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Oswaldo Gervasi · Beniamino Murgante
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David Taniar · Bernady O. Apduhan
Eufemia Tarantino · Yeonseung Ryu (Eds.)

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Proceedings, Part V

5
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Editors


Oswaldo Gervasi 
University of Perugia
Perugia, Italy

Beniamino Murgante 
University of Basilicata
Potenza, Italy

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Covenant University
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Eufemia Tarantino 
Politecnico di Bari
Bari, Italy

Yeonseung Ryu 
Myongji University
Yongin, Korea (Republic of)

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Preface

These multiple volumes (LNCS volumes 10960–10964) consist of the peer-reviewed papers presented at the 2018 International Conference on Computational Science and Its Applications (ICCSA 2018) held in Melbourne, Australia, during July 2–5, 2018.

ICCSA 2018 was a successful event in the International Conferences on Computational Science and Its Applications (ICCSA) conference series, previously held in Trieste, Italy (2017), Beijing, China (2016), Banff, Canada (2015), Guimaraes, Portugal (2014), Ho Chi Minh City, Vietnam (2013), Salvador, Brazil (2012), Santander, Spain (2011), Fukuoka, Japan (2010), Suwon, South Korea (2009), Perugia, Italy (2008), Kuala Lumpur, Malaysia (2007), Glasgow, UK (2006), Singapore (2005), Assisi, Italy (2004), Montreal, Canada (2003), and (as ICCS) Amsterdam, The Netherlands (2002) and San Francisco, USA (2001).

Computational science is a main pillar of most current research and industrial and commercial activities and it plays a unique role in exploiting ICT innovative technologies. The ICCSA conference series has been providing a venue to researchers and industry practitioners to discuss new ideas, to share complex problems and their solutions, and to shape new trends in computational science.

Apart from the general tracks, ICCSA 2018 also included 33 international workshops, in various areas of computational sciences, ranging from computational science technologies, to specific areas of computational sciences, such as computer graphics and virtual reality. The program also featured three keynote speeches.

The success of the ICCSA conference series, in general, and ICCSA 2018, in particular, is due to the support of many people: authors, presenters, participants, keynote speakers, session chairs, Organizing Committee members, student volunteers, Program Committee members, International Advisory Committee members, International Liaison chairs, and people in other various roles. We would like to thank them all.

We would also like to thank Springer for their continuous support in publishing the ICCSA conference proceedings and for sponsoring some of the paper awards.

July 2018

David Taniar
Bernady O. Aduhan
Osvaldo Gervasi
Beniamino Murgante
Ana Maria A. C. Rocha

Approximation Problems for Digital Image Processing and Applications

Gianluca Vinti

Department of Mathematics and Computer Science,
University of Perugia, Italy

Abstract. In this talk, some approximation problems are discussed with applications to reconstruction and to digital image processing. We will also show some applications to concrete problems in the medical and engineering fields. Regarding the first, a procedure will be presented, based on approaches of approximation theory and on algorithms of digital image processing for the diagnosis of aneurysmal diseases; in particular we discuss the extraction of the pervious lumen of the artery starting from CT image without contrast medium. As concerns the engineering field, thermographic images are analyzed for the study of thermal bridges and for the structural and dynamic analysis of buildings, working therefore in the field of energy analysis and seismic vulnerability of buildings, respectively.

Short Bio Gianluca Vinti is Full Professor of Mathematical Analysis at the Department of Mathematics and Computer Science of the University of Perugia. He is Director of the Department since 2014 and member of the Academic Senate of the University. Member of the Board of the Italian Mathematical Union since 2006, member of the “Scientific Council of the GNAMPA-INdAM “(National Group for the Mathematical Analysis, the Probability and their Applications) since 2013, Referent for the Mathematics of the Educational Center of the “Accademia Nazionale dei Lincei” at Perugia since 2013 and Member of the Academic Board of the Ph.D. in Mathematics, Computer Science, Statistics organized in consortium (C.I.A.F.M.) among the University of Perugia (Italy), University of Florence (Italy) and the INdAM (National Institute of High Mathematics).

He is and has been coordinator of several research projects and he coordinates a research team who deals with Real Analysis, Theory of Integral Operators, Approximation Theory and its Applications to Signal Reconstruction and Images Processing.

He has been invited to give more than 50 plenary lectures at conferences at various Universities and Research Centers. Moreover he is author of more than 115 publications on international journals and one scientific monography on “Nonlinear Integral Operators and Applications” edited by W. de Gruyter. Finally he is member of the Editorial Board of the following international scientific journals: Sampling Theory in Signal and Image Processing (STSIP), Journal of Function Spaces and Applications, Open Mathematics, and others and he holds a patent entitled: “Device for obtaining informations on blood vessels and other bodily-cave parts”.

Contents – Part V

Workshop Cities, Technologies and Planning (CTP 2018)

Spatial Data Analysis and Evaluation by Urban Planners of a PPGIS Experiment Performed in Porto Alegre, Brazil	3
<i>Geisa Bugs</i>	
A GIS-Based Method to Assess the Pedestrian Accessibility to the Railway Stations	19
<i>Gabriele D’Orso and Marco Migliore</i>	
Urban Regeneration for a Sustainable and Resilient City: An Experimentation in Matera	31
<i>Piergiuseppe Pontrandolfi and Benedetto Manganelli</i>	
Internal Areas and Smart Tourism. Promoting Territories in Sardinia Island	44
<i>Silvia Battino, Ginevra Balletto, Giuseppe Borruso, and Carlo Donato</i>	
Gentrification and Sport. Football Stadiums and Changes in the Urban Rent	58
<i>Ginevra Balletto, Giuseppe Borruso, Francesco Tajani, and Carmelo M. Torre</i>	
ALARP Approach for Risk Assessment of Civil Engineering Projects	75
<i>Gianluigi De Mare, Antonio Nesticò, Renato Benintendi, and Gabriella Maselli</i>	
Smart Block EAN: Ten Scalable Initiatives for a Smart City	87
<i>Alix E. Rojas, Camilo Mejía-Moncayo, and Leonardo Rodríguez-Urrego</i>	
Spatial Indicators to Evaluate Urban Fragmentation in Basilicata Region	100
<i>Lucia Saganeiti, Angela Pilogallo, Francesco Scorza, Giovanni Mussuto, and Beniamino Murgante</i>	
Increasing the Walkability Level Through a Participation Process	113
<i>Raffaella Carbone, Lucia Saganeiti, Francesco Scorza, and Beniamino Murgante</i>	

Workshop Defense Technology and Security (DTS 2018)

VM-CFI: Control-Flow Integrity for Virtual Machine Kernel Using Intel PT	127
<i>Donghyun Kwon, Jiwon Seo, Sehyun Baek, Giyeol Kim, Sunwoo Ahn, and Yunheung Paek</i>	
Study on Classification of Defense Scientific and Technical Information in Korea	138
<i>Ara Hur and Yeonseung Ryu</i>	
A FPGA-Based Scheme for Protecting Weapon System Software Technology	148
<i>Minhae Jang, Yeonseung Ryu, and Hyunkyoo Park</i>	
Conceptualization of Defense Industrial Security in Relation to Protecting Defense Technologies	158
<i>Heungsoon Park, Heejae Go, and Jonghyeon Hwang</i>	
Secure Cluster-Wise Time Synchronization in IEEE802.15.4e Networks	170
<i>Wei Yang, Zhixiang Lai, JuanJuan Zheng, Yugen Yi, and Yuanlong Cao</i>	
Defense Technology Security Education Status	183
<i>Hyoungh-ryoul Cho</i>	
Multi-lateral Cybersecurity Cooperation for Military Forces in the Digital Transformation Era	193
<i>Hyun Kyoo Park, Wootack Lee, Zinkyung Ha, and Namhee Park</i>	
A Study on the Weapon System Software Reliability Prediction and Estimation Process at the Software Development Phase	205
<i>In Soo Ryu and Suk Jae Jeong</i>	
Decentralized Message Broker Federation Architecture with Multiple DHT Rings for High Survivability	218
<i>Minsub Kim, Minho Bae, Sangho Yeo, Gyudong Park, and Sangyoon Oh</i>	
Method to Judge the Coupling State of the Resonator in the Q-Factor Measurement	227
<i>Hai Zhang</i>	
An Efficient Transmission Approach for Information-Centric Based Wireless Body Area Networks	236
<i>Longzhe Han, Yi Bu, Xin Song, and Jia Zhao</i>	
Efficiencies in Binary Elliptic Curves	246
<i>Scott T. E. Hirschfeld, Lynn M. Batten, and Mohammed K. I. Amain</i>	

