban areas through out KMA. Howrah-Bally, Baranagar, Titagarh, South Dum Dum, and Kamarhati falls in Custer 2. And rest of the ULBs fall in Cluster 3.

Cluster wise distribution of selected indicators

Assessment of potential clusters

▪ As shown in Table, the selected indicators have an impact in cluster formation and the population density has the least impact in it. In Table below, the positive and large F values of the selected indicators denote the higher impact of indicators to the separation and in classifying the clusters.

▪ The F tests are normally used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Population_density	12.720	2	.366	37	34.707	.000
Workforce	18.327	2	.063	37	289.107	.000
No._of_literates	18.114	2	.075	37	241.790	.000

ANOVA* *Analysis of Variance: used to analyze the differences among group means.

Department of Architecture and Regional Planning,
Indian Institute of Technology Kharagpur, India

23RD INTERNATIONAL CONFERENCE ON URBAN PLANNING AND REGIONAL DEVELOPMENT IN THE INFORMATION SOCIETY GEOMULTIMEDIA 2018

REAL CORP 2018

24

Conclusion…

Department of Architecture and Regional Planning,
Indian Institute of Technology Kharagpur, India

23RD INTERNATIONAL CONFERENCE ON URBAN PLANNING AND REGIONAL DEVELOPMENT IN THE INFORMATION SOCIETY GEOMULTIMEDIA 2018

REAL CORP 2018

25

Conclusion

- Needs approach on the grassroots level.

- Realization for focusing on bottom needs along with higher requirements for smart development of urban areas.

- Connected with high-tech informatic society, whereas huge **disconnection** in meeting the infrastructure needs, economic welfare and basic quality of life.

- In developing country like India, approach to smart development needs more attention on solutions based on the local expression i.e., the indicators considered to be responsible to best understand the potential of an urban area like availability of workforce, no. of literates showing the knowledge groups and the gap.

Image source: http://www.economist.com/node/16106603

Conclusion

▪In this study, three indicators i.e., poulation density, workforce, and number of literates, were analyzed, since it gives a initial picture of the area how potential or weak it is in terms of the preparedness for potentcial clusters of innovation zones.

▪Need for considering an inclusive concept like Ekistics, to envisage the development and augmentation of innovation zones in metropolitan areas.

▪Need of modifications based on the context and scale of cases should also be taken in to account while preparing for the innovation zone development.

▪Indicators varies from context to context, thus the local expression of an area must be taken into account considering their potential in terms of any one or more than one elements like Nature, human, or Shell. And thus, the indicators underlying to it must be taken into consideration for the study.

Limitation and scope

Limitations:

▪The study was limited with the demonstration of the selected indicators as governed by Ekistics elements, extracted for initial conceptualization.

▪This research is not an attempt to replace any of the more commonly known indicators but instead present alternative holistic approach.

▪ In this paper, three indicators were selected under Ekistics elements for the analysis, i.e., population density, workforce, and no. of literates based on expert's opinion and literature. This is one of the limitations of the study.

Scope:

▪Initial clusters were identified based on these indicators, and with the help of these clusters further scope of analysis to identify level of augmentation and development prerequisites for innovation zones can be assessed.

▪Scope and implications for an array of stakeholders, including researchers, policymakers, industries, and government and private bodies, which are in the long run, concerned with the development of innovation zones to augment economic prosperity and social welfare with an inclusive approach for the identification of indicators based on local context.

References

AMERICAN INSTITUTE OF ARCHITECTS: Cities as a Lab: Designing the Innovation Economy. 2014

BROUWER, E., BUDIL-NADVORNIKOVA, H., & KLEINKNECHT, A.: Are Urban Agglomerations a Better Breeding Place for Product Innovation? An Analysis of New Product Announcements. Regional Studies, Vol. 33, Issue 6, pp. 541–549. 1999

CAMAGNI, R., & CAPELLO, R: Regional innovation patterns and the eu regional policy reform: Toward smart innovation policies. Growth and Change, Vol. 44, Issue 2, pp. 355–389. 2013

DEDEHAYIR, O., MÄKINEN, S. J., & ROLAND ORTT, J: Roles during innovation ecosystem genesis: A literature review. Technological Forecasting and Social Change. 2016

DOLOREUX, D., & PARTO, S: Regional innovation systems: Current discourse and unresolved issues. Technology in Society, Vol. 27, Issue 2, pp. 133–153. 2005

