TeMA

Journal of Land Use, Mobility and Environment

The 10th volume of the TeMA Journal will promote the debate on the definition and the implementation of methods, tools and best practices aimed at improving energy efficiency at the neighbourhood level while increasing the capacity of urban systems to adapt to natural changes and/or man-made changes.

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METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES

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Cover Image: Tabiat pedestrian bridge in Tehran, Iran by Leila Araghian from Diba Tensile Architecture – Photo by Mohammad Hassan

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Contents

TeMA Journal of
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CALL FOR PAPERS: TEMA VOL. 11 (2018)

The Resilience City/The Fragile City.
Methods, tools and best practices.

The fragile/resilience city represents a topic that collects itself all the issues related to the urban risks and referred to the different impacts that an urban system has to face with. Studies useful to improve the urban conditions of resilience (physical, environmental, economical, social) are particularly welcome. Main topics to consider could be issues of water, soil, energy, etc.. The identification of urban fragilities could represent a new first step in order to develop and to propose methodological and operative innovations for the planning and the management of the urban and territorial transformations.

The Journal also welcomes contributions that strategically address the following issues:

- new consideration of the planning standards, blue and green networks as a way to mitigate urban risks and increase city resilience;
- the territorial risks and fragilities related to mobility of people, goods, knowledge, etc.;
- the housing issue and the need of urban regeneration of the built heritage;
- socio-economical behaviour and the "dilemma" about emergency and prevention economy;
- the city as magnet of the next future's flows (tourism, culture, economy, migration, etc.).

Publishing frequency is four monthly. For this reason, authors interested in submitting manuscripts addressing the aforementioned issues may consider the following deadlines

- first issue: 10th January 2018;
- second issue: 10th April 2018;
- third issue: 10th September 2018.

CALL FOR PAPERS: GENERAL CALL.

Papers in Transport, Land Use and Environment

The Journal welcomes papers on topics at the interdisciplinary intersection of transport and land use, including research from the domains of engineering, planning, modeling, behavior, economics, geography, regional science, sociology, architecture and design, network science, and complex systems

TeMA Journal of
Land Use, Mobility and Environment

EDITORIAL PREFACE: TEMA JOURNAL OF LAND USE MOBILITY AND ENVIRONMENT 2 (2017)

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES

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The 10th volume of TeMA Journal, given the relevance of the topics, dedicates the three issues of 2017 to promotes the scientific debate on the definition and the implementation of methods, tools and best practices aimed at improving, in the forthcoming decades, the capacity of the urban areas to cope a range of climate, technological and socio-economic challenges that will require the development of integrated and adaptive strategies. The articles published in this second issue address some themes, such as the resilience capacity of urban system, the energy consumption, the geographical information system, the community spaces, the urban green network design, the urban regeneration processes and the territorial cohesion.

The section "Focus" contains the article "The End-use Electric Energy Consumption in Urban Areas: A GIS-based methodology. An application in the city of Naples." by Gerardo Carpentieri and Federica Favo (University of Naples Federico II) offers a GIS-based methodology that allows the knowledge, classification and representation of end-use electric energy consumption by the use of Big and Open Data. The results constitute a cognitive asset that local administrations can use to improve the energy sustainability, by providing the classification and representation of electric energy consumption for domestic and non-domestic users.

The section "Land Use, Mobility and Environment" collects four articles. The first one, titled "Between Community Spaces. Squares of Minor Centers of Calabria", by Mauro Francini, Rosario Chimirri, Annunziata Palermo and Maria Francesca Viapiana (University of Calabria), analyse the theme of "community spaces" or public spaces has led, in recent years, to important interdisciplinary issues also if the reading of smaller towns, in city planning, historical-anthropological and geographical terms appears less extended. For this reason, the paper introduces the first results of a research that want to reinterpret the specific characteristics of these areas in small towns placing the region of Calabria. Through this reading the authors want to emphasise how urban planning, in synergy with other disciplines, can operate to give back to these spaces the meaning of "center", or urban-community landmark.

The second article, titled "Urban Green Network Design: Defining green network from an urban planning perspective", by Andrea Tulisi (University of Naples Federico II), provides a lexical analysis of the literature on the urban green network from an urban planning perspective. In order to overcome the ambiguities of the literature in handling both terms of the concept "green network", the paper suggests a unique definition

of the terms that takes into account both the network system theory and greenspaces as public services in the wider perspective of ecosystem services

The third article, titled "Metropolitan Governance for Territorial Cohesion", by Francesca Pirlone, Ilenia Spadaro and Selena Candia (University of Genoa), analyses in deep the case of the Italian metropolitan cities proposing a new governance approach to increase the capacity of urban systems to adapt to natural and man-made changes, considering the hinterland as a strong point rather than a disadvantage. Strategic and spatial plans drive the growth of metropolitan areas in a competitive space-economy and support sustainable development policy by ensuring a balance between urban areas with strong competitiveness and inland areas.

The fourth article, titled "Decision-making tools for urban regeneration processes: from Stakeholders Analysis to Stated Preference Methods", by Marta Bottero, Giulio Mondini and Giulia Datola (Politecnico di Torino), proposes an integrated evaluation approach for addressing decision problems in the context of urban regeneration operations. Starting from the real case of the regeneration programme of the city of Collegno (Italy), the contribution proposes an original evaluation model based on the combined use of Stakeholders Analysis and Stated Preference Methods.

The section "Review Pages" defines the general framework of the issue's theme, with an updated focus on websites, publications, laws, urban practices and news and events on the subject of energy reduction consumption in the transport sector. In particular, the Web section by Maria Rosa Tremiterra describes three web resources of: (i) European Climate Adaptation Platform; (ii) U.S. Climate Resilience Toolkit and (iii) Resiliencetools.org – Empowering Resilient Cities. The Books section by Gerardo Carpentieri briefly reviews three relevant books related to the Issues' theme: (i) Evaluating Urban Resilience to Climate Change: A Multi-Sector Approach; (ii) Urban Perspectives: Climate Change, Migration, Planning and Finance - A New Generation of Ideas and (iii) Integrating Land Use, Transport and Energy Planning. The Law section by Laura Russo keeps readers up to date with comparison between two legislative documents, in order to highlight the main innovations and present the key planning instruments (England and Nederland). The Urban Practices section by Gennaro Angiello presents two Car-Sharing Italian case study: (i) Milano and (ii) Rome. The News and Event section by Andrea Tulisi, proposes a selection of conferences on the topic of decision support tools where developed for supporting adaptation and mitigation policies at urban scale.

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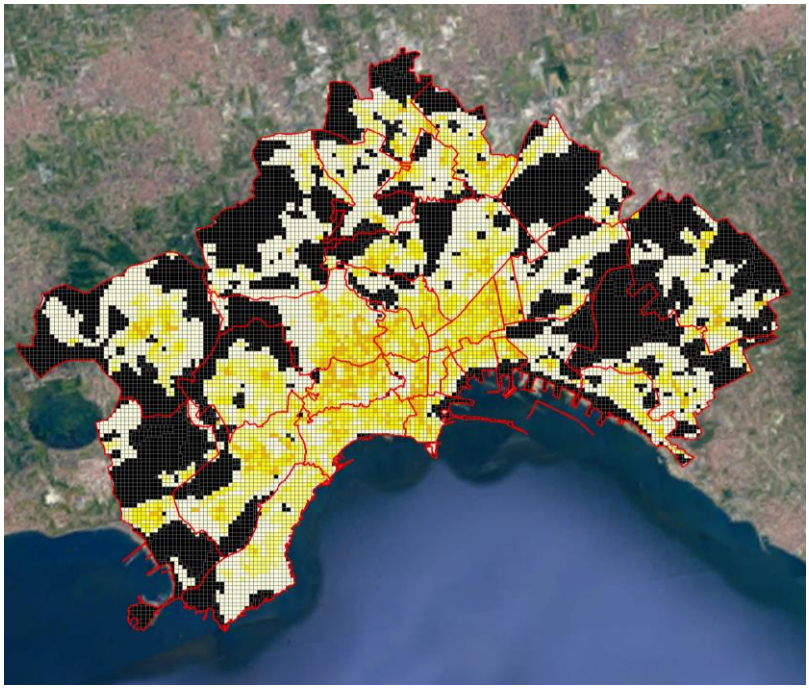

THE END-USE ELECTRIC ENERGY CONSUMPTION IN URBAN AREAS: A GIS-BASED METHODOLOGY.

AN APPLICATION IN THE CITY OF NAPLES.

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ABSTRACT

This work is part of the scientific research sector concerning the Government of Urban and Territorial Transformations in order to promote efficiency and reduction of energy consumption in urban areas. The contribution proposes a further deepening of the research work already carried out under the project Pon "Smart Energy Master" by the research group of the Laboratory of Territory, Mobility and Environmental (TeMA Lab) of Department of Civil, Architectural and Environmental Engineering, University of Naples Federico II. The aim is to assist public authorities, that also deal with the Urban Energy Governance, in determining the quantitative distribution of domestic and non-domestic electric energy consumption. Toward this goal, we use the Big Data, the Open Data and the Geographic Information System (GIS) techniques. In particular, this work developed a innovative GIS-based methodology that allows the knowledge, classification and representation of real electric energy consumption at micro scale for the domestic and non-domestic. Also, we validate the GIS-based methodology by an application at the city of Naples. We used the electric energy consumption data of year 2011 were given by Municipality Authority and Italian Revenue Agency. This will allow the identification of the electric energy problems present in the area of analysis in order to plan any intervention strategies. This contribution is divided into three main parts. In the first part, an analysis of the scientific literature is proposed on the theme of the Government of urban and territorial transformations and opportunities arising by Big Data, Open Data and GIS in the reduction of electric energy consumption. The second part explains the theoretical and technical phases that led to the development of the GIS-based methodology. In the last part, the application of the GIS-based methodology at the City of Naples is described.

KEYWORDS:
GIS; Big Data; Smart City; Electric Energy Consumption.

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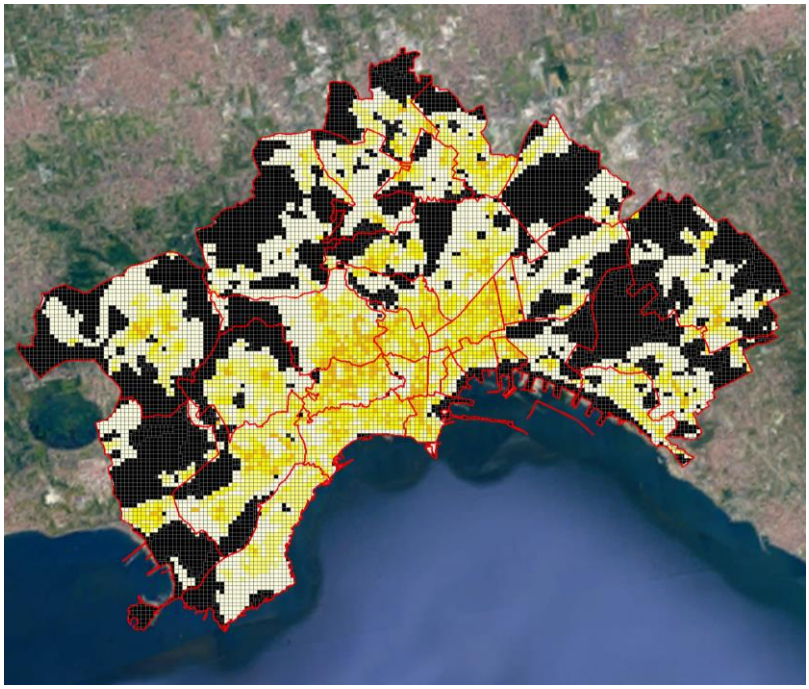

城市区域终端用电能耗：基于GIS的研究方法。

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摘要

本文为“城市管理与区域转换”相关的系列科研区域的组成部分，旨在促进城市区域能源高效和减少能耗。本文进一步深入研究了领土实验室、不流动性和环境博物馆、建筑与环境工程和那不勒斯费德里克二世大学组成的科研团队曾主持研究的“智源大师”项目。旨在推动公共管理，同时处理城市能源管理问题，了解国内外能耗的数量分布。为实现这一目标，我们采用了大数据、开放数据和最新地理信息系统（GIS）进行分析。本文尤其分析了可确定、划分和描述城市电能耗问题的 GIS 研究方法。这将有利于确定分析领域出现的能源问题，方便拟定干预策略。本文正文可分为三大主要部分。第一部分分析了城市管理和区域治理为主题的科学文献，它们希望减少能耗并利用大数据、开放数据和GIS应用过程产生的减少能耗的机会第二部分解释了促进以 GIS 为基础的研究方法的理论发展阶段和技术发展阶段。最后，第三部分叙述了以 GIS 为基础的研究方法在那不勒斯市的应用及分析结果。

关键词：
GIS、大数据、智慧城市、电能耗

1 INTRODUCTION

The paper proposes another step forward in the scientific research work carried out under the project Pon "Smart Energy Master" (SEM) by the research team of the Laboratory of Territory, Mobility and Environmental (TeMA Lab) - Department of Civil, Architectural and Environmental Engineering, University of Naples Federico II – aimed at developing a model of governance for the energy efficiency of the territory. After more than three years of work the project finished in January 2016. During which a series of topics closely related to the functioning of urban systems were explored like growing unsustainability urban systems, the possible advantages to apply a smart approach and the probable future evolutionary trajectories (Papa et al., 2016). A specific and innovative feature of the SEM project has been the definition, both in qualitative and quantitative terms, of the causal relationships between energy consumption and urban form of the city.