Workshop Geomatics for Resource Monitoring and Control (GRMC 2018)

A Low Cost Methodology for Multispectral Image Classification 263
Michele Mangiameli, Giuseppe Mussumeci, and Alessio Candiano

Low-Altitude UAV-Borne Remote Sensing in Dunes Environment:
 Shoreline Monitoring and Coastal Resilience 281
Gabriella Caroti, Andrea Piemonte, and Yari Pieracci

Calibration of CLAIR Model by Means of Sentinel-2 LAI Data for
 Analysing Wheat Crops Through Landsat-8 Surface Reflectance Data 294
Giuseppe Peschechera and Umberto Fratino

Multi-image 3D Reconstruction: A Photogrammetric and Structure
 from Motion Comparative Analysis 305
*Grazia Caradonna, Eufemia Tarantino, Marco Scaioni,
 and Benedetto Figorito*

Investigation of a Flood Event Occurred on Lama Balice, in the Context
 of Hazard Map Evaluation in Karstic-Ephemeral Streams 317
*Vito Iacobellis, Audrey M. N. Martellotta, Andrea Gioia, Davide Prato,
 Vincenzo Totaro, Rocco Bonelli, Gabriella Balacco,
 and Alisa A. M. G. Esposito*

Flood Susceptibility Evaluation on Ephemeral Streams of Southern Italy:
 A Case Study of Lama Balice 334
*Andrea Gioia, Vincenzo Totaro, Rocco Bonelli, Alisa A. M. G. Esposito,
 Gabriella Balacco, and Vito Iacobellis*

Static and Kinematic Surveys Using GNSS Multi-constellation Receivers
 and GPS, GLONASS and Galileo Data 349
*Raffaella Cefalo, Antonio Novelli, Tatiana Sluga, Paolo Snider,
 Eufemia Tarantino, and Agostino Tommasi*

Geometric Accuracy Evaluation of Geospatial Data Using Low-Cost
 Sensors on Small UAVs 364
Mirko Saponaro, Eufemia Tarantino, and Umberto Fratino

Fire Risk Estimation at Different Scales of Observations:
 An Overview of Satellite Based Methods 375
*Rosa Lasaponara, Angelo Aromando, Gianfranco Cardettini,
 and Monica Proto*

8th International Symposium on Software Quality (ISSQ 2018)

Developer Focus: Lack of Impact on Maintainability	391
<i>Csaba Faragó and Péter Hegedűs</i>	
Software Reliability Assessment Using Machine Learning Technique	403
<i>Ranjan Kumar Behera, Suyash Shukla, Santanu Kumar Rath, and Sanjay Misra</i>	
Quantitative Quality Assessment of Open Source Software by Considering New Features and Feature Improvements	412
<i>Kamlesh Kumar Raghuvanshi, Meera Sharma, Abhishek Tandon, and V. B. Singh</i>	
A Framework for Quality Measurement of BPMN Process Models	424
<i>Anacleto Correia, António Gonçalves, and Mário Simões-Marques</i>	
Feature Level Complexity and Coupling Analysis in 4GL Systems	438
<i>András Kicsi, Viktor Csuvik, László Vidács, Árpád Beszédes, and Tibor Gyimóthy</i>	
A Case Study on Measuring the Size of Microservices	454
<i>Hulya Vural, Murat Koyuncu, and Sanjay Misra</i>	
A Hands-on OpenStack Code Refactoring Experience Report	464
<i>Gábor Antal, Alex Szarka, and Péter Hegedűs</i>	
Teaching Database Design and Analysis in an Effective Way on Digital Platform and Its Effect on Society	481
<i>Uma Maheswari Sadasivam and Chamundeswari Arumugam</i>	
Study of Various Classifiers for Identification and Classification of Non-functional Requirements	492
<i>László Tóth and László Vidács</i>	

Workshop Smart Factory Convergence (SFC 2018)

A Hybrid Rule-Based and Fuzzy Logic Model to Diagnostic Financial Area for MSMEs	507
<i>Germán Méndez Giraldo, Eduyn López-Santana, and Carlos Franco</i>	
A Novel Cloud-Fog Computing Network Architecture for Big-Data Applications in Smart Factory Environments	520
<i>Dae Jun Ahn, Jongpil Jeong, and Sunpyo Lee</i>	

**Workshop Theoretical and Computational Chemistry
and Its Applications (TCCA 2018)**

The ECTN Virtual Education Community Prosumer Model for Promoting and Assessing Chemical Knowledge	533
<i>Antonio Laganà, Osvaldo Gervasi, Sergio Tasso, Damiano Perri, and Francesco Franciosa</i>	
A Circular Economy Proposal on CO ₂ Reuse to Produce Methane Using Energy from Renewable Sources	549
<i>Antonio Laganà and Lorenzo di Giorgio</i>	
Nitrogen Gas on Graphene: Pairwise Interaction Potentials	563
<i>Jelle Vekeman, Noelia Faginas-Lago, Inmaculada G. Cuesta, José Sánchez-Marín, and Alfredo Sánchez De Merás</i>	
Confinement of the Pentanitrogen Cation Inside Carbon Nanotubes	579
<i>Stefano Battaglia, Stefano Evangelisti, Thierry Leininger, and Noelia Faginas-Lago</i>	
Potential Energy Surface for the Interaction of Helium with the Chiral Molecule Propylene Oxide	593
<i>Patricia R. P. Barreto, Alessandra F. Albermaz, Vincenzo Aquilanti, Noelia Faginas-Lago, Gaia Grossi, Andrea Lombardi, Federico Palazzetti, and Fernando Pirani</i>	
<i>First-Principles</i> Molecular Dynamics and Computed Rate Constants for the Series of OH-HX Reactions (X = H or the Halogens): <i>Non-Arrhenius</i> Kinetics, Stereodynamics and Quantum Tunnel	605
<i>Nayara D. Coutinho, Vincenzo Aquilanti, Flávio O. Sanches-Neto, Eduardo C. Vaz, and Valter H. Carvalho-Silva</i>	

Workshop Parallel and Distributed Data Mining (WPDM 2018)

Parallel Mining of Correlated Heavy Hitters	627
<i>Marco Pulimeno, Italo Epicoco, Massimo Cafaro, Catiuscia Melle, and Giovanni Aloisio</i>	
An Innovative Framework for Supporting Frequent Pattern Mining Problems in IoT Environments	642
<i>Peter Braun, Alfredo Cuzzocrea, Carson K. Leung, Adam G. M. Pazdor, Syed K. Tanbeer, and Giorgio Mario Grasso</i>	
An Innovative Architecture for Supporting Cyber-Physical Security Systems	658
<i>Alfredo Cuzzocrea, Massimiliano Nolich, and Walter Ukovich</i>	

Workshop Sustainability Performance Assessment: Models, Approaches and Applications Toward Interdisciplinary and Integrated Solutions (SPA 2018)

Integrated SDSS for Environmental Risk Analysis in Sustainable Coastal Area Planning.	671
<i>Michele Greco, Giovanni Martino, Annibale Guariglia, Lucia Trivigno, Vito Sansanelli, Angela Losurdo, and Giovanni Mussuto</i>	
A Review of Residential Water Consumption Determinants	685
<i>Nguyen Bich-Ngoc and Jacques Teller</i>	
Carbon Stock as an Indicator for the Estimation of Anthropic Pressure on Territorial Components	697
<i>Arianna Mazzariello, Angela Pilogallo, Francesco Scorza, Beniamino Murgante, and Giuseppe Las Casas</i>	
Tourism Attractiveness: Main Components for a Spacial Appraisal of Major Destinations According with Ecosystem Services Approach	712
<i>Angela Pilogallo, Lucia Saganeiti, Francesco Scorza, and Giuseppe Las Casas</i>	
Using Open Data and Open Tools in Defining Strategies for the Enhancement of Basilicata Region.	725
<i>Raffaella Carbone, Giovanni Fortunato, Giovanna Pace, Emanuele Pastore, Luciana Pietragalla, Lydia Postiglione, and Francesco Scorza</i>	
From the UN New Urban Agenda to the Local Experiences of Urban Development: The Case of Potenza.	734
<i>Giuseppe Las Casas and Francesco Scorza</i>	
The Role of Intermediate Territories for New Sustainable Planning and Governance Approaches. Criteria and Requirements for Determining Multi-municipal Dimension: South Italy Case.	744
<i>Piergiuseppe Pontrandolfi and Antonella Cartolano</i>	
Investigating Good Practices for Low Carbon Development Perspectives in Basilicata.	763
<i>Alessandro Attolico, Rosalia Smaldone, Francesco Scorza, Emanuela De Marco, and Angela Pilogallo</i>	
Author Index	777



