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Ecology & Sustainability of Territorial Systems: Concepts & Principles

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- *Environmental consequences of socio-economic issues due to spatial isolation in transition countries*, Geopolitics, History, and International Relations **7(2)**: 197-206, 2015
- *Diversity: towards an unifying concept joining theoretical and practical views of ecology and geography under a spatial and statistical framework*, Oltenia. Studii și comunicări. Științele Naturii **30(1)**: 236-244, 2014
- *GIS-based methodology for the analysis of regional landscapes and their changes based on land cover and use: a planning perspective aimed at conserving the natural heritage*, in: Crăciun C., Boștenaru-Dan M (Eds.), *Planning and designing sustainable and resilient landscapes*, Springer, Amsterdam, The Netherlands, Earth Sciences & Geography - Geography Series, vol. 18, pp. 87-104, 2014
- *Long-term environmental changes analysis using CORINE data*, Environmental Engineering and Management Journal **13(4)**: 847-860, 2014 (co-authors: Grigorovschi M., Meiță V., Simion-Melinte C. P.)
- *Are human settlements ecological systems?*, Oltenia. Studii și comunicări. Științele Naturii **29(1)**: 227-232, 2013
- *Systemic theory applied to ecology, geography and spatial planning. Theoretical and methodological developments*, Lambert Academic Publishing, Saarbrücken, Germany, 2011
- *Synthetic principles of applying geostatistical methods to study territorial systems* (original title: *Principii sintetice de aplicare a metodelor geostatistice în analiza sistemelor teritoriale*), Estfalia Press, Bucharest, Romania, 2011 [in Romanian]
- *Land cover and use changes focused on the urbanization processes in Romania*, Environmental Engineering and Management Journal **9(6)**: 765-771, 2010 (co-authors: Ianoș I., Tălângă C.)
- *Dynamics of geodiversity and eco-diversity in territorial systems*, Journal of Urban and Regional Analysis **2(1)**: 61-70, 2010 (co-author: Sârbu C.)
- *Urban ecology, sustainable spatial development and legislation. An ecological approach of the relationships between man, the built space and the environment* (original title: *Ecologie urbană, dezvoltare spațială durabilă și legislație. O abordare ecologică a relațiilor dintre om, spațiul construit și mediu*), România de mâine Foundation Press, Bucharest, Romania, 2008 [in Romanian]
- *Environmental analysis with applications in urban and landscape planning* (original title: *Analiză de mediu cu aplicații în urbanism și peisagistică*), “Ion Mincu” University Press, Bucharest, Romania, 2007 [in Romanian]

Preface

In 2008, “Editura Fundației România de mâine” published a first book on urban ecology, titled “*Urban ecology, sustainable spatial development and legislation*”. The book was based mostly on the Bachelor thesis, “*Models for the sustainable development of cities*” (1997), notes from the courses taught to architects and urban planners on ecology (*Urban statistics and environmental analysis & Data analysis studio – 2007-present, Sustainable development in a territorial context – 2007-2009, Pathology of construction materials – 2008-2009, Environmental analyses and impact assessment – 2008-present, plus other courses taught occasionally*), and several research papers. The book was well received, and continues to be reprinted in order to accommodate the demand.

The first book was mainly designed to introduce the core elements of ecology to future planners (architects, urban and territorial planners). At the time when the book was written, the planning legislation in place did not account for the progress and conceptual models of systemic ecology. This is why the book criticized the legislative instruments regulating the methodology for elaborating the chapters of spatial planning studies dealing with the environment. Furthermore, given its main aim, the book was very theoretical and lacked the connection with planning (in fact, the future planners were thought to take the next step and find ways to make use of the concepts in their future planning work).

To fill in the gaps, this second book introduces and provides for the theoretical background of a methodology that was not only published, but also appreciated by the beneficiaries of plans elaborated after the publication of the previous book, in full

accordance with the principles and current developments in systemic ecology. Furthermore, this book is designed to start a future possible series, consisting of introducing the theoretical background (concepts and principles, with few examples derived from the planning experience), followed by one or more applied books, introducing examples from the planning experience of all specialists attested to carry out the studies addressing environmental issues associated to spatial plans: ecologists, geographers, engineers and other professionals.

From a theoretical perspective, the book is built upon the idea that the ecology of territorial systems is focused on two central issues – diversity and its conservation. ‘Diversity’ encompasses in fact the entire structure and functions of socio-ecologic complexes, including the diversity of living and non-living components, and the diversity of natural and man-dominated systems, from both structural and functional viewpoints. The chapters of this book present the core concepts, methodological developments and issues concentrated around these two themes, more exactly:

- What is the spatial expression of diversity, and which are the instruments needed to analyze it at different spatial scales, adequate for emphasizing in terms relevant to both ecologists and planners the diversity (geo-, eco-, and biodiversity) of administrative units with different ranks?
- What are the spatial principles applicable to the conservation of biodiversity in sustainable development, such that conservation is no longer opposed to socioeconomic development, and what are their implications for the planning process?

The phrase “*ecology of territorial systems*” is not chosen at random. The words reflect several key aspects:

- The theory is built on the principles of *systemic ecology* embraced by the school created by Professors Botnariuc and

Vădineanu and the geographical theory of *territorial systems*, developed by Professor Ianoş (2000). The theory identifies correspondences between the levels of systemic hierarchies specific to ecology, geography, and spatial planning, including the diversity, as understood by each discipline, and its spatial levels.

