ISBN: 978-88-98533-01-5
DOI: 10.13133/978-88-98533-01-5

Secoa

URBAN COASTAL AREA CONFLICTS ANALYSIS METHODOLOGY

Human mobility, climate change and local sustainable development

edited by
Armando Montanari

SAPIENZA
UNIVERSITÀ EDITRICE

digiLab
ricerca e servizi

Collezione di "Testi e Studi Umanistici"

Serie
Letterature, linguaggi e culture

SECOA, 5

The research leading to these results has received funding from the European Community's Seventh Framework Program FP7/2007-2013 under grant agreement n° 244251

SECOA BOARD

Editor:

Armando Montanari, Sapienza University of Rome

Editorial Board:

Karl Bruckmeier, University of Gothenburg, Sweden

Riccardo Carelli, Sapienza Innovazione, Italy

Eric Corijn, Vrije Universiteit Brussel, Belgium

Jo Foord, London Metropolitan University, United Kingdom

Tran Dinh Lan, Institute of Marine Environment and Resources, Vietnam

Eran Razin, Hebrew University of Jerusalem, Israel

José Manuel Simões, IGOT – University of Lisbon, Portugal

Vishwas Kale, University of Pune, India

Allan Williams, University of Surrey, United Kingdom

URBAN COASTAL AREA CONFLICTS ANALYSIS METHODOLOGY

HUMAN MOBILITY, CLIMATE CHANGE AND LOCAL SUSTAINABLE DEVELOPMENT

Edited by
Armando Montanari

SAPIENZA
UNIVERSITÀ EDITRICE

digiLab
ricerca e servizi

2013

SECOA FP7 Research Project is published by **Casa Editrice Università La Sapienza**

Published online in **2013**

The copyediting is by **Digital Publishing Division of DigiLab**

(Centro interdipartimentale di ricerca e servizi) – La Sapienza Università di Roma

Managing editor: **Gianfranco Crupi**

Copyediting and Layout editor: **Ivan Macculi**

Graphics of book cover: **Mariella Scelsi**

SAPIENZA
UNIVERSITÀ EDITRICE

This work is licensed under a Creative Commons Attribution 3.0 License

DOI: http://dx.doi.org/10.13133/978-88-98533-01-5

Table of Contents

Table of Contents 7

Editor's Preface to the Series 11

CHAPTER 0. Introduction 15

1. Introduction 16
2. References 21

CHAPTER 1. Logic and Semantics of Computational Models for the Analysis of Complex Phenomena. Analytical Archaeology of Artificial Adaptive Systems. 23

1. Introduction. The Encoding of Cognitive Principles and Spatial Complexity 24
2. Building Rules for the Analysis of Spatial Behaviour 30
3. Models for the Comparison of Spatial Behaviour 33
4. Cognitive and spatial behavioural logic 38
5. Conclusions: Analytical Archaeology of Complex Phenomena 46
6. References 48

CHAPTER 2. GIS and SOM Application in Different Scientific Areas 55

1. An Introduction to GIS and SOM 56
2. Applications 58
3. Modelling: a general overview 59
4. Idealization Procedure 61
5. Approximation and Similarity 61
6. Models of Data 62
7. Mathematical Models 63
8. Choice of the Model 64
9. Formulas Versus Reality 65
10. Models and Theories 66
11. Selected Bibliography 67

CHAPTER 3. Interpreting Local Issues in a Global Context: International Comparative Analysis and Coastal Urban Areas 77

1. Introduction 78
2. Cross-national Comparative Research. Methodological Issues, Theories, Organisation and Management 80
    2.1. From single cultures to a multidisciplinary approach 80

2.2 Why compare? The problems of cross-national and multicultural analysis in the natural and social sciences 84
2.3. The pros and cons of cross-national, multidisciplinary comparative research 87
2.4. Coastal areas 91
2.5 Urban areas: Scientific discussions in the 1970s and 1980s 92
2.6. Urban areas at the heart of the debate on environmental resources 95
2.7. The process of urbanisation: The market economy and central planning 98
2.8. Urban models as an instrument of a sustainable future 104
3. Cross-national comparative research: the SECOA project. Data analysis and interpretation for taxonomy and modelling 122
3.1 SECOA: The basis for comparative analysis 122
3.2 The information chain 126
3.3. The application of GIS and SOM in different scientific fields 131
3.4. The taxonomy for the SECOA space and conflicts: methodology 135
3.5. Modelling methodology: A few preliminary concepts 138
3.6. The method used 142
3.7. Conclusions 146
4. References 147
CHAPTER 4. SECOA Territories and Conflicts: Data Dilemmas 155
1. Introduction 156
2. Places, Regions, and Territories 156
3. Conflicts and Contrasts 158
4. Places and conflicts in SECOA 160
5. Descriptive and explanatory variables in SECOA 171
6. Conclusion 175
7. References 176
CHAPTER 5. Neural Networks for Multidisciplinary Approach Research 179
1. Overview: Non-linear Systems and Connectionism 180
1.1. Introduction 180
1.2. Linear and Non-linear Systems 181
1.3. Predictable Systems 191
1.4. Connectionism and Complexity 194
1.5. The SECOA System 196
2. Reductionist Approach: The Neuron Model 199

2.1. Introduction 199
2.2. The Biological Neuron 201
2.3. Activation Function, Bias and Synaptic Weights 206
2.4. Static and Dynamic Neurons 211
3. Putting Neurons Together: The Networks 213
3.1. The Beginnings: Perceptron 213
3.2. Storing and retrieving information. 221
3.3. Classification and Generalization. 226
3.4. Types of Neural Networks 228
4. Self-Organizing Maps: A New Method to Extract Similarities 231
4.1. Topological Maps 231
4.2. The Winner-Takes-All Mechanism 234
4.3. The Kohonen map 237
5. The Feed-Forward Networks: Strategies for Modelling 243
5.1. Training Algorithms 243
5.2. Feed-Forward neural networks: Structure and training 248
5.3. Operative Training Techniques and Analyses. 257
6. Conclusion 259
7. References 261
CHAPTER 6. GIS Data and Territorial Management Approach 265
1. Territorial Analyses and Multidisciplinary Research 266
2. Managing Heterogeneous Datasets 267
3. From GIS to ANN and Back Again 272
4. Masking the Areas of Interest 275
5. Empirical Results and their Evaluation on Maps 277
CHAPTER 7. Application of Artificial Neural Networks to SECOA Project 279
1. SECOA Taxonomy: Application of Local and Global SOM 280
1.1. Introduction 280
1.2. SOM and GIS Raster Data 281
1.3. SOM's SOM and GIS 284
1.4. SOM: Asian and Funchal Macro-areas Data 287
1.5. Conflicts: Description of SOM Outcomes 292
2. SECOA Modelling: A Feed-Forward Multilayer Perceptron approach 299

2.1. Structure of SECOA data for modelling 299
2.2. Modelling SECOA data: A Feed-Forward neural network algorithm 304
2.3. Experimental results 306
2.4. Test analysis 312
3. Analysis of SECOA modelling: Trend Analysis 316
4. Conclusion 319
Annex to Chapter 7. 320
CHAPTER 8. SECOA Territories and Processes: an Attempt of Conflicts' Interpretation 369
1. Introduction 370
2. A classification of Territories 370
2.1 The EU regions 370
3. A Classification of Conflicts 380
4. An Attempt to Interpret Territories and Conflicts. 381
5. Conclusion 383
CHAPTER 9. General Conclusions 385
1. Conclusions 386
List of Tables 389
List of Figures 392