The Role of Intermediate Territories for New Sustainable Planning and Governance Approaches. Criteria and Requirements for Determining Multi-municipal Dimension: South Italy Case

Piergiuseppe Pontrandolfi^(✉) and Antonella Cartolano

University of Basilicata DICEM, Matera, Italy
piergiuseppe.pontrandolfi@gmail.com, anto.cartolano@gmail.com

Abstract. In a context like the Italian one, in which the pulverization of Municipalities, the hyper-territorialization and the inadequacy of the current administrative network are the cause of ineffective and inefficient public policies, the paper investigates the close relationship between institutional and economic-territorial policies, through a comprehensive re-reading of the system of the organization of local authorities in Italy aimed, on the basis of some reading and interpretation criteria adopted, to identify more relevant territorial morphologies to ensure more advanced and effective forms of representation and government. The aim is to experiment with a possible methodology for reading the territories able to respond to the need to adapt the territorial structure of local authorities to the new challenges of modernity and economic-productive innovation and to the rescaling induced by globalization. A contribution to the process, still in progress, on the rules and principles according to which municipalities should join in functional, areas or networks, able to govern territories and promote conditions of greater sustainability in local development processes (1).

Keywords: Planning · Governance · Territory

1 Introduction

In a national regulatory scenario that is increasingly pushing towards the promotion of aggregative and centralizing logics, the contribution asks about the possible effects of this legislative trend on territorial governance and, in particular, on the planning and development policies of territories in the absence of guiding criteria that may accompany this now irreversible process. A process that cannot be driven by the need to rationalise public spending alone and cannot be anchored in purely quantitative terms, given that public policies are not indifferent to the “geographical perimeter” to which they refer, even more so if the theme of comparison is the government of the territory.

On the one hand the “pulverization of Municipalities” and on the other the phenomenon of “hyper-territorialization” [2], produce a “geographical short-circuit” that hinders the effectiveness of actions and functions, direct or indirect, placed on the local authorities [3], with an increase in the economic/territorial imbalances, aggravated by

the existence of multiple and diversified models of organization of the geographical space [4].

Hence the need for a comprehensive redesign of the institutional architecture that moves in the direction of accompanying current territorial and urban dynamics towards institutional forms and instruments of territorial government that are more responsive to the new challenges to which public action must respond, imagining therefore, new forms of organization and extension of various territorial entities and most appropriate instruments of governance.

However, it should be noted that a certain mismatch between territorial dynamics and political-administrative partitions is inevitable. In fact, the territory is articulated in institutional regions, and it means however to claim to contain within a defined boundaries a complex, dynamic and evolving system of spatial relations. Despite this it is also true that political-administrative action gains in effectiveness when its territorial “cut-out” corresponds to that of functional regions; just as it is also true that the latter, in turn, to some extent are modelled also with references to the spatial distribution of the network of collective services, infrastructures and other structuring factors that depend on the decisions and funding of the public administration [1].

It is a matter of configuring a more appropriate institutional framework that represents the “hard core” of policies and projects, capable of producing sedimentations and cumulative processes [5], even in the recognition of “variable geometry” strategies, policies and actions [6, 7].

It is obvious how the affirmation of new spaces of government has a direct impact on the operational instruments of planning, programming [8] and the management of territories at all levels, thus representing further key elements of reflection.

It is a matter of crossing boundaries with respect to their limited operativeness, in order to establish network relationships with other territorial interlocutors, through the search for new crystals for the interpretation of regional and sub-regional areas, more suitable to respond to the peculiarities of the territories and to the strategies and policies implemented.

It is demonstrated, in fact, how today’s “administrative cropping” differs significantly from the actual economic-political geography of the country [3].

Experimentation of new territorial organizations, the proliferation of soft spaces resulting from past planning seasons and sectoral policies, obligation of the associated management of services - even though they are manifestations of awareness of the importance and need to act on a more coherent scale to that of territorial and urban dynamics coinciding with the multi-communal dimension in its different configurations - highlight strong operational limits that hinder the effective recognition of optimal relevant areas, both for an effective and efficient reorganization of local services and for the promotion of credible local development policies and programmes.

Indeed, understanding necessary prerequisites for policies to take shape in a stable way in territories is itself a strategic step. Spatial organization of the Italian territory - characterized by a preponderance of small centres that, in many cases, suffer from limited accessibility to services - is a strategic key to the priority intervention for the relaunch of the entire country.

Therefore, starting from this close link between territorial and political spheres, an important part of the work focuses on the research of possible criteria to be adopted for the identification of multi-municipal areas, functional to the management and implementation of development strategies and territorial rebalancing.

2 Criteria and Requirements for Determining Multimunicipal Dimension

As already observed in previous studies [8, 9], rather than methodologies in the strict sense, it seems more correct to speak of “analytical strategies” that - starting from some initial premises and based on subsequent steps - outline an operational path of identification of “pertinent” spatial areas starting from clear objectives.

“Multi-step” strategies that involve a more “selective” treatment of informations, in relation to characteristics of examined territory and leaving a relatively wide border to interpretative interventions of the analyst.

The identification of possible “relevant” multi-municipal geographies took place through a series of criteria that accompanied, in successive steps, the reading of the territories. On the basis of the performance objectives for the multi-municipal morphologies to be identified and their functioning, a minimum set of criteria has been identified for the identification of different kinds of multi-municipal morphologies which, in the first instance, represent the areas in which the territories, through a voluntary process shared from below, must recognize their own identity and functional unity.

Multi-municipal morphologies are identified on the basis of the recognition of characters and conditions capable, theoretically at least, of meeting following objectives:

- to offer an adequate quality of life or guarantee the presence of a minimum endowment of services to person such that any development policy is not frustrated and that human permanence in the area is maintained;
- to harmonize transformation choices of the physical assets of the territories in a perspective that favours local development processes (assuming physical dimension of uses and transformations of the territory as an aspect not secondary to development policies);
- to represent a stable organizational and institutional structure with respect to development policies, without prejudicing possible opening up to multiple and variable geometries which flexible and adaptable planning and management tools can be connected to.

On the basis of these objectives, readings and interpretations of the elements that structure and characterize territories or which represent the main economic and territorial dynamics were made to carry out an applicative experimentation aimed at identifying different inter-municipal morphologies.

First reading concerned the presence of services (to individuals and companies) within the territory and their level of accessibility. The diversity of territories, in terms of equipment and infrastructure, requires a preliminary survey of the location of existing services and equipment, in order to preserve fixed assets where they exist and to enhance

their value to make them functional in responding to the demands and needs of less well-equipped neighbouring territories.

A second reading referred to the reconstruction of “planning territories” referring to past programming seasons and to the community in particular. This aspect, as reiterated for example in recent experimentation of Local Territorial Systems [6] and of the Urban Bioregions [10] is fundamental for the interpretation of the most recent territorial and economic dynamics. The network of actors, protagonists in various ways of promoting local strategies and projects, is a crucial aspect for understanding functioning of territories and for the implementation of development policies. The ability of territories to work together and experiences that have taken on a wider vision than the limited municipal dimension, refer, in the first instance, to the seasons of community planning (Territorial Pacts, PIT, PSL, Internal Areas strategy, etc.). These experiences help in understanding the heritage of existing relationships to consolidate/recover, develop, implement and eventually build shared visions of territorial development.

Furthermore, reading of physical characteristics of the territories, with reference to that set of “invariants” [10] that restore physiognomy of the territory and contribute to defining its identity.

In this sense, reading landscapes - as perceived by insular populations and whose character derives from the action of natural and/or human factors and their interrelations (European Landscape Convention Art. 1, letter a) - in addition to influencing the functionality of multi-municipal morphologies (think of the issue of accessibility), general rules of settlement and those of possible transformation of the physical assets of the territory, help to define sustainable and competitive territorial development models [11] and this is why they represent central elements in identification of entities at a pluri-municipal scale.