DOXIADIS, A: Books 373, pp. 373–374. 1969

DOXIADIS, C. A: Ekistics, the Science of Human Settlements. Science, Vol. 170, Issue 3956, pp. 393–404. 1970

FELDMAN, M. P., & AUDRETSCH, D. B: Innovation in cities:: Science-based diversity, specialization and localized competition. European Economic Review, Vol. 43, Issue 2, pp. 409–429. 1999

FOOKES, T. W: A Generic Policy Framework For Urban Sustainability. Shaping the Sustainable Millennium, CA, vol. 1, Issue 22. 2008

GOTTMANN, J: Megalopolitan systems around the world. Ekistics. Athens Center of Ekistics. 1976

KEEBLE, D., & WILKINSON, F: Collective Learning and Knowledge Development in the Evolution of Regional Clusters of High Technology SMEs in Europe. Regional Studies, Vol. 33, Issue 4, pp. 295–303. 1999

KHAN MAHSUD, A. Z: Rethinking Doxiadis: Ekistical Urbanism. University of Minnesota Press. 2010

KHERA, P: Business , Government , And The Science Of Human Settlements The application of ekistic criteria. 1973

KOMNINOS, N: Intelligent cities: Variable geometries of spatial intelligence. Intelligent Buildings International, Vol. 3, Issue 3, pp. 172–188. 2011

References

KUNDU, N: Understanding Slums Reports: The case of Kolkata India. Understanding Slums: Case Studies for the Global Report on Human Settlements. 2001

KUNZMANN, K. R., & WEGENER, M: The pattern of urbanization in Western Europe. Ekistics. Athens Center of Ekistics. 1991

MASKELL, P., & LORENZEN, M: The Cluster-and other current forms of Market Organization. 2003

MIKROGLOU, E., & KHAN, T. H: The Role of Innovation Zones in Regional Development. 2009

PAPAIOANNOU, J. G: Environment and the Role of Ekistics, Vol. 2. 2013

PAUL, A., & SEN, J: Livability assessment within a metropolis based on the impact of integrated urban geographic factors (IUGFs) on clustering urban centers of Kolkata. Cities. 2017

PEPONIS, J: EKISTICS - An introduction to the science of Human Settlements / C.A.DOXIADIS. Ekistics The Problems And Science Of Human Settlements, pp. 1–6. 1968

PEPONIS, J., HADJINIKOLAOU, E., LIVIERATOS, C., & FATOUROS, D. A: The spatial core of urban culture. Ekistics. Athens Center of Ekistics. 1989

PERTSEMLIDIS, C. R: The foundations of ekistics An attempt to test the validity of Anthropocosmos model in the context of modern evolutionary theory Purpose : The Anthropocosmos, pp. 1–15. 2007

RABELO, R. J., & BERNUS, P: A Holistic Model of Building Innovation Ecosystems. IFAC-Papers OnLine, Vol. 48, Issue 3, pp. 2250–2257. 2015

RANDHAWA, A., & KUMAR, A: Exploring sustainability of smart development initiatives in India. 2017

UTTAM, A., & ROY, K: Development of New Townships: A Catalyst in the growth of rural fringes of Kolkata Metropolitan Area (KMA). In In Annual Conference of HUDCO. 2005

YANG, Z., OTTENS, H. F. L., CAI, J., & SLIUZAS, R. V: Role of economic clusters in improving urban planning support. ITC Dissertation, Vol. 170. 2010

ZHANG, J. : Sustainable Degrowth and Relocalizing our Economies. 2017

Department of Architecture and Regional Planning, Indian Institute of Technology Kharagpur, India

23RD INTERNATIONAL CONFERENCE ON URBAN PLANNING AND REGIONAL DEVELOPMENT IN THE INFORMATION SOCIETY GEOMULTIMEDIA 2018

REAL CORP 2018

30

Thanks for your kind attention!

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

"To understand the whole situation one must be able to look at the trees as details and the forest as a whole. Often it is difficult for the people involved with the individual trees, with the details of day to day problems, to zoom out and look at the whole."

Quote Source: (Fugl, 2013)

Presented by: Prerna Mandal
Designation: Research Scholar
E-mail ID: prerna4sw@gmail.com
Contact No. : +91 7365886536
LinkedIn : linkedin.com/prerna4sw

Co-author: Joy Sen
Designation: Head and Professor
E-mail ID: joysen@arp.iitkgp.ernet.in
Contact No. : +91-3222-283222