The purpose of this study is to support public administrations, also dealing with the Urban Energy Governance, in determining the distribution and variation of urban energy consumption. These two characteristics facilitate the identification of strategies and actions useful to the reduction and optimization of domestic and non-domestic electric energy consumption. The objective is to develop, starting from the electric energy data of the individual users, a methodology able to quantify and geolocalize the distribution and intensity of electric energy consumption of the domestic and non-domestic users. This methodology thus allows the public administrations to identify and to analyse the high energy-consuming areas, in order to be able to intervene in the resolution of any critical issues, linked to the excessive and unsustainable use of the energy resource. In the following paragraphs are described the theoretical and practical research work phases to aimed at the collection, geolocalize and represent of the data related to electric energy consumption on an urban scale. In particular, the methodology has been developed thanks to the availability of Big Data, Open Data and Geographic Information System (GIS) software that can collect, store, manage and analyse such data types.

2 THE ENERGY GOVERNANCE OF THE TERRITORY

This work arises in a context where the number of urban inhabitants is increasing rapidly with, 54 per cent of the world's population residing in urban areas in 2014. In particular, in for the Europe continent this percentage is over 73 per cent and by 2050, 66 per cent of the world's population is projected to live in urban area. (UN, 2014).

The growth of the urban population makes the study of the negative consequences of this phenomenon an essential activity (Barles, 2010; Papa et al., 2014a). In particularly, one of the most worrying aspects connect to this phenomenon is the finding of the resources necessary to the livelihood and development of urban areas and their citizens (Anderson et al., 1996; Havranek, 2009). Over During the last few decades, some critical events have already occurred as a result of temporary difficulties in the finding of indispensable resources for life (oil crisis 1970s). The occurrence of these events has generated greater awareness in the finding and use of non-renewable resources, which has also led to greater sensitivity in the preservation of the environmental component. One of the first international documents that dealt with this issue is the Brundtland Report. In 1983, the United Nations General Assembly entrusted the World Commission on Environment and Development (WCED), composed of representatives from twenty-one countries, with the objective to write a report on status of the world environment and development (Our Common Future). The report highlighted the need to implement a strategy that would integrate the needs of development with the need to safeguard the environment component. These indications, in the following years, have been further deepened and have been concretized in laws and programmatic documents (UN, 1998; EU, 2004). Among the sectors concerned by the indications of the Brundtland report, there is also the sector that deals with the Government of urban and territorial transformations. Therefore, energy demand in cities should be a dominant issue. In the EU, the

residential building sector is responsible for about 22% of total energy consumption (IEA, 2011). The increase of energy consumption by the urban population could endanger economic development because the consumption of energy reducing the resources available to productive sectors.

The most important Italian regulation introducing prescriptions on energy planning issues, is Law n.10/1991 "Regulations for the national energy plan for the rational use of energy, energy saving and development of renewable sources of energy". This law, rather outdated by now, introduced the drafting of plans that address the deployment of energy from renewable sources, the identification of territorial energy basins, the localization of the electric energy systems and the energy balance of territorial jurisdiction (Battarra, 2014).

In recent decades, the researchers have concentrated their efforts on design and management solutions that can improve the environmental sustainability of urban and territorial systems. In this sector, one of the components that has attracted particular interest is that of energy. The production, distribution and end use of energy has a strong impact on the consumption of environmental resources and the placing in the environment of polluting substances. There are numerous research and projects aimed to improving the sustainability of this component. In particular, two macro sectors that study this aspect can be identified, related to:

- improving the sustainability of production and distribution processes (Orgerie et al., 2014);
- reducing and optimizing energy consumption by end users (Omer, 2008; GhaffarianHoseini et al., 2013).

As regards the second aspect in the scientific field is now shared the need to use an integrated approach that points to consider all the components that contribute to determine the demand for energy consumption (Steemers, 2003; Papa et al., 2014b). One of the main questions of research formulated in recent years has focused on the calculation of energy consumption on an urban scale for different categories of users. It is particularly important to know the energy consumption from a quantitative and distributive point of view in order to be able to foresee appropriate intervention strategies which are able to affect significantly improvement in the sustainable use of this component. There are numerous operational and technical solutions developed on a national and international level to attain a reliable quantitative and distributive calculation of energy consumption (Frayssinet et al., 2017; Šćepanović et al., 2017).

These solutions are principally aimed at the realization of energy models that differ in the method of calculation for different scales of analysis (single real estate unit, building, district and urban area) and for the type of users analysed (residential, business, industry, transportation). In generally, the methodologies for calculating energy consumption can be divided into two distinct approaches: top-down and bottom-up (Swam and Ugursal, 2009). Predictions models evaluate, in a parametric way, the response of a system to a given set of technical variables and identify the possible impacts and likely costs/benefits of the analysed configuration (Zhao and Magoulès, 2012). The top-down approach treats the domestic sector as an energy sink and is not concerned with individual end-uses. The bottom-up approach extrapolates the estimated energy consumption of a representative set of individual buildings to regional and national levels.

In recent years, the increasing availability of hardware and software tools able to collect, manage and process high amounts of data, has also allowed an improvement in the quality of results. In particular, the possibility of using detailed input data has allowed the development of new ways of calculating energy consumption, improving the level of detail and accuracy of results.

2.1 BIG DATA AND OPEN DATA

One of the main problems in the study of urban and territorial systems is the difficulty of finding adequate data, both in terms of quantity and quality. The actually complexity that characterizes both urban and territorial systems and the activities it takes place, makes the data have become a torrent flowing into every area of the economy (Economist, 2010). In recent years, a growing support has been lead from the new sources of data

obtained by the use of the latest hardware and software technologies. Among the categories of data, which have a greater interest and use within the technical-scientific community in recent years, there are big data and open data.

Big Data is an extensive data collection in terms of dimension, collection speed and variety that requires the use of specific technologies and analytical methods (De Mauro et al., 2016). The progressive increase in the size of the databases, which characterize Big Data, allows the extraction of additional information from that obtainable by analysing small data sets. There is no limit of size in the collection and analysis of Big Data other than that linked exclusively to the capacity of the instrumentation used in its collection, storage and processing. On the basis of a study carried out in 2001, the Big Data growth model is defined as three-dimensional: over time the volume, speed and variety of data increase (Laney, 2001). In many cases this model is still valid, although in 2012 a fourth variable was inserted, the veracity.

The second category of data considered is Open Data, which is a type of freely accessible data, without patents or other forms of control that restrict its reproduction and whose copyright restrictions may be limited to the obligation to cite the source or the issue of the changes in the same way. Open Data invokes the wider Open Government discipline, whereby public administration should be open to citizens, in terms of transparency, but also through the use of new information and communication technologies (European Parliament, 2007). The Open Data frequently refers to information represented in the form of databases and related to the most disparate issues.

2.2 THE GEOGRAPHICAL INFORMATION SYSTEM

The growing availability of data has required the development and use of new computer tools able to manage and process it. Among the software computer tools currently most used in the field of Government of urban and territorial transformations are the Geographical Information System (GIS) (Burrough, 1986). Through the use of GIS alphanumeric data (numbers, textual information, documents) can be elaborated, organized, stored and connected to specific geometrical elements that can represent territorial entities (urban areas, infrastructure networks, mobility networks, buildings). In general, the GIS software is configured as an "operating environment" within which it is possible to develop management and decision support tools for the analysis, transformation and management of the territory (Fistola, 2009). The structure of GIS is composed of two components closely connected and interrelated: Cartography and alphanumeric data. The first component is the cartographic base that contains the geometrical elements (vector and raster), that have specific references and coordinates. The second component consists of the set of information and data that can be connected to every single geometrical element. Through the application of specific procedures, it is possible to connect elements belonging to both components in order to define a system that can provide not only information on individual elements in a static way, but also descriptions of the evolution of territorial phenomena or to highlight the areas where common values are manifested (Papa, 2009). In addition, GIS allows the development of numerical cartographies that represent and identify the elements and phenomena present on the study area. Therefore, GIS is a valuable technical support tool for decision-making processes, which enable the identification of choices in order to respect the principles of objectivity, transparency and environmental sustainability (Campagna & Matta, 2014).

3 GIS-BASED URBAN ENERGY CONSUMPTION TOOL

The following paragraphs describe the structure of the GIS methodology developed, which allows one to quantify the real energy consumption, for domestic and non-domestic users, located in the study area (Papa et al., 2017). This GIS-based methodology, called Urban Energy Consumption Tool, solves some of the main limits of traditional energy consumption calculation techniques that mainly involve the use of simulation models

top-down and bottom-up (Swam and Ismet, 2009). The limits of the top down models are the reliance on historical consumption information, no explicit representation of end-uses and the coarse analysis. The Bottom-up models presents some limits that depend to multicollinearity, large survey sample to exploit variety and determination of end-use qualities based on simulation. These methodologies have some issues that relate to the reliability of the results, which depend on the complexity of the computation model and the level of detail of the data used input (Kavgic et al., 2010). These limits also restrict applicability, because the model's reliability varies in relation to variation in the structural and morphological characteristics of the context and the availability of data. For these reasons this study proposed a new GIS-based methodology to calculate the real energy consumption for domestic and non-domestic users. The methodology is composed of three main steps described below: (i) The individuation and retrieval of the data; (ii) The structuring and processing of data by GIS; (iii) The classification and representation of results by GIS.

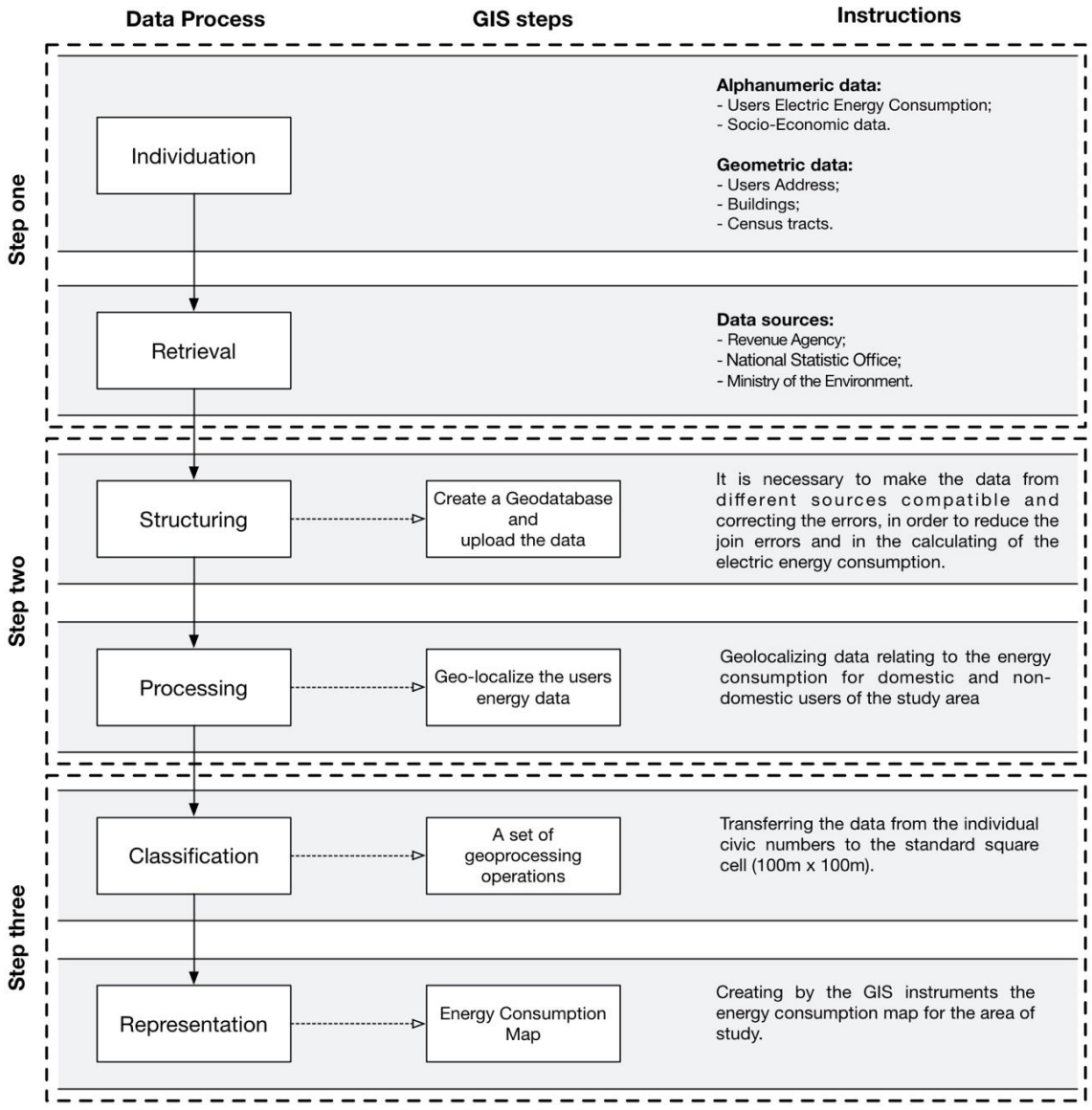

Fig. 1 GIS-based methodology workflow of Urban Energy Consumption Tool

3.1 THE INDIVIDUATION AND RETRIEVAL OF THE DATA

This first step concerns the individuation and retrieval of the data necessary to calculation the electric energy consumption for the study area. In order to solve some of the main problems that characterized the previous

methodologies of calculating the electric energy consumption for the domestic and non-domestic users, only the alphanumeric and geometrical data freely accessible to the technicians of the public administrations and to the researchers were used. Based on these indications, the sources of the data individuated were the Italian Revenue Agency, the municipal authority, the National Institute of Statistics and the National Geoportal of the Italian Ministry of the Environment and Protection of Land and Sea. Thus, through the open access databases provided by these sources, the alphanumeric and geometrical data needed to set up the GIS methodology were found, as shown in Tab. 1.