Each of the readings made has found operative support in the construction of cognitive and analytical frameworks specifically imagined in research or in consideration of studies, researches, analyses and elaborations already existing, considered and evaluated, within the work, according to the objectives set.

The readings made and subsequent interpretations and simulations were based on general interpretative rules defined upstream and during the process of experimental and gradual “identification” of groupings and aggregations.

Rules defined are the following:

1. groupings must present a certain degree of homogeneity;
2. groupings shall ensure that an appropriate level of spatial and functional interdependence is recognised;
3. groupings cannot overlap;
4. groupings may not present continuity solutions (they must be spatially contiguous);
5. the number of groupings must be limited;
6. the size of the groupings must reach (not exceed) an appropriate size threshold;
7. the internal accessibility of the groupings must meet certain requirements;
8. groupings must show a certain stability over time [5].

The interpretation work was based on a step-to-step reading that progressively crosses the different thematic readings made, trying to give a summary of the subsequent results achieved.

Before going into the operational description of the simulations performed, some further clarifications are necessary.

Criteria and rules applied and step-to-step methodology adopted were conceived for a possible operational experimentation in local contexts considered; hence need for a simple approach that could accompany the self-recognition process without, for this reason, giving up considering the complexity of the situations and contexts examined.

Proposed and tested methodology seeks to preserve a right balance between the operational immediacy of reading context and the complexity and number of variables to be considered, filling, at least in part, the data availability gap that is still recorded (with reference to example services, economic activities, internet coverage, etc...).

Experimentation area includes the southern peninsular regions, and in particular Campania, Puglia and Basilicata; Calabria was not considered for the objective difficulties in the recognition of data that prevented production of the same analyzes carried out for the other Regions.

The field of study is considerable interesting for several reasons. These include the presence of border areas in which interesting inter-regional dynamics are observed. Precisely the territory of Basilicata Region is representative of a reality in which internal dynamics are strongly conditioned by relations with other realities outside regional boundaries and in which there are consolidated processes of gravitations that currently do not find any administrative representativeness.

Another interesting element is represented by the diversity of the territorial contexts under study; we move from the metropolitan area of Naples, in the opinion of many the only true Italian metropolis, to several "internal areas" present in each region. Physical and structural characteristics of these three regions, in fact, implicate the need for a polycentric-reticular rebalancing of the territories.

Finally, the condition of peninsularity facilitates the definition of boundaries and stimulates its reading transversely to the Tyrrhenian and Ionian/Adriatic coastal roads.

3 Proposed Multi-municipal Reading for Campania, Puglia and Basilicata

First reading refers to the presence within considered territories of service supply, of mobility infrastructures and productive system, all strategic variables that characterize their structure and organization.

Spatial analysis of these facilities is aimed at identifying a territorial articulation capable of maximizing accessibility conditions for local population to use these services and consume goods; therefore, reference is made to policies for allocating resources, locating supply, organizing and developing communications [5].

Analytical reading of these different situations was preceded by a preliminary and essential survey of existing services and equipment, in order to identify areas with the highest concentration and those, on the contrary, less densely served.

The main objective was to identify Municipalities or groups of Municipalities that, due to the equipment and services offered and not having the characteristics of metropolitan centres or medium-sized cities, potentially lend themselves to being poly-attracts towards the adjacent Municipalities less gifted, or complementary poles. In this case, it is a question of identifying the specific group of Municipalities which, even if not territorially contiguous, generally have a certain amount of functional services for a larger territory.

Analysis carried out develops in following phases:

- selection and classification of main services;
- data recognition;
- data preparation;
- geolocation of services;
- elaboration of the concentration maps functional to territorial readings;
- identification of the poles.

In absence of a national inventory from which information about the presence of equipment and services could be obtained, a preliminary survey of the main existing services was carried out.

A fundamental first step was the discretization of essential services of citizenship or of the patrimony of services that must necessarily be offered to the local populations in order to guarantee a good quality of life and the permanency throughout them.

There are three questions and elements analysed functional to the identification of poles (of services): the presence of services to the population, the infrastructural facilities for mobility, the basic economic-productive system.

Each of three aspects has been described through a detailed survey and organization of available data, processed in order to obtain initial indications on the potential of territories in terms of services, infrastructures and production facilities.

The recognition of heritage of services has not been limited to the identification, within a municipality, of the presence of a specific equipment or service, but has gone so far as to geolocate acquired data.

In absence of a univocal database it was not possible to proceed with identification of all types of existing services (and which would deserve to be registered), just as it was not possible to proceed with a precise localization of services for entire national context (Fig. 1). Above services listed represent only those for which it was possible to make a survey through open-data banks and/or specific processing.

For this reason, for each category listed above, an in-depth analysis was carried out on web to identify official databases that present geolocalized data of services to be registered.

In other cases - that is, when the official portal of a specific service made available the list, in various forms, of addresses - addresses were extrapolated and processed before proceeding to next geolocation of the elements of interest.

Specifically, free bathgeo service was used to map and geolocate address lists.

Numerous difficulties encountered in acquisition and processing data did not particularly affect result. Scale of reference, suitable for analysis referring to a vast area, and the nature of analyses, which do not go into qualitative considerations, have involved

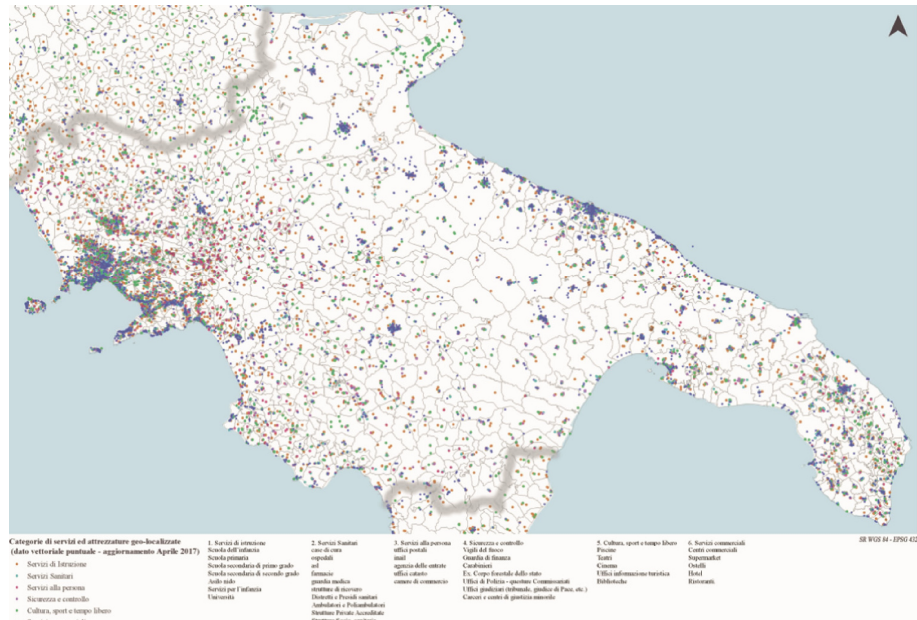


Fig. 1. Geolocation of services and equipment.

the fact that simple geolocation of services, together with a suitably evaluated classification, could represent a solid and valid starting point for conducting an analysis with a high degree of accuracy, useful for achieving significant results.

Subsequent to the operation of returning to map, and as these are point data, we proceeded to draw up a map of concentrations using the IT tools available in GIS environment (Fig. 2).

The objective was to identify the areas with the greatest concentration of services, starting from geolocalized data, in order to identify areas most equipped. The function used is that of “Kernel density” with a research radius of about 10 km.

Raster of personal and mobility services concentrations and of enterprises and production companies have been elaborated (Fig. 3), problem has been identified of the so-called “intermediate poles” represented by one or more municipalities in which there is a greater concentration of services and of mobility equipment and which have a greater liveliness in economic terms (in terms of significant presence of production facilities).



Fig. 2. Map of concentration services and equipment.