- Based on these structural correspondences, the theory looks also at the functions of ecological, geographical and socio-spatial systems, and proposes a coupled mechanism of the joint dynamics of natural and man-dominated systems, of diversity (analyzed at multiple spatial scales) based on the concept of primary eco-energy, also developed by Professor Ianoş (2000).
- The steps are also reflecting the spatial application of systemic analysis, through the reiteration of studies at different spatial scales in a trans-disciplinary approach. The geographical concept of “territorial systems” is analyzed from a theoretical and methodological ecological perspective.
- The term ‘*ecology*’ suggests also that the book focuses on environmental issues rather than addressing all pillars of sustainability (economic, social, cultural, and environmental).

The core concept of book is, like in the definition of sustainability, *integration*. The first principle of Rio Declaration states that “*human beings are at the centre of concerns for sustainable development*”. Human beings are also at the core of planning, and therefore sustainable planning has to address human needs, including, among others, the one for a healthy environment. Decades of negative experience have showed the negative consequences of favoring one component or another. Integration is manifested and achieved through:

- Recognition of all pillars of development (economic, social, environmental, and cultural) and their equal horizontal consideration when designing the sectoral strategies of development at each administrative level

- Integration of the policies of development for all administrative and territorial levels – international, national, regional, and local, manifested through vertical correlations between these levels

A concept subordinated to *integration* is '*system*'. The environment is a system, and human society and natural components are its subsystems. The *integration* means that development cannot favor one of the two components while disregarding the other one. The book is based on a full understanding of systems as *functional structures*; the integrity of a system includes the one of its components, of their relations, and of the functions of the system. In more detail, a complete understanding of systems includes their functions in addition to the classical definition of interrelated elements (emphasizing the two components, elements and relations). Systems are functional structure, and have an ultimate goal or endpoint, to which all other functions are subordinated. Moreover, in addition to the relationships between elements, systems are characterized by connections between their structure and functions:

- The structure of a system is adapted to carrying out its specific function
- Functions require in time an adaptation of structure, to the extent of disabling a different structure to carry out the same function.

In addition to the concepts and principles, the book introduces some instruments used in planning for a sustainable development. Of particular importance are Geographical Information Systems and Environmental Impact Assessment or Strategic Impact Assessment, seen as decision support systems and important instruments for urban and spatial planning, but also for territorial research. To illustrate their use, the book includes in the final chapter, in addition to the planning experience, results of the territorial research carried out at the

National Institute for Research and Development in Constructions, Urban Planning and Sustainable Territorial Development “URBAN-INCERC”, “Ion Mincu” University of Architecture and Urban Planning and the Interdisciplinary Center of Advanced Research on Territorial Dynamics. Although examples all come from Romania, their role is to illustrate the main concepts rather than shaping an overview of the Romanian particularities.

Even though synthetic, the book is designed to be read alone, and the same principle is applicable to each chapter. For this reason, each sub-chapter starts with a brief summary; the reader is advised to read it in order to decide whether the sub-chapter is of interest or not. Also, each chapter ends with a set of conclusions related to the planning relevance and implications of its content. In addition, similar to the Western style, other elements facilitate reading: the text is illustrated with images, charts and tables, with self-explanatory captions and thoroughly discussed in the text. In addition, examples are provided as much as possible; some brief examples are included in the text, but others are thoroughly discussed and placed in gray boxes.

Even though the book is first addressed to specialists, the main concepts of ecology are revisited in the first chapters, in order to familiarize professionals from other disciplines with the concepts and, most important, with the jargon of ecology. The book is a collection of apparently unrelated pieces; nevertheless, all together they constitute a theoretical and methodological framework for understanding the structural and functional organization of coupled socio-ecological complexes in a territorial setting, at multiple hierarchical levels, including the dynamic of their relationships (within and between).

All figures and tables were produced by the author, unless a different source is specified. Sometimes, they represent a mixture between the original and interventions made by the author.

The book also represents a synthesis of developments from the Bachelor Thesis “*Models for the sustainable development of cities*” (1997), the Doctoral Dissertation “*Geostatistical methods for the analysis of territorial systems*” (2011), and the Habilitation Thesis “*Application of spatial quantitative methods to study the dynamics of relations between socioeconomic and natural systems*” (written in 2013 and defended in 2014). It is natural to thank all advisors who have contributed to them: Dr. Liviu Dragomirescu, Dr. Cătălin Sârbu, Dr. Costel Negrei, Dr. Virgil Diaconu, Dr. Ioan Ianoș, Dr. Cristian Tălângă, Dr. Iuliana Armaș, Dr. Liviu Bogdan Vlad, Dr. Smaranda Bica, Dr. Marieta Costache and Dr. Daniel Göler have contributed with valuable suggestions to these theses. In addition to them, Dr. John Wanzer Drane, Dr. Alan Decho, Dr. Michael Fulton, Dr. Dwayne Porter and Dr. David Cowen provided comments to the doctoral dissertation (*Geostatistical approaches to microbial image quantification and classification* – 2004), which is also part of the book. Most important, the book benefited during the review process from direct comments from Dr. Vesselina Troeva and Dr. Cătălin Sârbu. I am thankful to all of them for the final form of the manuscript, substantially improved from its primary stages.

I hope that the readers of “*Ecology & Sustainability of Territorial Systems*” will find its practical utility in designing plans that are well grounded from a theoretical standpoint, and could benefit upon some of the methodological instruments being discussed.

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