Data	Type	Source
Electric Energy Consumption	Alphanumeric	Italian Revenue Agency and Municipality of Naples
Socio-Economic	Alphanumeric	National Statistic Office ISTAT
Address	Geometric	Ministry of the Environment
Buildings	Geometric	Ministry of the Environment
Census tracts	Geometric	National Statistic Office ISTAT

Tab. 1 The list of data necessary for the application of the GIS methodology

In particular, the information platform SIATEL 2.0 of the Italian Revenue Agency, allows local authorities to consult and download the alphanumeric data present in the tax registry for any individual or company throughout the national territory.

Among the available data there are those relating to electricity users, with the annual electric energy consumption of the residents since 2005. It is worth clarifying that the consumption data on the platform does not consider the production of energy obtained from production plants installed on the individual buildings. The availability of this data to public administrations was ensured by the 2005 Financial Act (art. 1 com. 332, 333 e 334 of the low n. 311 31/12/2004), which obliges all companies providing electricity, water and gas services to inform the Italian Revenue Agency of the consumption data of the users. As part of the GIS methodology developed, further data found are those provided by ISTAT relate the censuses of the censuses of Population and Housing and Industry and Services. These two ISTAT censuses, which analyse the economic, social, territorial and built environment aspects, are held every ten years throughout the national territory and the data are available in open aggregate format for single census section. In general, a census area is the "homogeneous" part deriving from a subdivision of the municipal territory. The different size of each census area is influenced by the physical and socio-economic structure.

In order to geolocalize the alphanumeric data of the energy consumptions of the single users, it is necessary to use a GIS software, with which it is possible to manage and visualize in a combined way the alphanumeric and geometric data. The National Geoportal operates within the regulatory framework established by the D.Lgs. 32/2010 e s.m.i., that implements the European directive INSPIRE (2007/2/CE) aimed at implementing the diffusion of geometric data infrastructure in the European Community.

Through the open access web portal of National Geoportal, technicians and researchers can access the search services (CSW), visualization (WMS), download (WFS and WCS) and transformation (WPS), of the available geometric databases. These services can be used through the online interface and GIS software.

For the development and application of the GIS methodology, we use the geometric database of buildings and civic numbers.

3.2 THE STRUCTURING AND PROCESSING OF DATA

This second step allows one to define the structuring and processing of all data necessary to apply the GIS-based methodology able to quantify the real electric energy consumption of the domestic and non-domestic users. In particular, the structure of the geodatabase has been defined as containing all the alphanumeric and geometric data identified in the previous phase. Geodatabase is a relational data storage format used in GIS, that is designed for storing simple vector geometries (dots, lines and polygons), raster images, and alphanumeric data tables, which can be related to each other.

To organize all the data within the geodatabase, it is necessary to make data from different sources compatible, in order to reduce the join errors. In particular, one of the most complex operations carried out at this stage was to identify an operating mode to uniform the data of the addresses of the electrical users downloaded from the SIATEL 2.0 to the geometrical and numerical data relating to the addresses obtained from the National Geoportal. This difficulty arose due to the differences in both the text formatting of the address and the numbering. The SIATEL 2.0 platform uses the data provided by the public administrations and the operators of the different services (water, electricity, gas, telephone). These enter billing addresses, based on information provided by users. In many cases this information is incomplete and incorrect, due to changes of type toponymical not communicated by users to the managers.

These correction and processing operations are fast when applying the GIS methodology to small municipalities, while for large cities the work of implementing the GIS methodology is more complex because it is necessary to organize and process databases of alphanumeric and geometrical data that possess a high level of complexity. The completion of this phase allows one to obtain the geo-localized data relating to the energy consumption for domestic and non-domestic users throughout the study area.

3.3 THE CLASSIFICATION AND REPRESENTATION OF RESULTS

After completing the structuring and processing step, that allows the creation of a single geodatabase containing the input, a GIS tool has been developed, which contains all operations necessary for the classification and representation of the output data calculated in the previous phases. Then, a model builder and the graphical interface of the GIS-based urban energy consumption tool were created. These consist of a set of automated commands in GIS that allows one to classify and represent the output data, taking into account the geometry and dimensions of the reference territorial unit and the size of the numerical ranges that one intends to assign to the output variables for the mass point of the graphic representations. The default reference unit in the tool consists in a standard square cell of 100m x 100m. It was decided to use this modality, to display the output results of the GIS-based methodology, as the electrical energy consumption data are initially associated with the individual civic numbers, which correspond at a single point. To allow the display of data related to a reference surface, it was carried out by means of some geoprocessing operations in GIS. Furthermore, it was considered that the sections do not have a standardized dimension but are characterized by a different territorial extension, according to the urban and socio-economic characteristics of each area. This aspect involves a difficulty in immediately reading and comparing the data associated to each census sections, because it is necessary to take into account the different size of census sections in the analysis of the results obtained. Then, the calculation operations included in the GIS-based methodology enable the improvement in the reading and comparison of the output data between the different portions of the territory and to graduate the classification and representation of the electric energy consumption. This GIS-based methodology automatically divides the entire study area into square grids, with a standard square cell of 100m x 100m. The methodology performs additional geoprocessing operations that allow to the transfer of data from the census sections to the cell grid, through the factors of numerical and geometrical proportionality that also take into account of the buildings. In conclusion, the GIS methodology allows one to obtain a "photograph"

of the electric energy consumption of the study area, in addition to knowing how the electricity consumption is distributed according to the type of users considered. This type of analyse is thus no longer based on the simulation and optimization models but on the actual data of end-use electric energy consumption.

4 THE CASE STUDY OF NAPLES

In order to test the GIS methodology, described in the previous paragraphs, it was applied to a specific case study. In particular, it was selected for the application of the GIS-based urban energy consumption tool to the City of Naples. The resident population of the city is 974,074 inhabitants (ISTAT, 2016), and it is the fifth largest Italian city in terms of population density, that is equal to 8,184 inhabitants/Kmq. The city in the last twenty years has been affected by a gradual reduction of the resident population that prefers to live in the neighbouring municipalities or in the peripheral neighbourhoods of the city. Relative to urban structure, in the city of Naples there are approximately 39,000 buildings, of which about 34,000 are mainly residential. The degree of occupancy of the housing is high, for the whole city the unoccupied dwellings are about 4%. In particular, there are 0.71 inhabitants/room in the municipality and 0.71 inhabitants/room in the province, while the national average values fluctuate around 0.6 inhabitants/room.

With regard to the composition of households, data shows that families with more members are located in the peripheral neighbourhoods. While the families in the main residential neighbourhoods (Chiaia, Posillipo, Vomero, Fuorigrotta and Bagnoli) have a reduced composition, averaging 2.5 components for each family. Moreover, it is interesting to note that the presence of small families and singles also characterizes the neighbourhoods located in the historical city center (Pendino, Porto, San Giuseppe, San Lorenzo, Montecalvario e Mercato). This phenomenon is presumably due to a process of ageing of residential population and the high cost of real estate. Therefore, the choice of this study area, is due to the high complexity and magnitude of city, that allows to test effectively the developed GIS methodology.

Fig. 2 The territory of the city of Naples with different *neighbourhoods* (in red)

4.1 THE IDENTIFICATION AND RETRIEVAL OF DATA

This section describes in detail the alphanumeric and geometrical data selected for the application of the GIS-based methodology at the City of Naples. In the Tab. 2, the data that are need for the test are listed. The alphanumeric data are composed of the data of the addresses and the electric energy consumption provided by the web platform "SIATEL 2.0" of Italian Revenue Agency and the socio-economic data provided by the ISTAT. The data of electrical energy consumption by users were obtained with the collaboration of the city authority. This alphanumeric database contains data relating to 443,185 users for the year 2011. These data can be divided into categories according to the following factors:

- type of subject, for this category there are two types of category "Natural person" and "Legal person";
- type of user, in order to carry out a more detailed analysis of the variation of energy consumption in the municipal territory of study, it is possible to classify the users in: "Residential natural person", "Non-residential natural person".

Data	Type	Source	Year
Energy consumption	Alphanumeric	Italian Revenue Agency and Municipality of Naples	2011
Socio-Economic	Alphanumeric	National Statistic Office ISTAT	2011
Address	Geometric	Ministry of the Environment	2012
Building	Geometric	Ministry of the Environment	2003
Census tracts	Geometric	National Statistic Office ISTAT	2011

Tab. 2 List of data collected for the application to the case study of Naples

In this application to the case study of Naples, the data of electric energy consumption related to domestic and non-domestic users has been considered.

During the research, it was necessary to find an additional type of numerical data, namely those related to the socio-economic characteristics collected in the ISTAT census of the year 2011.

About the geometrical data used, these were downloaded from the National Geoportal and ISTAT. Those downloaded from the Ministry portal relate to the localization of the addresses present in the city of Naples. The available database is composed of approximately 109,000 items, each one corresponding to an address (Street and House number). During the elaboration of the GIS methodology there was the potential problem of the inadequacy of the databases provided in the case of large cities, where the localization of all civic numbers can be complicated. The forecast was correct at this stage of collection: it was in fact noted that the database on the National Geoportal was not complete, as it lacked data related to the neighbourhood of Scampia. The database was then updated by inserting all the missing house numbers. For a city of considerable size such as Naples, achieving a high level of precision in the retrieval of missing data has also required the use of databases consultable online (e.g. Google Maps, all city, Municipal Road) and site surveys. Consequently, one of the outcomes of this study was also the realization of a geolocalised database of all the updated house numbers throughout the city of Naples. The geometric and numeric census data, download from the ISTAT web portal, are related to the census area. For the city of Naples census 4,301 sections were identified. By means of the web portal of ISTAT, it was also possible to obtain the division of the study area

into neighbourhoods, which was used in the subsequent phase of validation of the results obtained by the application of the methodology.

4.2 THE STRUCTURING AND PROCESSING OF DATA

The main operation that has characterized this phase concerned the correction of the data relative to the addresses of the users contained in the alphanumeric database downloaded from the platform of the Italian Revenue Agency of the revenue, through the competent offices of the municipality of Naples. As already clarified in the previous paragraphs concerning the GIS-based methodology developed, the addresses associated with energy consumption have some types of errors that can be derived from erroneous naming of roads and incomplete numbering of addresses. By making a first attempt to merge it became apparent that on a total of 443,185 users, only for 189,000 users do the addresses correspond to those present in the geodatabase of the addresses provided by the Ministry of the Environment. Thus, thanks to the alphanumeric data correction functions implemented in the GIS-based urban energy consumption tool, it was possible to achieve a union percentage of more than 96% of the users. In Fig. 2, two sample screens of the Address table are shown before and after the correction done by the correction functions implemented in the developed of the methodology.