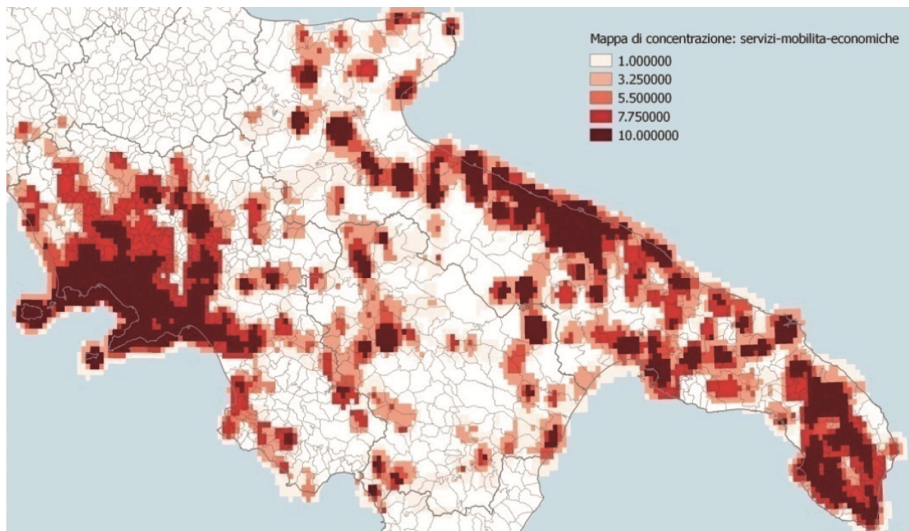


Fig. 3. Map of concentration of summary services - mobility - economic activities.

At this point, to determine the potential poles around which to construct multi-municipal morphologies, a threshold value was considered and established in 5 (mean value) (Fig. 4).

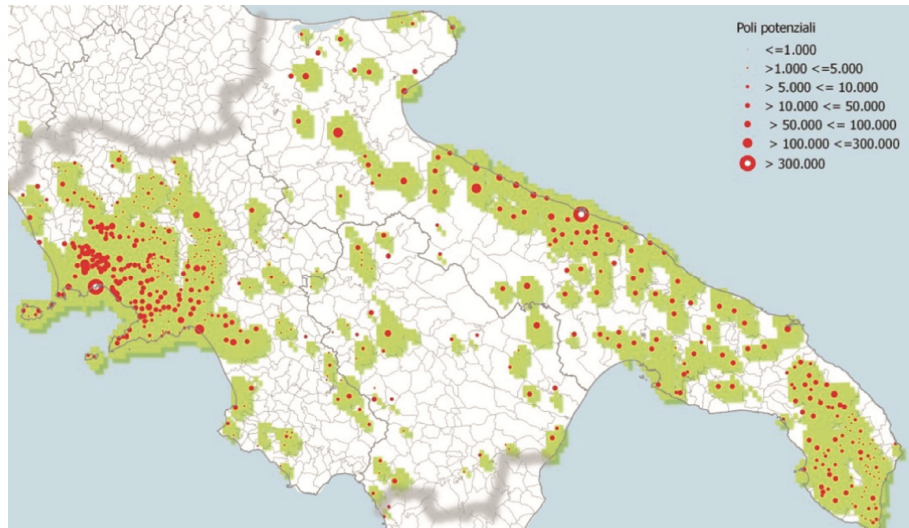


Fig. 4. Identification of potential poles with services concentration greater than the average placed value of 5.

Following elaborations carried out, there is a preliminary indication of areas that, for endowments of services, infrastructures for mobility and economic activities turn out to be potential poles, i.e. they possess the minimum characteristics to trigger gravitational processes, first of all affecting the less gifted neighbouring territorial realities.

Although the use of data may not be sufficiently representative of the actual conditions of the realities examined, it should however be noted that this method of reading allows first of all to identify potential elements that can be strengthened towards a polycentric and reticular organization of the territory [12].

Given this - and in order to define a first identification of multi-municipal morphologies from a purely functional point of view - theme of services, as previously discussed, has been associated with theme of accessibility.

The degree of accessibility, in fact, is one of the most effective criteria for assessing the influence that a “potential pole” has on a more or less vast surrounding territory. Considering therefore that “potential poles”, by definition assumed, have a higher endowment of services and such as to exert an influence and an attractive capacity with respect to the territory that surrounds them, accessibility, in terms of time needed to access the reference pole, measures the extent of this influence. Obviously this is only one of criteria that can be adopted and applied. To this criterion can be added the evaluation of flows, for reasons of work and study, as assumed by the analysis of Local Labor Systems developed in the follow-up of the research work.

The gravity areas of thus identified range from metropolitan areas to smaller centers, assuming, therefore, that each multi-municipal morphology has within it one or more main centers around which areas of influence and/or gravitation are generated [1].

On the basis of these considerations “poles”, as previously identified, have been preliminarily classified into 7 ranges, which identify their descending functional rank.

For each typology of poles accessibility isochrons have been calculated, divided into 10 min intervals and within the maximum limit of 40 min.

As already mentioned, just to take into account conditions of spatial proximity, a pole of lower rank - included in an area of influence in the maximum limit of 20 min - was not considered as a pole for the calculation of isochrones, considering it absorbed by area of influence of the potential pole of higher rank in whose limit isochron falls.

Furthermore, in areas where there is a high concentration of poles, belonging to the same rank, selection took place considering the most populous centre.

5 levels of isochrones were identified by maps elaborated with reference to poles of two metropolitan cities, the first level poles, the second level poles, the third level poles and finally the fourth level poles.

From representation of the isochrones immediately emerge as north of Campania, in addition to registering a high number of potential poles, it is also characterized by a favourable accessibility to them. An opposite situation is recorded in the north of Puglia, and in particular in the Gargano, where, in addition to registering a limited number of potential poles, a reduced accessibility to them is also noticeable, given the limited extent of the areas reached within 10 to 20 min (Fig. 5).

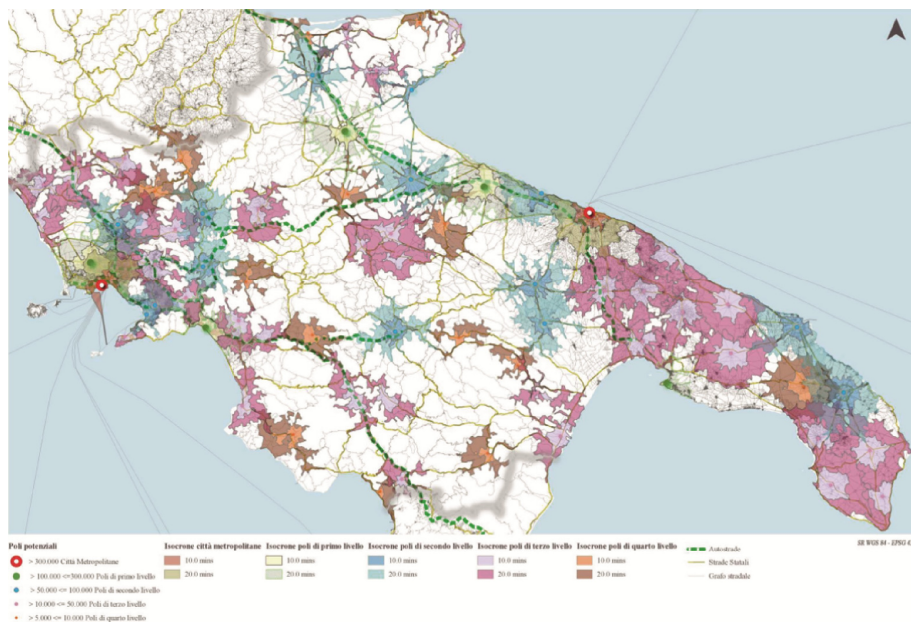


Fig. 5. Isochrone of potential poles.

Central and southern parts of Puglia are characterized by an easy accessibility with respect to the poles - as can be detected by large areas reachable within ten and twenty minutes - with a prevalence of third level poles, i.e. with a population between 10,000 and the 50,000 inhabitants.

Observing Basilicata Region and the south of Campania, it is immediately evident how limited the number of potential poles is, with an accessibility that is not always optimal. Starting from preliminary identification of areas of influence of the potential poles, we proceeded to the evaluation of possible pluri-municipal morphologies (Fig. 6). Deliberately, during the evaluation activity, regional and provincial limits were not taken into account, assuming single Municipality as the basic unit. Evaluation took place for subsequent cross-readings.

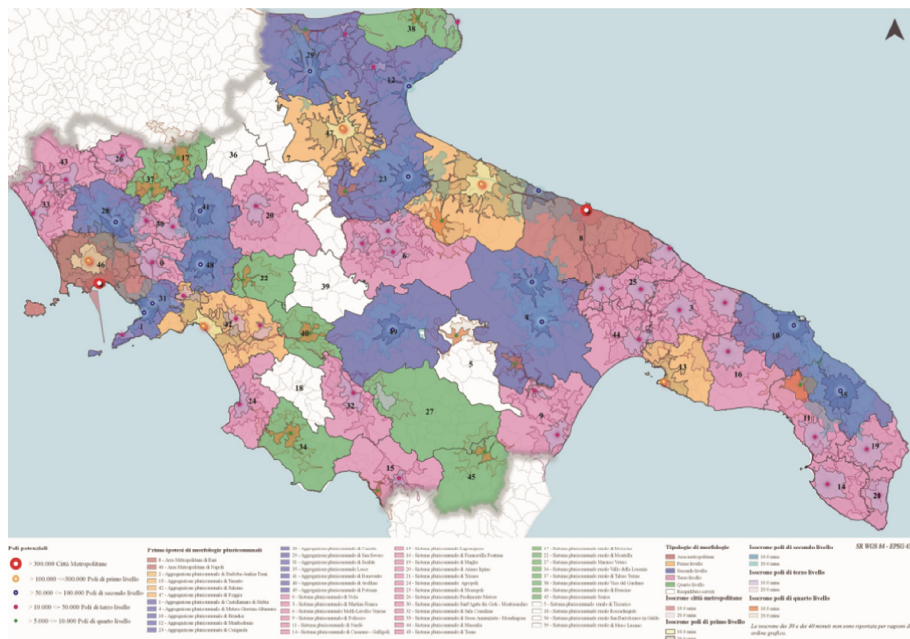


Fig. 6. First identification of pluri-municipal morphologies.

Generally speaking, and considering due exceptions, the number of Municipalities considered increases as the range of pole considered decreases. This for two orders of reasons, opposite but complementary:

- on the one hand, not to further streamline flows on already densely populated urban and/or metropolitan areas;
- on the other, aim to increase the critical mass (in terms above all of resident population) to increase efficiency in management of services as well as development opportunities in less densely populated areas.

Therefore, there are two objectives pursued in this preliminary perimeter: to lighten weight of metropolitan/urban areas by strengthening the innermost areas and imagining more structured and consolidated urban systems (as proposed by Archibugi in the definition of urban ecosystems).

Completed checks on the perimetrations of different morphologies, starting from poles and relative isochrones, we have found ourselves faced with areas without potential poles and not included in any area of influence of major centres. These areas, named as rebalancing of services, are those in which, presumably, condition of the absence of services and accessibility is more dramatic. These are border areas between Campania and Puglia, in the northern part of two regions, border areas between the Potentino and the Avellinese, areas of internal Cilento of Campania and those, finally, of a hinge between two provinces of Basilicata.

It should be noted that the main limit of the comparisons made is represented by the fact that various territorial readings, from time to time considered, are contained and limited, generally, within existing administrative, provincial and regional limits, not taking into account the particularity of border areas.

Conscious of this condition (institutionally imposed) we proceeded to cross-reading with:

- perimeters of Local Labor Systems to 2011 in order to take into account the commuting flows for work and study purposes contained within each SSL (Figs. 7 and 8);

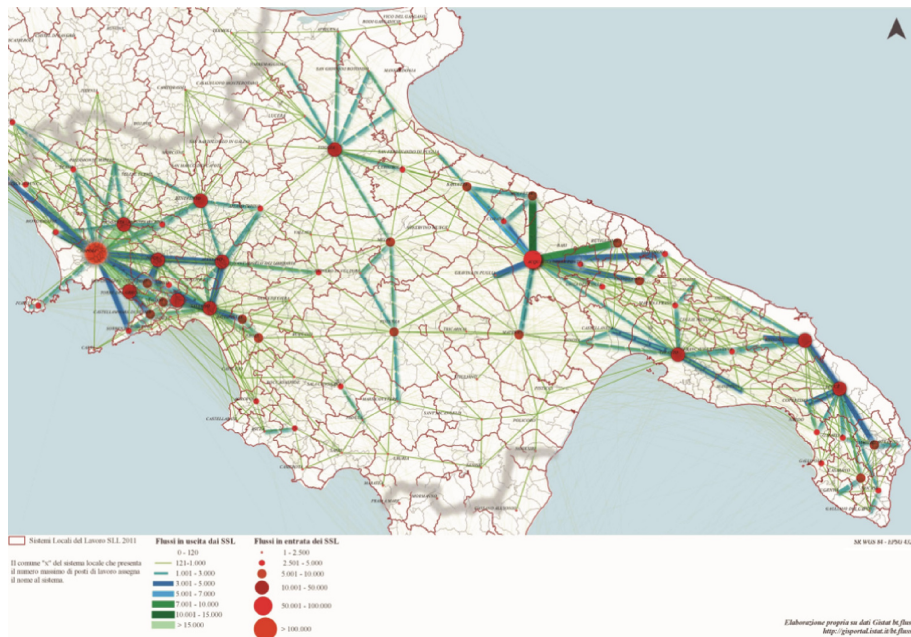


Fig. 7. Commuting flows for work and study purposes.

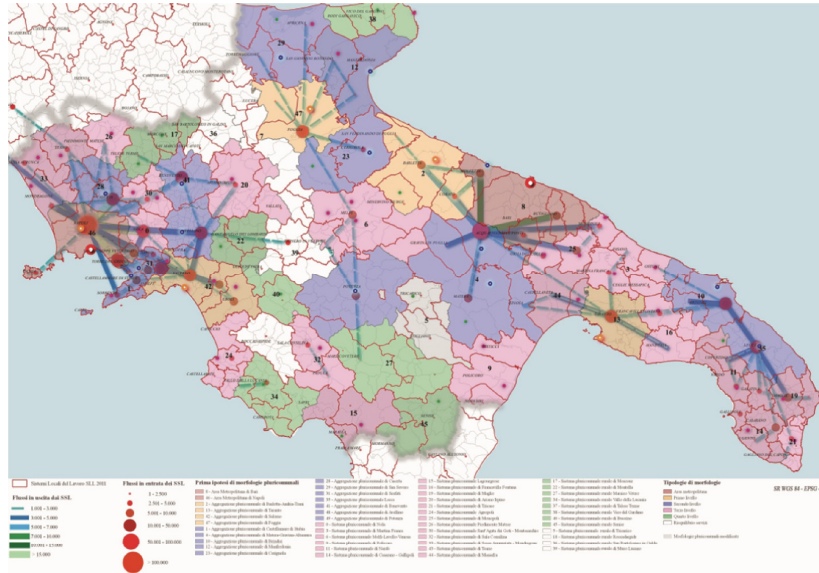


Fig. 8. Multi-municipal morphologies, commuting flows for work and study purposes and Local Labor Systems.

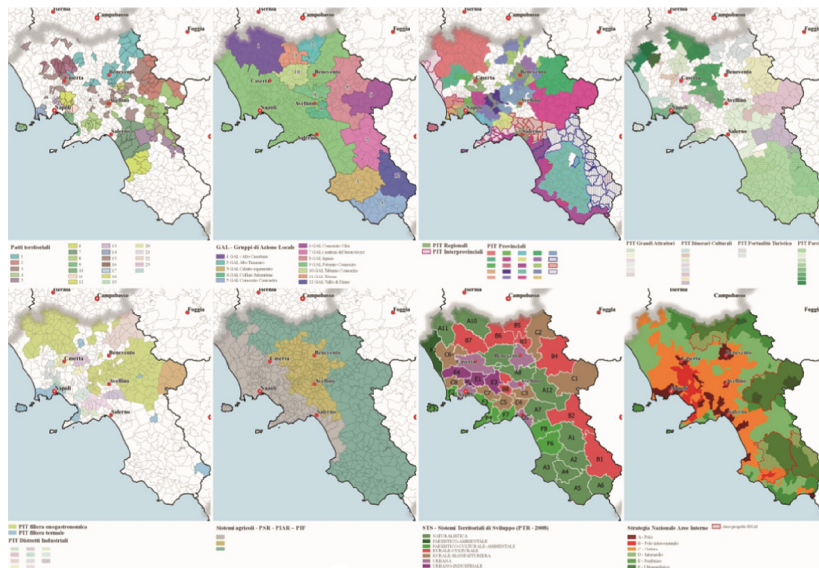


Fig. 9. Planning framework for the campania region.