ID	Indirizzo
241789	VIA S.DOMENICO FAB.CETIPA 29C A 4 1
182635	VIA S.EFR.VEC. 35A IS.6
215374	VIA S.F.SCO DE GERONIMO 10
212721	VIA S.F.SCO DE GERONIMO 13
183864	VIA S.F.SCO DE GERONIMO 2A
186786	VIA S.FERRARA 7
19488	VIA S.FILIPPO 30/E
291839	VIA S.FRANCESCO 9
231120	VIA S.FRANCESCO 9
302165	VIA S.FRANCESCO 9A
299852	VIA S.FRANCESCO 9A
60712	VIA S.FRANCESCO 9A
165602	VIA S.FRANCESCO 9A
392103	VIA S.FRANCESCO 9A
71771	VIA S.FRANCESCO 9A
236812	VIA S.FRANCESCO 9A
232455	VIA S.FRANCESCO 9A
12703	VIA S.G DEI CAPRI PALAZZO ASTINO SN
187584	VIA S.G. CAPRI 52
187585	VIA S.G. CAPRI 52
55833	VIA S.G. DEI CAPRI 53 SCALA A1P.IN2
167526	VIA S.G. DEI CAPRI 63/E
228975	VIA S.G. DEI CAPRI15

ID	Indirizzo
241789	VIA SAN DOMENICO 29
182635	VIA SANT'EFRAMO VECCHIO 35
215374	VIA SAN FRANCESCO DE GERONIMO 10
212721	VIA SAN FRANCESCO DE GERONIMO 13
183864	VIA SAN FRANCESCO DE GERONIMO 2
186786	VIA SALVATORE FERRARA 7
19488	VIA SAN FILIPPO 30
291839	VIA SAN FRANCESCO 9
231120	VIA SAN FRANCESCO 9
302165	VIA SAN FRANCESCO 9
299852	VIA SAN FRANCESCO 9
60712	VIA SAN FRANCESCO 9
165602	VIA SAN FRANCESCO 9
392103	VIA SAN FRANCESCO 9
71771	VIA SAN FRANCESCO 9
236812	VIA SAN FRANCESCO 9
232455	VIA SAN FRANCESCO 9
12703	VIA S.G DEI CAPRI PALAZZO ASTINO SN
187584	VIA SAN GIACOMO DEI CAPRI 52
187585	VIA SAN GIACOMO DEI CAPRI 52
55833	VIA SAN GIACOMO DEI CAPRI 53
167526	VIA SAN GIACOMO DEI CAPRI 63
228975	VIA SAN GIACOMO DEI CAPRI 15

Fig. 3 Example of correcting the address database as result of the application of the tool

Therefore, as a result of this correction, only 4% of the users were unable to merge the data of the SIATEL 2.0 database and the geo-localized address data, due to the absence of adequate information.

4.3 THE CLASSIFICATION AND REPRESENTATION OF RESULTS

This paragraph shows and describes the results obtained following the application in the city of Naples of the GIS methodology, developed to quantify the electric energy consumption, for domestic and non-domestic users, located in the selected study area. The Figure 4 shows the results obtained for domestic users. The black zones represent the areas of city with zero or negligible electric consumption. The consumption of less than 2,500 kwh, equal to the average of annual electric energy consumption estimated per user, was considered negligible. It can be noted that black areas are located in the most peripheral parts of the city while those with high consumption are concentrated in the central areas. Among the areas with low domestic consumption, it is possible to identify some of the areas with a prevalent non-residential vocation, such as the

airport area, the former Italsider of Bagnoli, the eastern area of the territory for industrial use and the headquarters of the main offices of the city.

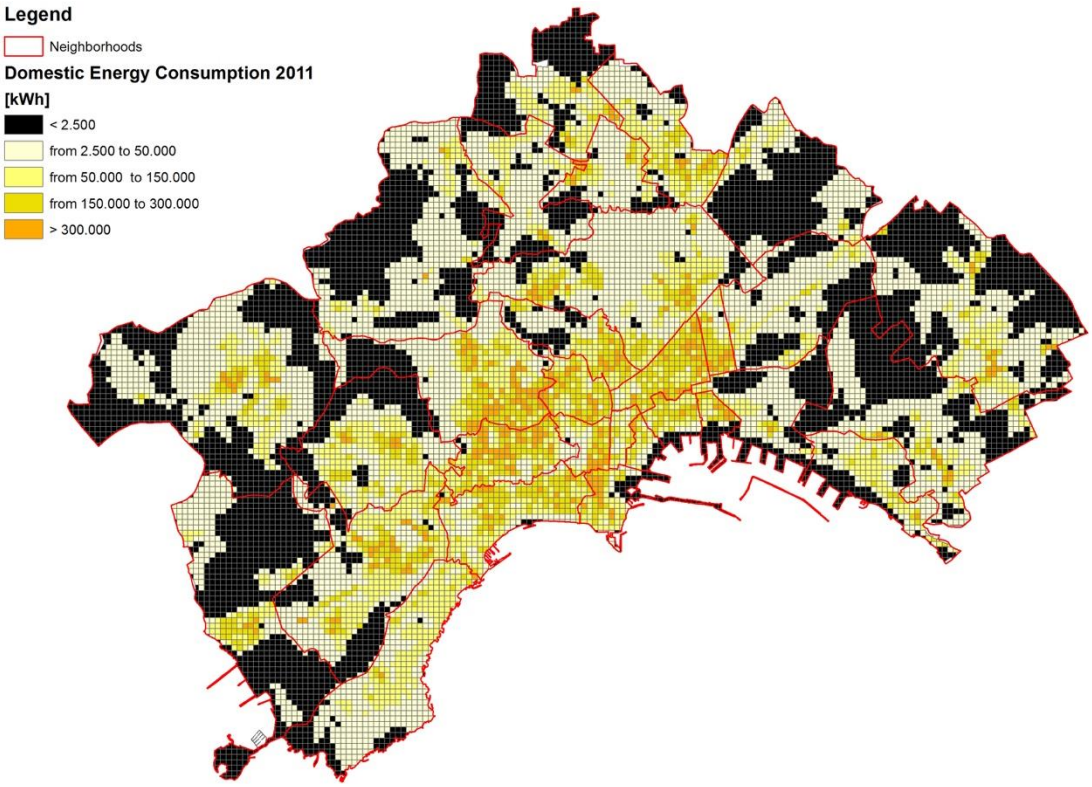

Fig. 4 Electric energy consumption map in kWh for domestic users in 2011

The zones with a high domestic electric energy consumption are those of the City Centre and the main residential areas. The Figure 5 shows the graph of domestic electric energy consumption for the individual neighbourhoods of the city of Naples, in the 2011.

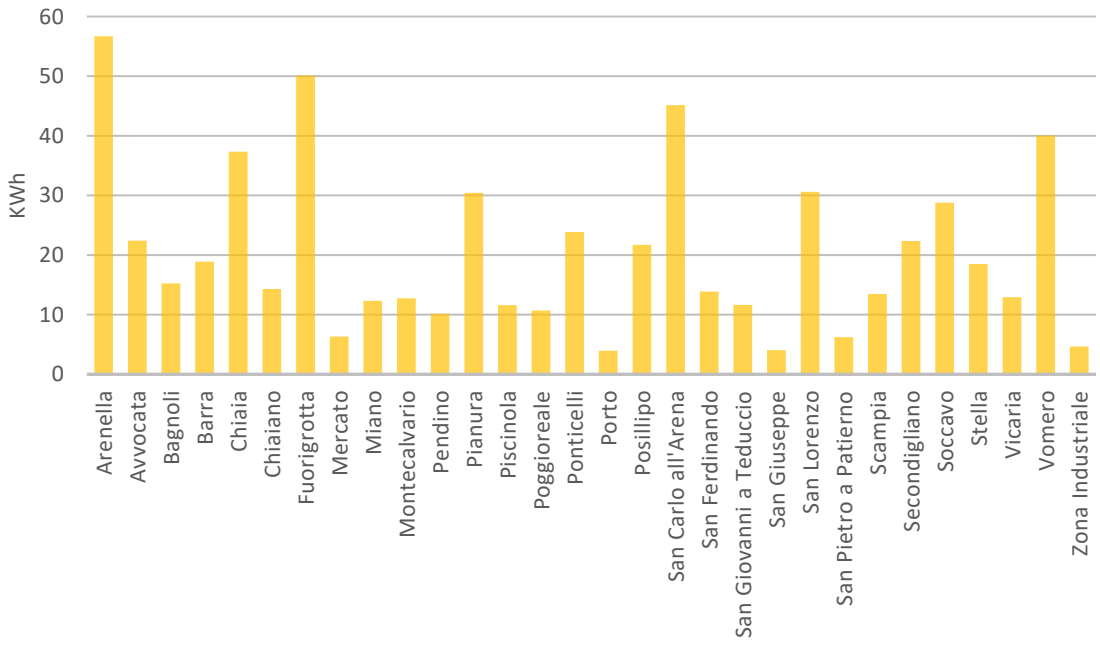

Fig. 5 Electric energy consumption of domestic users for the neighbourhoods of the city of Naples in the 2011

It can be noted that the neighbourhoods with high consumption are those with a prevalent residential vocation. In order to show such correspondence, in the following Table 3, there is the data for the resident population of the neighbourhoods with a prevalent residential vocation.

Neighbourhood	Number of apartments
Fuorigrotta	71.808
San Carlo all'Arenella	69.094
Arenella	67.634
Pianura	57.821
Ponticelli	52.284
San Lorenzo	48.078
Soccavo	45.314
Vomero	44.791

Tab. 3 Number of apartments for the most densely populated neighbourhoods in the City of Naples (source ISTAT 2011)

According to Figure 4, the central areas are characterized by a consumption below the minimum consumption threshold identified (2,500 kwh). Furthermore, in these black areas there is some urban equipment such as the Villa Floridiana, the wooded areas near the district of the city and the area of the San Paolo football stadium.

As regards non-domestic users, it can be noted that high-consumption areas are concentrated in specific areas of the municipal territory. In particular, the peripheral areas are in most cases characterized by consumption less than the minimum threshold of 20,000 kwh or are entirely null. While, as shown in Figure 6, it is possible to find a high concentration of consumption in the neighbourhood of Poggioreale.

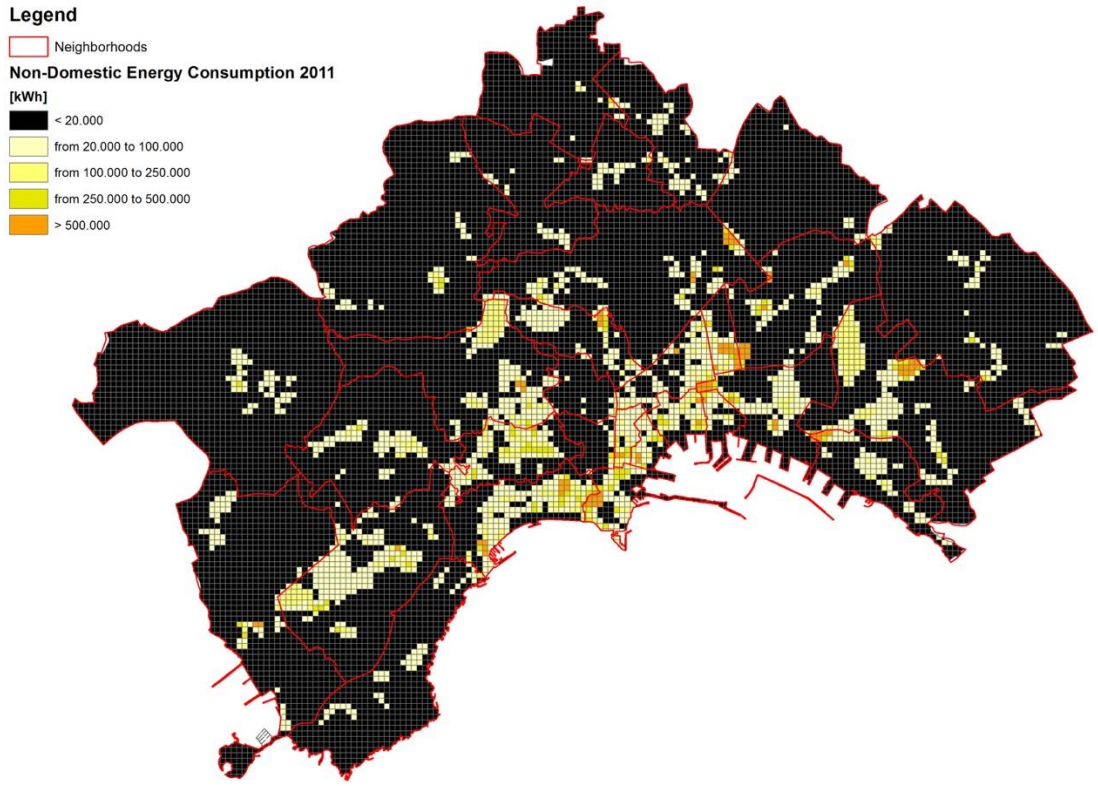

Fig. 6 Electric energy consumption map in kWh for the non-domestic users in the 2011

The result obtained is consistent because in this area there is a large number of private activities and urban services such as the law courts and the central business district. Portions of territory with a high consumption of non-domestic are also that of the Barra neighbourhood and of the industrial area where many companies and industries are located. It is possible to identify other parts of the territory with significant non-domestic consumption for the presence of commercial areas and offices in the neighbourhoods of Chiaia, Fuorigrotta and in the city centre.

These results become apparent by observing the results shown in the graph in Figure 7.

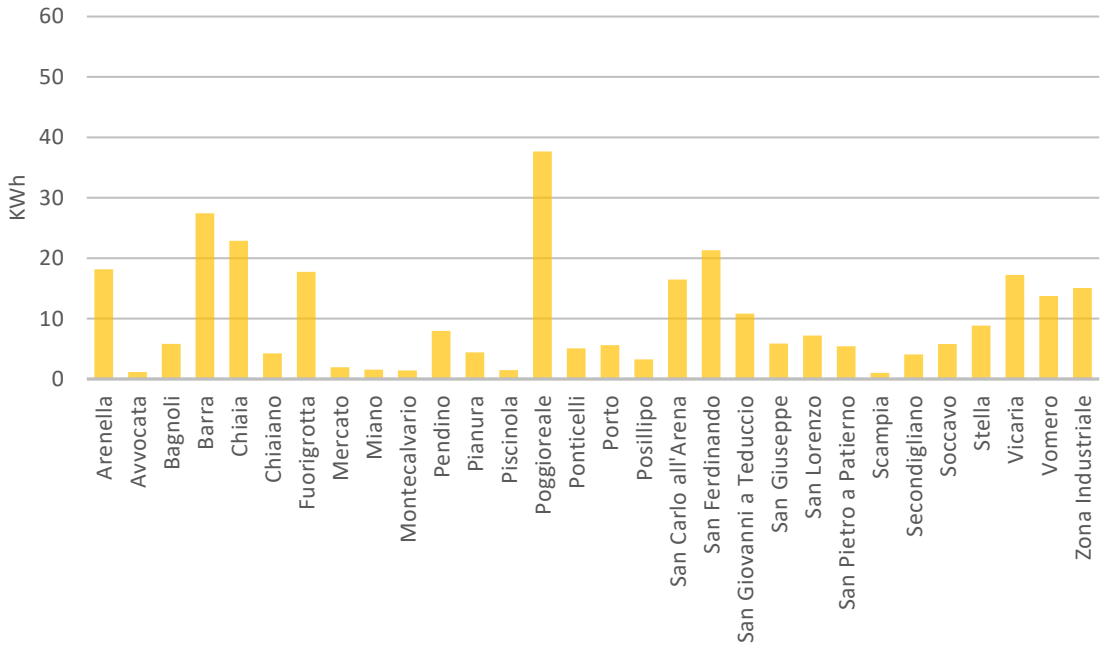

Fig. 7 Electric energy consumption of non-domestic users for neighbourhoods of the municipality of Naples in 2011

4.4 THE VALIDATION OF THE METHODOLOGY

In order to verify the results obtained following the application of the GIS methodology to the city of Naples, a validation step was carried out through a comparison of the data obtained in the output and those of the average electric consumption derived from the surveys/studies carried out by ISTAT and in the field of the SEAPs (Sustainable Energy Action Plans submitted under the 2020 Covenant of Mayors) by the municipal authority of Naples. This validation step is therefore aimed at verifying whether the results obtained are consistent with the values obtained through other studies that have calculated the consumption of energy through the use of estimation models. For the validation, starting from the outputs following the application of the methodology to the municipality of Naples, the average consumption for the individual quarters was calculated. Some of the calculated values are shown in Table 4.

The comparison data found are in both cases referred to the average consumption per user for the entire city of Naples. The ISTAT reports the end-use electric energy consumption per users of 2,556 kwh for the year 2011, while the SEAPs reports a value of 2.600 kwh calculated in 2011. However, this data is provided at an urban scale, not at a neighbourhood scale such as those analysed and therefore represent an average between the maximum and minimum values.

The comparison shows that the data calculated using the GIS methodology are similar to those found, so the validation can be considered satisfied.

Neighbourhood	Average consumption [kWh/year]
Arenella	2.221
Chiaia	2.517
Posillipo	2.854
Fuorigrotta	2.105
Pianura	2.268
Chiaiano	2.201
Vomero	2.333
San Giuseppe	2.292
San Pietro a Patierno	2.149
San Ferdinando	2.182
Soccavo	2.173
Vicaria	2.165

Tab. 4 Average electric energy consumption of some neighbourhoods of Naples

5 CONCLUSIONS AND FUTURE DEVELOPMENTS

This paper describes the technical-scientific activities that lead to the development of a GIS-based methodology able to quantify the electric energy consumption for domestic and non-domestic users.

For the development of this methodology, the computing capacity offered by the latest generation of GIS software has been used. These systems allow the collection, management and elaboration of the new types of data like Big Data and Open Data. There are three working steps that led to the development of the GIS-based methodology. The first step has provided data individuation and retrieval, through the choice of data freely usable by public administration necessary for the calculation of electric energy consumption of domestic and non-domestic users.

The second step involved the structuring and processing of data, which allowed both the development of an automated process of degree to relate data belonging to the different sources and the setting point of a GIS tool capable of performing the operations of geoprocessing and numerical calculation. The third and final step concerns the definition of the methods of classification and representation in GIS the results in output from the methodology. Therefore, through the application of the GIS-based methodology it is possible to obtain a real quantitative "photograph" of the variation of electric energy consumption for the study area analysed. Subsequently, in order to verify the real applicability and reliability of the GIS methodology, a study area has been identified. The City of Naples was chosen for the complexity of the urban system and for the collaboration of the municipal offices that provided the energy data by the web platform SIATEL 2.0. The alphanumeric data related to the electric energy consumption has allowed the identification of 443,185 domestic and non-domestic users while the national Geoportal database containing the alphanumeric and geometric data of the addresses for the City of Naples consists of 109,000 civic numbers. To geolocalize the electric energy consumption data, to each individual user has been joined the correspondent element of the addresses database. In order to carry out this operation, a process of correcting the addresses was applied, which joined of the data belonging to the two databases with a match of 96%. It was not possible to reach a complete association because for some of the users the civic numbers were not reported or addresses were not comprehensible.

Moreover, in order to facilitate the reading and interpretation of the results, a procedure was also developed to report the consumption of electricity compared to a standard territorial unit. It was selected, as standard territorial unit, the one entered by default in the GIS-based methodology, that is the rectangular cell of the size 100 m per 100 m. Through this technique it was possible to realize in GIS the representation of electric energy consumption for domestic and non-domestic users. In order to be able to verify the accuracy of results,

it was be a validation phase through the comparing the average consumption values per user calculated by ISTAT and by local authority (SEAPs) with the average consumption data calculated for the individual neighbourhoods of city by the GIS-based methodology. The outcome of this comparison confirmed the correctness of the values calculated with the developed GIS-based methodology.

In conclusion, it was possible to identify two categories of products both linked to the development of the GIS-based methodology and to the application of the methodology to the study area of the City of Naples. As regards the first category, the work carried out allowed the development of the GIS-based Urban Energy Consumption Tool, which allows the application of the developed GIS-based methodology through a graphical interface in the GIS. While the second category of products concerns the numerical and graphic results obtained for the territory of the municipality of Naples both in the stage of organization and processing of data such as for example, the updated version of the geodatabase addresses both in the classification and representation of electric energy consumption for domestic and non-domestic users. These results constitute a cognitive asset that local administrations can use to improve the energy sustainability. Among the strengths of the GIS-based methodology developed is the quantification and detailed distribution of electric energy consumption, using the actual data. In addition, the results obtained support the decision making processes related to improve the urban sustainability to optimize the energy consumption and reduce the greenhouse gas emission through a smart and integrate strategies that involve the different components of urban system.

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IMAGE SOURCES

Fig. 1, 2, 3, 4, 5, 6,7: elaborated by the author

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BETWEEN COMMUNITY SPACES: SQUARES OF MINOR CENTERS OF CALABRIA

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ABSTRACT

The theme of open "community spaces" in recent years has to the development of important interdisciplinary issues.
Nevertheless, the reading of smaller towns, in urbanistic, historical-anthropological and geographical terms appears less extended, considering the declination of public spaces as "squares." Starting from this declension we would like to introduce the first results of a research. The research had the aim of (re)interpreting the particular characteristics of these areas in specific areas such as small towns, using the region of Calabria for the case of analytic application.
These communities have diverse and stratified living cultures, altered by settlement processes that have triggered two different types of urban contexts. The former often lead either to urban areas in depopulated decay or, in contrast, in places of memories: empty containers of relationships, sterile and crystallized museum objects, reduced to scenarios on which passing groups of visitors move necessarily from those realities. The latter often encircle primitive nuclei, asphyxiating them, or characterizing the so-called "dual" or "satellites" towns, completely detached from the original urban center in which all public functions are decentralized.
The applied methodology is based on the reading of the historical-functional evolution of squares by the identification of codified compositional criteria.
Through this research we seek to verify how urban planning, in synergy with other disciplines, can define processes of regeneration aimed at restoring the meaning of "center", and thus of an urban-community reference center.

KEYWORDS:
Community spaces; Interdisciplinary approach; Culture of living; Vernacular architecture; Urban regeneration.

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社区空间之间：
卡拉布里亚小中心广场

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摘要

开篇提及的“社区空间”主题广义而言指的是公共区域。近年来，“社区空间”推动了国内外领域重要跨学科事务的发展。然而，从城市化角度、历史人类学角度和地理学角度，对小镇的解读依然不够，认为公共区域的衰退是“广场”。本文以这一衰退为切入，从历史衰退、健康和功能解读两方面进行研究，介绍了调查的初步结果。它以卡拉布里亚地区为分析应用实例，旨在（重新）解读小镇等特定区域的这些空间的特殊性质。

我们希望通过这一解读，突出城市规划与其它原则可以如何帮助这些区域重获“中心”意义，最终成为参考城市社区极点。

参考领域可分为两种不同城市环境：历史环境和现代集群。第一种会导致城市区域降级、人口减少或者反过来，成为记忆之城：空空如也的关系容器、锁在博物馆中的无菌或结晶的物件，最终变成与现实完全脱节的游客观光地。第二种往往围绕初生核，要么使其窒息而亡，要么形成“双倍”或“行星”村落，完全不同于所有公共功能彼此分散的原始城市中心。

关键词：
社区空间、小中心、微环境、城市复兴、一体化

1 INTRODUCTION

The theme of open "community spaces", generally considered as public spaces, in recent years has to the development of important interdisciplinary issues both internationally and nationally. Specifically, reference is made to Enrico Guidoni's historical-urbanistic analysis which intersects the cultured and the traditional dimension; to the more recent writings of Marco Romano, with the aim of reviving the notions of squares and streets, avoiding the "wrongdoings" of the past; to Salvatore Settis's critical notes on the assault on cultural heritage, including that inherent to public spaces, once an expression of the town's identity; to Stefano Boeri's appeals urging us to open "enclosed squares"; to the contributions to the size of premises of Alberto Magnaghi and Bernardo Secchi[1].

Nevertheless, the reading of smaller towns, in urbanistic, historical-anthropological and geographical terms appears less extended, considering the declination of public spaces as "squares." Starting from this declension – investigated both in terms of historical development, and in terms of physical and functional reading – we would like to introduce the first results of a research. The research had the aim of (re)interpreting the particular characteristics of these areas in specific areas such as small towns, using the region of Calabria for the case of analytic application. This is because it is a region which is mainly characterized by smaller centers. In fact, of the 405 municipalities, 318 have a population of less than 5,000 inhabitants.

These communities have diverse and stratified living cultures, altered by settlement processes that have triggered two different types of urban contexts. The former often lead either to urban areas in depopulated decay or, in contrast, in places of memories: empty containers of relationships, sterile and crystallized museum objects, reduced to scenarios on which passing groups of visitors move necessarily from those realities. The latter often encircle primitive nuclei, asphyxiating them, or characterizing the so-called "dual" or "satellites" towns, completely detached from the original urban center in which all public functions are decentralized.

The applied methodology is based on the reading of the historical-functional evolution of squares by the identification of codified compositional criteria. These criteria will contribute to the definition of a support instrument for project modelling, especially in terms of understanding the supra-structural patterns imposed by economic and political power on the organization of space.

Through this research we seek to verify how urban planning, in synergy with other disciplines, can define processes of regeneration aimed at restoring the meaning of "center", and thus of an urban-community reference center[2].

2 BETWEEN OPEN COMMUNITY SPACES: SQUARES

Open community spaces, coinciding with squares, have different and multiple types. In the first instance, they help to characterize the places and the people who live there: from the most prestigious[3] to smaller yet equally famous ones[4], and to the small squares of "lesser" villages from around the world; we also include areas of the microenvironment, which may even be reached by narrow and bumpy steps that are carved into the rock or covered walkways, between earthen architecture.

In any case, we refer, with all due differences, to places of the urban structure that excel: places of social meeting, of resting, of dialogue, of comparison, of celebrations, of collective symbolic discoveries, of dreams and of the mirror in which the community recognises itself. Yet the squares are also places of the internal-external dialectic, full-empty, open-closed, scene-room, body-gaze; in a continuous succession of events,

1 Guidoni, E. (1980); Romano, M., (2008, 2015); Boeri, S. (2011); Magnaghi, A. (2010); Secchi, B. (2015).

2 See. Zali N., Gholami, N., Karimiazeri, A. R., Azedeh, S. R., (2016).

3 Piazza di Spagna, Piazza Navona, Piazza S. Pietro in Roma, Piazza S. Marco in Venezia, Piazza del Duomo in Milano, Piazza Plebiscito in Napoli, Piazza del Campo in Siena, etc.

4 Piazza delle Erbe in Verona, Piazza della Cisterna in San Gimignano, and so on to foreign squares Place de Vosges in Paris, Piccadilly Circus in Londra, the square in front of the mosque of Djenné in Mali.

functions, representations and maps are to be found, expressions of vitality, of community strength, of togetherness and of centrality. It all has an enormously significant role (sacral, political, celebratory, legal, confrontative, ostentatious, theatrical, folkloristic), since squares were the place of processions, executions, riots, parades, funerals, rallies, sporting events and all kinds of performances.

Until recently, such a dimension was still tangible and the square (or any other place of the community) lived its real initial dimension. Instead, recently, the process of transformation – which actually started in the 1900s and consequent to the becoming of society and the serious crisis throughout almost the entire world – led to macroscopic changes.