- reading of territorial perimeters defined in the past programming seasons and of the multi-city scale configurations stratified over time, which help to intercept network

of local actors as learned in the SLOT experience and to highlight the ability of territories to work together (Figs. 9 and 10);

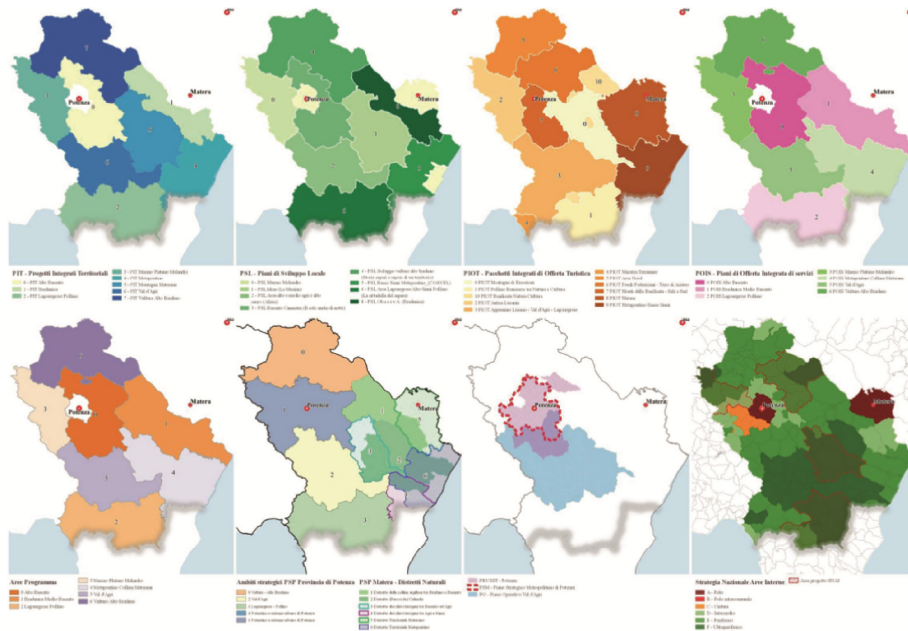


Fig. 10. Planning framework for the Basilicata region.

- physical-morphological aspects, functional to understand on the one hand the physical barriers that hinder consolidation of solid and stable cooperation relationships over time between various Municipalities belonging to multi-municipal entities and, on the other, any homogeneous landscape;

Finally, the map has been subjected to a series of subjects (deliberately not experts) residing in the territories of the three Regions to verify if the perimeter correspondence with perception of real relationships of gravity and influence, as perceived by people who they live, for reasons of residence or work, territories in question. With reference to this last aspect, it should be noted how the comparison is only an example and how perception of these aspects, by the real actors of the territories, is an important issue in recognition of territorial morphologies. This comparison, by way of example, has been used to refine morphologies according to real dynamics as perceived locally.

It is interesting to note - from the cross between pluri-municipal morphologies as configured in the last hypothesis with the SLLs and the planning frameworks reconstructed for the three regions - as high heterogeneity of the territorial perimeters defined during various programming seasons render difficult to identify stable morphologies to take into account in defining possible new configurations.

In fact, especially for older experiences, perimeters linked to planning and/or planning strategies and policies have a high variability that prevents a summary reading to be taken as an element of consistency and stability consolidated over time.

4 Conclusion

The identification of preliminary pluri-municipal morphologies took place on the basis of construction of a cognitive framework accompanied by a plurality of information layers (each of which returns often very different territorial organizations and forms): services and accessibility, flows, framework of planning and territorial districts, physical, ecological-environmental and land use readings, perceptual/identity readings.

On a large scale, identification of pluri-municipal morphologies took place primarily on the basis of essential prerequisites that regulate human life and permanency in the territories, or presence of essential services of citizens. Without doubt the system of organization of goods supply and services, whose functioning determines the conditions of life quality, can be assessed, even if only partially, in terms of accessibility [5]. In fact, services, and in particular the “advanced” ones, both to person and to production, represent the main polarities through which the so-called “urban effect” is produced and therefore the same degree of attractiveness and evolutionary potential of settlement structures [12]. Therefore, it cannot be stressed that most of the advanced analytical proposals are essentially based on the concepts of “functional or nodal system” (5) and on the area of influence [1]. Preliminary evaluations and proposals (of “basic” we could say) followed a series of successive adjustments, as described above, functional to the multiplicity of elements that must be based on the recognition and interpretation of territories. Starting from these assumptions, identification of pluri-municipal morphologies has come about with the specific purpose of recognizing territories that can represent a design and management reference that is stable over time.

The framework of morphologies, thus constituted, represents the background with respect to which different subjects and different actions are placed and interact.

Analysis identifies six profiles of pluri-municipal morphologies, for a total of 49, namely:

- monocentric structures in which there is a centre with a strong attractiveness and in which there is a large concentration of activities and people, high levels of mobility for work, study and use of services, polarization of innovative and strategic activities. These are the large urban areas, meaning, for urban areas, not only the administrative boundaries of cities but also territory surrounding them, within which the functions that city is no longer able to contain and within which the dynamics typical of metropolitan areas are verified. These are therefore metropolitan areas.
- pluri-municipal morphologies of first level structures articulated, again, around a centre with strong attractiveness, but smaller than metropolitan area. These are typically provincial capitals with a population of more than 100,000 and less than 300,000 inhabitants.
- Second level pluri-municipal morphologies. These include poles with populations over 50,000 and less than 100,000, which, together with poles of previous structure,

largely coincide with the classification of medium-sized cities Anci-IFEL 2013. The limit of 50,000 inhabitants is taken as a threshold minimum to identify poles, or urban centres, able to offer essential services. These are cities that, although often presenting high quality conditions of life, do not reach a more advanced threshold of “urbanity” [13].

These cities can play an important role not only for the welfare of inhabitants, but also for surrounding rural populations. Their presence serves to prevent depopulation of rural areas and exodus towards cities and to promote a balanced territory development [14].

- Third-level multi-municipal morphologies. In these we can find one or more poles with dimensions between 10,000 and 20,000 inhabitants (third level poles ap-point).

These morphologies are characterized by the presence of centres of small-medium size, with a low density of services. Generally, these structures include Municipalities classified as internal. Despite the certainly not optimal conditions, the presence of the poles, even if of lower rank for dimensional characteristics and for services, represents a potential on which to invest, from which to imagine and build a polycentric and more balanced development of the whole territory.

- Four-tier plurinomial morphologies. Unlike previous ones, in this category poles assume even smaller dimensions, including between 5,000 and 10,000 inhabitants. Weaker provision of services and more marked levels of rurality of municipalities included in these areas.

The sixth and last morphology refers to classified areas of “rebalancing of services” and coincides with internal areas of the country, classified as peripheral and ultra-peripheral in the SNAI and with those classified as rural areas with complex development problems. Within these, no pole is present and, therefore, their configuration presupposes and requires, as a priority, policies to enhance services and mobility infrastructures to be implemented on multi-municipal scale.

This last group of morphologies identifies complex and articulated structures in several urban centres that have weak functional relationships between them [15]. In particular, urban centres, with a population below a critical threshold, should integrate with each other in “city systems” in order to reach, together, the so-called city effect, overturning existing and traditional dependency condition and of gravitation with respect to centres of higher rank, often distant, functionally overloaded and hypertrophic. It is what is called a “strategy of integration and polarization” [13].

These profiles can be traced back to a network model [16] in which the role of a centre does not necessarily depend on its size but also and above all on its ability to integrate itself in the exchange circuits - not just economic ones - bringing into play its environmental and cultural specificities [12].

In these morphologies, therefore, verified mutual accessibility between various centres within the maximum limit of 40 min, polycentric models to be built starting from existing potentials in terms of services and equipment.

Looking more closely at Basilicata, in the region there are 9 multi-municipal morphologies, 4 of which are interregional. Lucan territory, hinge between the two

Tyrrhenian and Ionian/Adriatic coastal routes, is characterized by having only two urban poles, coinciding with the two provincial capitals of Potenza and Matera, around which two second level morphologies develop. Furthermore, reading of the Lucan context returns a particular condition for on-board areas, i.e. those areas in which processes of gravitation and relationships, even historically consolidated, between different centers represent territorial morphologies that do not find any representativeness in current administrative limits.