In greater centers, such spaces are filled with vehicles, or even by the delineation of monument-squares. In smaller peripheral centres, where squares and wide spaces were long maintained as the fulcrum of the community there is, instead, an inexorable abandonment with consequent decay for several reasons. In each case the relation with the city is lost, its being the glue between the different urban places and, therefore, between both the people and groups living there. The public space becomes an atrophied space rather than a place for social relations between individuals, mediated by images. Some public spaces of those cities are still saved, barely contaminated by the process of mass "modernization" the structures of which still contain the essential reasons of the identity survival of its inhabitants.

The world is ever changing and increasingly projects people into realities like those of Times Square in New York, in the city-market communes, in the new dormitory conurbations, without spaces for exchange and human comparison, in the isolated villas of the bourgeoisie, in the ever-present "media squares" etc.

In this world, as stated by Marco Romano, the challenge is that of making the squares[5] once again become signs of the urbanistic and cultural becoming of a habitat. They, representative of the "collective spheres of our living", must become neuralgic points of irradiation of more recent urban parts, new real and symbolic centres of gravity, perhaps even designated by the community, between the oldest village and the new building expansion.

3 TEMPORAL AND FUNCTIONAL EVOLUTIONS OF OPEN COMMUNITY SPACES IN CITIES AND LESSER CENTRES

In observing the first symbols of cities, from the Egyptian to the Mesopotamian, it is notable that they are defined by a crossroad of right angle roads. The greatest powers unite and the most important places of exchange, of circulation of goods and people are to be found where the axes converge. It is there that culture coagulates, becoming the representation of the city par excellence, expression of an idea, of an age, and of an institution. It is a central space of the settlement, which continues to be found in the great palaces of Sargon in the fertile crescent, and in Knossos and Festos in Crete, where the internal courtyard around which the other spaces of the great structure are articulated and which became the square of the palace/city and even the centre of the entire empire. With the successive transmigration in Greece, the square transformed from an internal court to a mega construction in an open clearing of the intricate urban fabric of the low city. This new urban invention, called agorà[6], is the first that, due to form and function, is comparable with our squares: in fact, it is a religious centre, due to the presence of the main places of worship of the polis, in particular those of the founder and protector divinity; political centre, becoming the place elected by citizens for assemblies, to discuss civic problems, to create and maintain interpersonal relations, to make decisions; economic and commercial centre as the market place.

5 The reference is more specifically addressed to the Italian reality.

6 In ancient Greek ἀγορά from ἀγείρω = assemble, gather.

Later, during the Roman Empire, following the Hellenistic experience of the *plateia* [7], the *agorà* transforms into a *forum*. It is an open and central place of the city (Figure 1), almost always located at the crossroads of the two main roads, the cardo and the decumanus, around which the most important buildings were located (the basilicas in which justice was administered, buildings for the local judiciary, the most important temples, the workshops of the most prestigious trades).

The slow deterioration of the Empire and the start of the new urbanisation process of the territory, between the Early Middle Ages and the Late Middle Ages, led to the reinvention of the city and of the open and closed spaces suitable for the new needs of the inhabitants. In this new world, unlike previous ages, squares acquired a monofunctional character, as well as reflecting the most representative buildings. They are substantially differentiated: for religious activity in front of churches; for political occasions, in front of the town hall; for the sale and exchange of products or for fairs, often in proximity of the walls, thus decentred compared to previous ones for obvious logistical reasons. The solutions of squares nearby other squares, including the citizen market of daily needs, were grouped together and positioned in central places of the settlement; both due to the limited urban extension and to exploit the same system of streets. Numerous systems of squares derive from it – squares with different shapes that are, for the main part, religious or civil, simply separated by one of the public or religious buildings of which they are a function, and the unique squares that join them both – strong symbolic centres of the community – since, during the Middle Ages, religious and civil life often had many shared aspects. All this was realised without the adoption of a preformed scheme or without proportions between building height and walkable surfaces, but through the structuring of frequently irregular typologies.

Fig. 1 Roman forum to Scolacium

[7] Columned square/street ornamenting the city, bordered by workshops and other commercial activities. From the Greek version of this word, πλατεία, deriving from the latin *platea*, and therefore "piazza".

However, the typologies respected the lines of the horizon, result of a precise settlement culture and of adaptation to sites and of the organic development of the urban complex the connective tissue of which became vital organs. In any case, it is a diversified system due to dimensions and forms that are dependent on the functions and which are generally closed and self-contained. However, their opening and spaciousness is clear compared to the compactness of the settlement fabric and of the narrowness of paths, from which they are served without being crossed; this occurred at the edges and never at the centre so as to not alter the occurrence of facts and of daily actions[8] that make it a continual field of community life. Conventual squares will be distinguished which, following the experience of Eiximenis will regularise new urban parts on square links, thematising the respective areas.

The general setting given to the squares in the Middle Ages also continued to be manifested in the following centuries; but, the functioning mode and form would change. From the Renaissance on, they lost their character of "accidentality" and of adaption to functions, to needs, to sites and to local cultures, actions "from below"; instead, they become works designed at a table, like any other architecture for schemes, geometries, symmetries, applied regularity and modularity, with a "from above" procedure, desired by the most visible society to mark their power. Therefore, they acted on the existing fabric to improve and add value almost exclusively to the spaces in front of churches and palaces, giving them greater decorum that is more appropriate for the new canons of beauty, regularising and geometrising a previous square, eviscerating part of the existing fabric to obtain and remodel new spaces structuring as a square part of the city that had yet to be defined, in the case of urban expansions.

This occurred by paying great attention to the rules of proportion between walkable surfaces and the height of buildings, as well as to that of perspective, paying significant attention to the view of the observer and, consequentially, to connections with roads, placed opportunely, almost always at the centre to exalt the architecture and the monuments situated within. Instead, the creation of new cities with relative squares are scarce, notwithstanding the numerous elaborations of "ideal" models, namely of perfect forms of cities to be block built from nothing, consequent to the cultural revolution of the age.

In the Baroque age, even though squares were still of a similar character to Renaissance squares regarding the value given to the city, their renewal would be notable. They were to be characterised prevalently by a marked tension translated into a constant movement of curved forms, in fantasy, in theatrical scenery, consequent to the new moral and intellectual climate, to the change of social and political conditions, to the new geographical discoveries, to the reaction of the Catholic church towards Lutheran and Calvinist reformist attacks, to the anxiety of innovation. They would, thus, be engaged in the structuring of large "stages", correlated to the network of streets in which one could constantly move, with squares conceived as nodes, fastenings, points of reference around which the building fabric and the community could gravitate. In any case, it would be important to correlate a monument of notable importance to it – constructing it ex novo, before a significant pre-existence, which would be further valued by the space in front, or even by raising the reference building (churches, palaces, convents, hospitals, etc.) – or an attractive centre which would deputize it (such as an obelisk, a column or a fountain), perceivable from several angles, as the end or junction of the path. The novelty of all this is that it gives significant space to urban circulation, in particular that of the ruling classes, whether they be on foot or on-board coaches in which they show themselves to the population, in a scenic urban extension of aristocratic residences (Figures 2, 3, 4).

Starting from the nineteenth century, the accelerated changes of society, which were increasingly engrained by the leadership of the middle classes, were not matched by new propositive theories neither on the organic conception of the city nor on the component elements such as the squares.

[8] For the same reason, sacral architectures (such as aedicules and votive chapels), as well as fountains are placed along the sides.

Fig. 2 The picture of the Cathedral's plaza of the eighteenth-century Cosenza

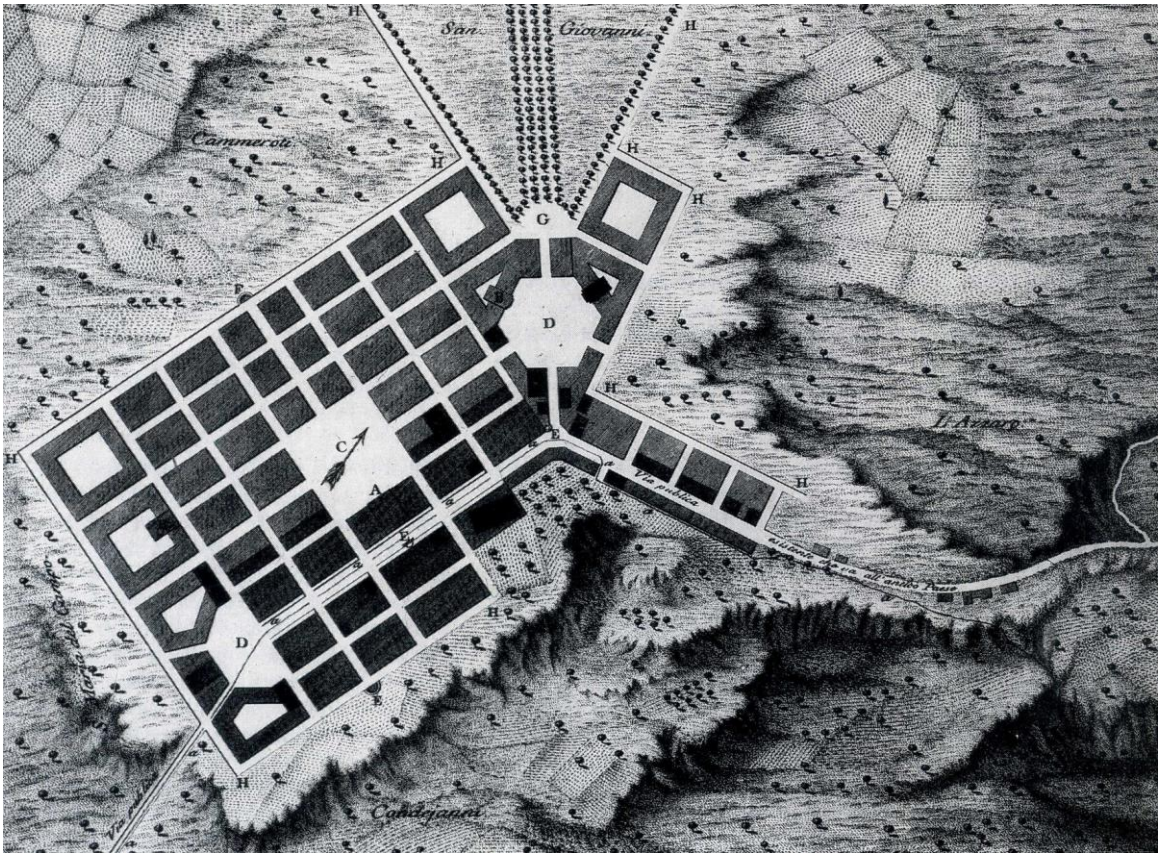

Fig. 3 The Enlightenment plan of Palms with central plaza

They resumed sumptuous baroque concepts, among forms that were usually circular, semi-circular, and elliptical, albeit with specific adaptations to the new urban dimensions. The demolition of portions of the "lesser" historical fabric, believed to be less important, were recurrent in order to isolate a monument and render it visible from several sides and also to give the city wide representative spaces.

With few exceptions – that use galleries, squares and covered streets to define connections between buildings and urban parts – the result was to be that of a reduction of courtly architecture to a museum exhibit, often isolating it in large and bare spaces, thus breaking the relationship between it and the whole urban context for which it was meant.

This was followed, due to increasing traffic, by a widening of roads and the transformation of the squares connected to them into roundabouts around the central flower beds: rough copies of British *squares*, hard for people to reach except through underpasses or slaloms between vehicles.

With regards to large urban centres, where the direct action of communities on constructions was surpassed by that of architects and urbanists (badly in the present), the reality of "minor" centres is different (Figure 5). They are expressions of compositional community choral acts in which the sense of the squares, intended as a place of social integration and centrality, is felt more than in cities. In fact, they were more guarded archaic and metaphorical meanings.

The symbolic manifestation of power and of the commodified material relations, in which the social life of the village is still felt, that sense of villager collectiveness, of "tranquillity", of instant communication, in an area where there are still flavours and an old way of life, are dissolute.

Apart from the accommodation of war memorials and other green oases in squares that were supposed to give more "decorum" in spaces that were already relevant in their own right, transformations were limited.

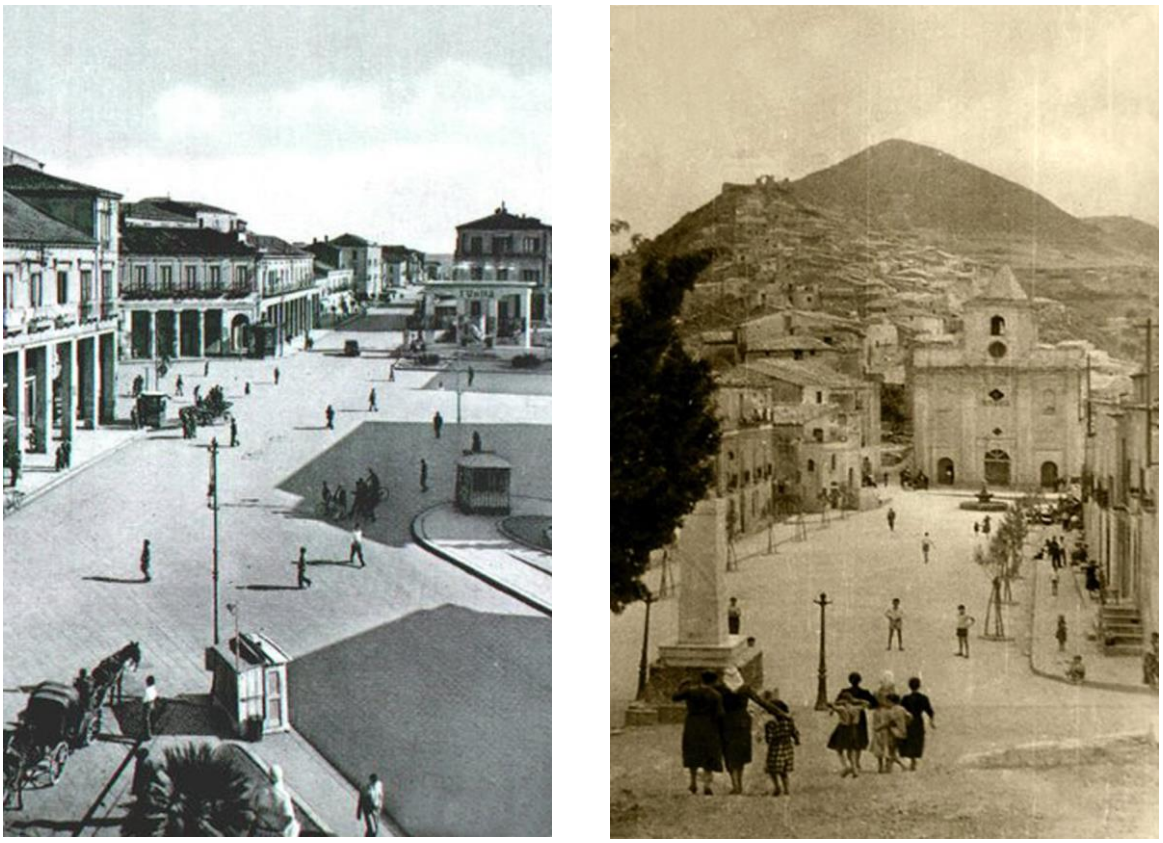

Fig. 4-5 The neoclassic "Pitagora" Plaza to Crotone (on the left) and the "Ferrante" Plaza to Bonifati in early 1900s images (on the right)

This occurred despite the inexorable arrival of the frantic metropolitan way of life, the recent economic decline of villages and consequential depopulation, and then the shift to the new urbanized suburbs, which tended to desert squares and empty them of meaning. Fetes are an expression of this, in all their manifestations, in which the space is still maintained as a physical fact, but not in its cultural dimension between the material and the symbolic. A greater continuity with the past is found in community spaces, which frequently are more numerous and more connected with everyday life, even if they are also increasingly being abandoned. Besides the squares, which are not very numerous, and the streets that conflux in them, it is the microenvironment which represents the minimum level of interference between the private (family house) and the community (the space used by several families or by the entire community) (Guidoni, 1980). It is a "privileged field", to be considered as a social exteriorisation of the internal, familiar or architectural or economic structure; including signs of religion, service equipment, spaces destined for work activities. It is here that regulations and customs of coexistence between different families unfold. Each element is mutually connected and, besides contributing to the definition of formal and spatio-functional compositions, it allows them to assume an important social and symbolic significance. In this light, the urban system, according to the organic principle of Mediterranean societies, does not only represent a path structure but it is also imposed as a community set: a place of encounter and exchange, like the house, not to be considered only as an exclusive space, but strongly compared to other households in a community vision (Figures 6, 7).

The associative models of the communities that found their origins both in familial groups (clans) and in those related by a productive activity were thus concretized. The structures differ qualitatively and quantitatively depending on the multiple cultural aspects of the different sites involved and the diverse historical periods during which such groups were formed.

There are, thus, individual families, families with extensive ties of kinship and, finally, situations characterized by different matrix aggregate forms, which are situated within diversified urban spaces that, however, correspond in both the model and dimension of the inhabitants' needs.

Despite this phenomenon characterizing each urban area, of course in a less intense manner than in the past, settlements that have a more complex urban grid appear as those most affected. The urban systems with a curvilinear-parallel or regular mesh trend, due to the usability of the roads, do not favour the permanence of these relationships; on the contrary, the intricate urban fabric – characterized by numerous clearings and from a few crossing axes, as can be seen in Islamic matrix installations – seems to have been composed precisely to facilitate interfamilial relationships.

Nearby seats, projections, external staircases, atriums, lodges, landings and galleries which primarily characterise these sectors, a network of reciprocity, of social and economic relations, of courtesies or even of hostilities[9], were created. In any case, membership in a neighbourhood[10] was deeply felt, sometimes more than the membership of the community as a whole. People identified with it and everyone was proud of it, considering such an area significantly more beautiful, orderly, important and safe if it is compared to others. There were also frequent conflicts between neighbourhoods, including those related to the celebrations of madonnas and saints belonging to those specific places, which was attenuated during main or patron saint feasts, involving and aggregating the entire village. Furthermore, these places are generally referred to as

[9] *Lassa u fuocu ardente e scappa duve a parturente*, states a Calabrian proverb highlighting the need to quickly lend help at a birth. Almost daily, instead, were cooking reciprocities, as can be drawn from another proverb from the same region: *alla vicina a pitta cchiù china* that tells you how important it was to reserve the best portions for the neighbours opposite. Special help was also given on the occasion of illnesses and death, when even enemies ran to help; economic exchanges regarded, instead, services and food stuffs: in practice, who had something or brought it home had to share it with the others. Neighbours, instead, helped each other if there was an immediate need for money, often paid back with interest, or even for the workforce or for weddings; in any case without social distinction because, as stated in another Calabrian proverb: *A regina avietta bisogno da' vicina* meaning everyone could need others.

[10] *Ruga* in Greek communities, *vaglio* and *slargu* in Islamic ones and *gjitonia* in the Arberësh communities of Calabria.

"intermediate spaces": in fact, numerous services find place there, as well as storage rooms for furnishings, which simultaneously allowed for the execution of domestic work, rest and other collective activities of food preparation and rural or fishing crafts. Despite the differences compared to the past, they are still areas that have been able to maintain their typological characteristics as protected. The latter, in particular, overlook housing units that are aligned and easily accessible, which have been adjusted to citizens' models (asphalt or concrete surface coverage of what was once pedestrian, or frequently used for the passage of horses and chariots) and affected by other customs such as car use and new services. The transformations, in the latter case, were even more invasive and, in addition to involving the use of different materials from tradition, have determined: demolition of walls; physical annulment of stepped paths for very steep roads for light traffic; change of destination of numerous rooms, with the consequent alteration of the facility layout.
In any case, the presence of commercial activities, usually along the recently constructed main roads more used by transport and by people, is scarce.
The movements which occurred usually regarded activities of the overlooking home or rare entertainments between neighbours and passers-by. It is believed, however, that when the urban arrangement was defined, there was a certain harmony. The creation of collective spaces occurred through the participation of all overlooking families; the same people who kept them clean, who provided them with services and ensured their maintenance. Being spatial entities with multiple characters, each could also intervene in the formal classification, usually following the construction of their own home.

Fig. 6-7 Women and microenvironment to Tiriolo. The competition of the piñatas to Monterosso

Everyone was a direct protagonist of their own distribution, decorative and symbolic choices; interpretive freedoms were nonetheless accurate and consolidated, which made it possible to express a language belonging to a code in which everyone could recognize themselves and relate to. A process, therefore, to be understood

not as a passive adaptation to different situations, nor as a refinement of beauty (intended as an external variable), but rather as an interpretation rich in functional meanings. Such an interpretation, devoid of theory, drew on the complex cultural heritage of each area, consolidated by experience and handed down by tradition, with very little codification from outside. Therefore, it consists of places with different but very specific meanings, both in the cultured and traditional dimension. Center of the city from which they take nourishment, it was also the stage of the community's life until a few decades ago. In these, people, materially acknowledging their citizenship, were mixed, they compared themselves with their peers, and represented themselves. This allowed them to give vent to their personality which was often stifled in the home, in a continuous flow between private and public life. They were urban structures that were consistently projected onto the social ones, where the voices, the din, the sounds, the noises and the ritual music created family resonances, where distances were measured with looks: from the largest squares, often a symbol of individual emotions to the more contained squares, closely linked to the evolution of the various moments of existence. This can be related to a past dimension, echoing between the lines and always less current. It deals with places of the community, paradoxically no longer in the hands of the community, and therefore victims of a modern schizophrenia and swallowed up by an urban planning and architecture whose members are not able to understand, maintain and propose them in contemporary days. It is no coincidence that in neighbourhoods built in recent decades no provision has been made for squares, reducing suburbs to deserts where often social marginalisation is cruelly underlined by symbolic marginalisation (Romano, 2015).

Added to this is the reality of sprawl, the widespread "city", due to powerful cultural, economic, social and anthropological factors; in such contexts there are no longer community places; they have been replaced by a disorder that is seemingly irrational, a reflection of the ways of using and perceiving the space of today's society. Thus, we encounter the *private city* dispersed in vast territories, fragmented, consisting of settlement islands in their own right, without central spaces and hubs of community life; but we also come across atrophied sites, places of remembrance, destroyed areas, topologically but not typologically recognizable, as they are without the functions for which they were created.

They, in particular, gave meaning and identity to the same shape since these are areas characterized by strictly commercial meanings. This connotation coincides with their trivial reconsideration, with a view to the re-use of historic centers, as places of meetings and holiday strolls; places compared and "replaced" by other "squares" (such as centers and shopping streets, or replaced by stations, airports, stadiums, gymnasiums, media "squares", etc.) that overturn the out of community space into an increasingly "internised" inner space. It passes, then, following the rhythms of social impoverishment: from an emptiness, dense in relations and sociality to a complete emptiness of meanings and values; from their being a scene to progressively becoming a screen, increasingly misty, an irrefutable sign of suffering towns and villages (Figures 8, 9).

4 AMONG MINOR CENTRES: THE CASE OF CALABRIA

As indicated above, this paper aims to introduce the first results of a research aimed at (re)interpreting the particular characteristics of such spaces in specific areas such as minor centers: the case of analytical application is the region of Calabria. To do so, we start from the analysis of the squares, both in terms of historical evolution, and in terms of physical and functional reading.

It is to grasp different facets of a territorial area of peripheral southern Italy. In it – due to several factors including distance from the centers of power, the physical-territorial disintegration and the presence of a long-monarchical feudal regime – since the Middle Ages the settlements remain strongly marked by the simple and essential character of the rural world, in particular of the hinterland; and these are maintained, with few exceptions, up to the mid-1900s, in respect of customs and in the sharing of common reference horizons inherited from tradition. In addition, the continued frequency of natural disasters – such as earthquakes and

floods, incident on the devastation of constructions and the insecurity and anxiety of naturally scattered communities – which involve the maintenance of urban facilities, the most difficult to remove, but the constant renovation of the architectures.

Fig. 8 Abandoned plaza to S. Lorenzo

Fig. 9 Modernity to Melito Porto Salvo

The investigation therefore moves in territories that, as in much of the South, see the sea but which are not seen from it, without deriving economic activity, mentality or behaviour from it. It is, therefore, a landscape area not located near the coast, but, basically, lived folded neatly between the hills and overlooking high ground. A situation that has occurred for about a thousand years; since the decline of the Roman Empire, the new territorial urbanization process and reinvention of the settlements with the respective community spaces suited to new needs started. It is a historical phase in which the countryside assumes a leading role and rural centers proliferate. Different urban traditions coexist, and are founded and, in part, differentiate, tending in any case to build a common heritage. The inhabited appear defined, accordingly, by settlement cultures determined by long experimented and precise design rules. They are rules that are constituted by dimensions, relations between houses, use of common spaces, building materials, etc.; they are transmitted orally from generation to generation and, each time, adapted to all stimuli and to the new requirements developed within a community.

This territorial context often manifests itself "floating" and consists of a mosaic of places, each with their own historical and geographical individuality. They are delimited by precise boundaries, within which each community interprets and defines its own environment, according to specific organizational models; such models are expressions of social life and originate from an intense relationship with nature, history and religion.

Fig. 10 The village of Fuscaldo

A close interdependence binds the settlement network to the natural field of belonging, which constitutes an inseparable unicum centred on the strength of bijective relations and of the relations of lived knowledge, between man and his surroundings. This phenomenon marks each urban setting in a less intense manner than in the past; nevertheless, there is still a difference between settlement patterns depending on compactness,

on complexity and on the articulation of the connective tissue, which are the fundamental and differentiating parameters of the community structure.

In this context, among the different ways to build and organize the urban fabric, curvilinear road models[11] appear to have an important role. With regard to the study in question, they are among those that least facilitate rest and entertainment between community members. In its early forms, the phenomenon should not be seen only as a passive adaptation to the natural landscape, but also as the externalization of the will not to impose artificial signs. It slowly loses this last value, while continuing to manifest itself during the Middle Ages as a "curvilinear style": it is one which will be repeatedly employed, even with the use of more durable materials, to resolve defensive and road urban problems.