One thinks, for example, of the reality of Matera that stands in close contact with important centres of the Puglia Region, with respect to which substantial gravitational flows are generated (think of the Matera-Altamura relations); in this sense, there is an area of mutual influence between urban centres (in addition to Altamura certainly also Gravina in Puglia) that looks beyond current regional limits and is characterized by the presence of Bradanica infrastructure.

Identified criteria (territorial readings addressed to services, accessibility, economic dimension, flows, planning) and step-to-step methodology adopted are conceived to have a possible operational application in local realities; hence the need for a simple approach that can accompany the self-recognition process, without oversimplifying complexity of the issues to be considered.

It should be stressed that we speak of “self-recognition” within a methodological frame of reference in which each reality, starting from its specificity, can bring out aspects of greater identity. In fact, it is not possible to impose solutions evaluated only in the abstract and hetero-direct to very different local and regional situations.

Evaluations and solutions must necessarily come from the bottom and with the widest possible participation of public and private subjects, configuring reading criteria proposed in the research work, as possible guide criteria in the accompaniment of local actors (public and private) in a self-recognition of the territories, inspired by the logic of interdependence and complementarity mentioned in the work.

In order to avoid that interest in new territorial readings on pluri-municipal scale may be conditioned by rigid regional (and clearly provincial) administrative boundaries, a reconsideration of the role and the same geographical extension and morphology of regions is proposed, to model them on the networks of cities and territories and adapt them as much as possible to a new functional articulation of the national territory and the European one [1].

Moreover, having noted that cities are no longer functional realities limited to the areas of single municipality, it will be necessary to recognize that this is no longer valid only for the few large metropolitan aggregates, but also for medium and small-sized cities. Therefore, policies should be referred to general category of the ‘urban and territorial system’ consisting of aggregations of municipalities. Such pluri-municipal aggregations could also be realized - and preferably - on the basis of voluntary accessions; certainly, however, such a process of institutional reorganization can not only be left to spontaneous and to extemporaneousness of initiatives [1].

A similar approach is also promoted by the European Union in the economic planning for the period 2014–2020. The EU urged Member States to strengthen their “institutional capacity” in the sense of taking a coordinated set of reform actions aimed at making public institutions, including decentralized ones, capable of tackling challenges

of territorial competitiveness at global level, promoting smart, sustainable and inclusive growth, which is the purpose of new and well-known “Europe 2020” strategy [17].

Starting from the SSSE (European Space Development Scheme) of 1999, the principle of “polycentric and balanced spatial development” was enunciated, aimed at satisfying two mutually synergistic objectives: the competitive integration of Europe into world economy and the multiplication development engines on European territory.

To answer to the demand of effective development policies according with a rational planning approach [18, 19] and an efficient redefinition of organizational structure of the territories, it is necessary first of all a change of cultural paradigm that can not be founded only on the logic of spending cuts, which can only be pursued in presence of processes and adequate organizational models, through fight against waste and realization of economies of scale; in fact, it is not possible any automatism between the type of management chosen and the attainment of benefits and savings.

The process of institutional reorganization and stabilization of public finances - aimed at simplifying, rationalizing and reorganizing local self-esteem system - invests primarily organizational structure of the Municipalities, specifically those of smaller demographic size, for which it is urgent find new and more effective solutions [20].

In this perspective, a very challenging path from an institutional standpoint emerges, during which not only aspects relating to new perimeters of institutional and administrative areas should be carefully assessed, but also those relating to the precise definition of functions and possible new territorial entities that will be established, also in reference to local specificities and to substantial patrimony of experiences and infra-communal relations diffused in different contexts.

On the other hand, however, “liquidity” and speed of economic and territorial dynamics and processes require adequate margins of flexibility both in the organization of processes and in the definition of territorial areas of reference, apparently opposite conditions with respect to necessary stability of institutional arrangements, as argued and proposed in the present research work.

In this sense, it is necessary to imagine, above all, flexible instruments and procedures in the territories governance, capable of adapting to “variable geometries” of different configurations of questions and territorial dynamics, while recognizing a “hard core” of administrative organization on to invest human and financial resources, in order to promote an overall rebalancing of current structure of local institutions in our country.

References

1. Dematteis, G.: *L'Italia e le sue Regioni. Regioni come reti di sistemi urbani*. Abramo printing s.p.a., vol. 19, pp. 197–216 (2014)
2. Ferlaino, F., Molinari, P.: *Neofederalismo, neoregionalismo e intercomunalità: il governo regionale e provinciale del territorio*. Atti della XXX Conferenza Italiana di Scienze Regionali “Federalismo, integrazione europea e crescita regionale”, Firenze (2009)
3. Società Geografica Italiana Onlus: *Il riordino territoriale dello Stato, Scenari Italiani 2014*. Rapporto annuale della Società Geografica Italiana (2014)
4. *Rapporto Istat Sistemi Locali del Lavoro 2011: La nuova geografia dei Sistemi Locali*, Roma (2015)

5. Preto, G., Ocelli, S.: Zonizzazione territoriale ed ambiti spaziali delle politiche, Considerazioni teorico-metodologiche. In: Working Paper n. 105, IRES (1994)
6. Dematteis, G.: SLoT (Sistema locale territoriale). Uno strumento per rappresentare, leggere e trasformare il territorio. Documento del Convegno: Per un patto di sostenibilità. Sviluppo locale e sostenibilità tra teoria e pratica, Pinerolo (2003)
7. Celata, F.: L'individuazione di partizioni del territorio nelle politiche di sviluppo locale in Italia. Ipotesi interpretative. *Rivista Geografica Italiana* **115**, 1–25 (2008)
8. Sforzi, F.: La regionalizzazione dei flussi come base spaziale per la pianificazione dei trasporti: alcune valutazioni empiriche delle principali tecniche. In: Reggiani, A. (a cura di) *Territorio e trasporti. Modelli matematici per l'analisi e la pianificazione*, F. Angeli, pp. 188–213 (1985)
9. Ires: L'organizzazione territoriale del Piemonte. In: *Quaderni di ricerca Ires*, n. 56, Torino: Ires (1988)
10. Magnaghi, A.: *Il progetto locale. Verso la coscienza di luogo*. Bollati Boringhieri Editore (2000)
11. Altieri, G.: Il paesaggio come elemento identitario e fonte di riconoscibilità nei processi di pianificazione territoriale della Provincia Autonoma di Trento. In: *Planum. The Journal of Urbanism* n° 25, vol. 2 (2012)
12. Fanfano, D.: La descrizione delle reti territoriali per il progetto di sviluppo locale autosostenibile. In: Magnaghi, A. (a cura di), *Rappresentare i luoghi, metodi e tecniche*. Alinea, Firenze (2001)
13. Archibugi, F.: *La Città Ecologica. Urbanistica e sostenibilità*. In: Bollati Boringhieri (2002)
14. ANCI-IFEL. "Quaderno n° 4", MMXIII (2013)
15. Parr, J.B.: The polycentric urban region: a closer inspection. *Reg. Stud.* **38**, 231–240 (2004)
16. Camagni, R., Salone, C.: Network urban structures in Northern Italy: elements for a theoretical frame-work. *Urban Stud.* **306**, 1053–1064 (1993)
17. Bruzzo, A.: Riferimenti teorici per la delimitazione territoriale delle Regioni. In: *Argomenti*, terza serie, n° 3 (2016)
18. Casas, G.L., Scorza, F.: Sustainable planning: a methodological toolkit. In: Gervasi, O., et al. (eds.) *ICCSA 2016. LNCS*, vol. 9786, pp. 627–635. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-42085-1_53
19. Las Casas, G., Scorza, F.: A renewed rational approach from liquid society towards anti-fragile planning. In: Gervasi, O., et al. (eds.) *ICCSA 2017. LNCS*, vol. 10409, pp. 517–526. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-62407-5_36
20. Casas, G.L., Scorza, F.: Discrete spatial assessment of multi-parameter phenomena in low density region: the Val D'Agri case. In: Gervasi, O., et al. (eds.) *ICCSA 2015. LNCS*, vol. 9157, pp. 813–824. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-21470-2_59