The research has highlighted that these signs are still to be found in many settlements of both the Tyrrhenian coast[12] (including Fuscaldo[13] and, further south, Monterosso, Arena[14]) and of the Ionian coast (in the case of Staiti, St. Severina, Rocca Imperiale and some villages of Greek Sila[15]) as indicated in Figures 10, 11, 12, 13. These settlements are characterized, in the historic part, by compact or elongated urban networks; however, they follow conformation of the ground and are differentiated by the ground's different morphology, clearly highlighting a similar settlement grammar. The agglomerations are usually situated on hilly offshoots and along often inaccessible slopes or natural terraces hanging over gorges (such as Grisolia). Furthermore, they are connected by roads that cross the territory strongly mark constructions. In each case, the structural organization occurs around a military or religious center, placed in a central position which, in the past, functioned as the point of origin and of urban attraction.

The blocks, arranged on steep terraces (such as in Cleto, Sorianello or Sangineto), usually occupy spaces that are more easily buildable and better exposed, yet this is not an absolute rule. Some districts have developed on apparently inaccessible rock formations that determine (such as in the case of Tortora, Maierà or Roccabernarda) urban forms of particular interest and fascination; among them the upper part of Amantea stands out, modelled directly on the rock with buildings that overlook large and high caves.

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11 The roots of this system lie the early history; it disappears in Roman times and then resurfaces after the collapse of the Empire, when the State authorities and citizens cease to exercise control of town planning which, in a moment of antiurban tendency of new populations, will be handled directly by the inhabitants themselves according to the ways of their own peasant-pagan culture. It is a settlement tradition also rooted in North European peoples, in predominantly rural areas, and centred on the natural elements which reflect the characters. Its forms, spread throughout the territory by the Normans and Lombards clearly contrast the classical heritage; they have less rigid lines, the use of which will be facilitated by the use of timber structures, for the construction of defensive structures and housing, irreversibly decreeing the switching between ancient and medieval settlement structures.

12 Tortora, San Nicola Arcella, Grisolia, Maierà, Buonvicino, in part Bonifati, Acquappesa, Longobardi, Arena.

13 In Fuscaldo, the village is crossed by a sinusoidal road which, at the top, wraps around the primitive nucleus, still arranged according to the steepness of the site, degrading compared to a fortified structure

14 The village belongs to a seriation of centers that first saw the dawn at the beginning of the second millennium; it covers the top of a hill, extending upstream with a fairly consistent nucleus. The buildings, made up predominantly of terraced types of a popular matrix, respect the lines of nature; along with the urban routes, they define a fusiform settlement system of historical-urban interest, which still retains the characteristics of its medieval origins. In addition to the particularly valuable ecclesiastical buildings, there are important palaces and an old disused mill, which was later transformed into an olive oil mill, which along with other building episodes embellish historical buildings.

15 The oldest inhabited area is bordered by a group of older homes; it extends to the North over a hilly tuft offshoot that ends, gradually, in a sharp incline, with steep external traits defining the boundaries. In respect for the steepness of the site, the belonging to urban and architectural typological characters of the rural world; they come with traditional forms that are strongly influenced by an exclusive adaptation to the needs and to the essential. The dwellings are designed on a human scale, with a few emerging architectural elements; overall, they assume a decidedly homogenous urban collection, confirming a commonality of material and cultural resources and to life experiences of unitary life. There are numerous groups of row houses, usually on two floors, forming compact blocks and developed on four fronts; they are usually formed by a single row of houses with shared side walls and two faces. Rarer are cases of living cells in adherence to walls with rocks or with another house that opens onto the parallel street.

Closely connected to the system of buildings, the trend of paths is presented: the frequent curvilinearity does not imply contorted and irregular structures.

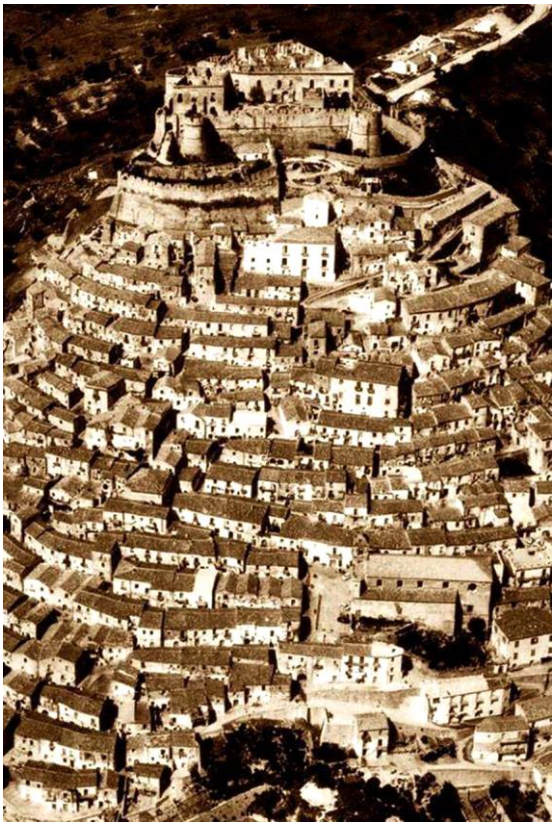

Fig. 11-12-13 Curvilinearity in the villages of Monterosso and Arena. The village of Rocca Imperiale.

There are many parts that horizontally follow land orography; others serve as a connection between the various heights with both inclining slopes, in order to ensure drivable communications, as well as stepped slopes, in the direction of the slope, for pedestrian use.

In this territorial situation, which is already in itself highly diversified, the radically innovative Islamic cultural component is also connected. It has had some influence on the investigated territory both in a direct yet marginal manner during the fleeting presence of such peoples, as well as indirectly, continuing to transmit some forms of organization of the cultural landscapes over centuries which can still be found today[16].

Without handing down forms of courtly architecture, it enabled indirect evidence to reach the current day, including common Arabisms and indications of place names, as well as several significant traces. They can be found here, as in other areas of the region, especially in the presence of some aggregation modes of living spaces: these are ways which can be attributed to the habits of small groups bound by relations of common ethnicity or family relations or work. Some case studies are characterized by: compact and irregular fabrics, blind alleys, covered streets, road arcs, bayonet paths, sudden changes of direction, sudden widenings, denticulation of buildings on street fronts, rounded edges, exterior stairs and frequent angles. These characters facilitate the relations of the community even more compared to the previous model, creating open places that are more difficult to cross and which are protected. In the original nuclei of many centers there are signs of this way of conceiving the settlement, although some similarities compared to previously seen examples remain, concerning: morphology and geological properties of the site; the presence of architectural centers; connection routes with the territory (Chimirri, 2008, 2015).

It is the case of the following towns, as further shown in Figures 14, 15, 16: Belmonte, crossed by a steep penetrating road onto which flow minor connection paths with more external areas; Paola, where in the part above Piazza del Popolo, the housing units, in contrast with the 1800s expansion areas, form a rather compact agglomerate; Cetraro, perched above a hilly offshoot slightly deviated from the coast, that in the outer portion is defined by a series of dense housing units; Belvedere, circumscribed by a curving road that also encircles the castle, from which some crossing paths depart; Scalea, situated along a steep hill facing the coastal plain, on which on which unfolds a dense branching of steps converging on the ruins of a fortified structure; Morano and Saracena, defined by intricate and at times labyrinthine settlement systems; Crotone, relative to its historic center, consisting of a maze of streets with a very complex pattern, with clearings and squares wedged between them; Catanzaro, where the settlement complexity appears in the district of *Grecìa*; Cosenza, which presents an urban fabric south-west of Corso Telesio that is heavily influenced by an alternation of uncovered and covered paths, interspersed with clearings of different extensions.

They do not deviate from the latter way of conceiving the settlement organisation of villages of arberësh origin or remodelling (Santa Sofia d'Epiro[17], San Demetrio Corone[18], Vaccarizzo, San Cosmo Albanese and Mongrassano, San Benedetto Ullano, Cervicati, respectively on the right and on the left of the river Crati,

16 The process started around 1000, when along the entire Calabria coast there was a series of landings and raids by the populations. As well as constituting permanent bases such as Amantea and Reggio, the seat of emirates, they penetrated inland also affecting productive organisation and settlement organisation both of small existing nuclei as well as those to be built.

17 The inhabited area is made up of a somewhat irregular urban fabric; inside it is possible to note elements belonging to different settlement cultures. The buildings come together and form very large but also isolated housing units; between them, paths (*rrugat*) of different shapes, spaced by widenings and squares (*sheshe*). Of particular interest are the street underpasses with visible beams: they are frequent in primitive area of the lower zone, where there are many external stairs to the buildings. The prevailing building typology is one with very small dimensions, with simple finishes in both the wall surfaces and the openings

18 The original nucleus, planimetrically uneven, consists of a row of buildings; they often have jagged edges formed by masonry stairs, arranged above along a rough stretch and one below of a lesser steepness. There are also many aristocratic houses and some row houses, with interesting carved stone portals. Between the urban and architectural features of interest, road underpasses assume a considerable role, often overlooking more or less wide open spaces even sloping.

Fig. 14-15-16 Road arches in Belmonte and Saracena. Covered path in Cosenza.

Fig. 17-18-19 Settlement tradition and modernity in Vaccarizzo Albanese. The "gijtonìa" to S. Demetrio. Urbanistic linearity to Guardia Piemontese.

Falconara, along the Cosentinian Tyrrhenian coast, Civita and Lungro, close to the Pollino) which, in the gijtonia, cell/space of the neighbourhood, have a meeting place par excellence for community relations (see Figures 17, 18).

The shapes of the villages of sixteenth-seventeenth century[19] foundation/expansion (Figure 19), or those rebuilt after 1783 according to Enlightenment models[20], appear finally rather different and less compact; they are therefore less open, but do not exclude rests nor relationships. In such centers, despite the diversity of both morphological and altitude situations, urban networks are characterized by a road system consisting of a checkerboard of mainly straight and parallel streets, forming very elongated and regular blocks. There is a large central square around which the settlement system and community gather, while clearings and more isolated lanes are usually absent; instead, the roads are the "open air rooms" of the people, parallel to the inner courtyards in the blocks.

5 CONCLUSIONS

There are numerous studies that have led to the definition of genuine manuals that gather principles, operative instruments and case studies at the disposal of urban context administrators to support them and guide them on the best way to interpret, create and manage community spaces, intended as quality public spaces[21].

These studies show that ensuring an increase in quality of life and prosperity, including economic prosperity, means preparing roads, green areas, parks, squares and other public spaces in the best way, providing them with services and efficient infrastructures.

Critical to the success of the city, like in the villages and the territorial systems, is a high consideration of the importance of the community space intended as a public space: the adequate distribution and proportion of urban areas devoted to streets and public spaces, as well as greater connectivity, make the territories more liveable and productive. The territories that revalue and promote widespread access to common assets, to urban *commons*, thus increase social cohesion, civic identity and the quality of life of all citizens, including and above all the most vulnerable.

Therefore, in order to contribute to the definition of such practices this research has focused on squares as specific public spaces, using the case of Calabria. Calabria is a region where the geographical and social capital is weaker than other regions and, consequently, it is necessary to look for answers that are as effective as they are encouraging, to be compared and exported.

The open community space, in these contexts, should be an admonition to rethink the new urban design; it must not conflict the historical legacies and natural evidence nor conflict the current needs of socio-economic development which these territories need, that will also lead to a reversal of the trend of population decline.

Obviously, seeking to reverse the demographic trend in such contexts solely through the rethinking of these spaces is not sufficient; on the contrary, it is not at all inappropriate to think of local development actions which rethink appropriate community spaces, contributing to enhancing territorial peculiarities, also for the purposes of transversal tourism activities.

The reversal of demographic trends occurs when a recovery of the labour demand is credible and sustainable and when adequate conditions of citizenship, both for the young and the not so young, are restored. By contrast, such a reversal determines the reuse of unused fundamental territorial capital elements, particularly the settlement system, enabling recovery, maintenance and safety which would otherwise not be activated; it

19 Guardia Piemontese, Diamante, Fabbrizia, Cittanova.

20 Filadelfia, Palmi, Cortale.

21 It is noted, for example, the preparation of the *Global Toolkit on Public Space*, created by the partnership between the UN agency UN-Habitat and INU. It sees the two organizations merge capabilities, resources, skills and knowledge in the production and dissemination of policies and guidelines on the topic of Public Space.

also leads to the restoration and consolidation of the vitality of local communities. Given those necessary and essential assumptions, it emerges that the definition of community spaces in general, and smaller centers in particular, lies in the delineation of a collective creative process.

This process, however, cannot fail to take into account, in the specific case of squares, that they obey codified compositional criteria. These criteria in turn follow a particular design model, understood as an instrumental aid to the understanding of the superstructure schemes imposed by economic and political power on the organization of space.

Therefore, both in regenerating the existing community spaces and in the delineation of new spaces, it is necessary to identify the moment and the reasons of the design, of the visual and theatrical relations between the dominant monuments, the building and the roads that connect these areas; it thus necessary to interpret urban and architectural transformations in the long term (see Figure 20).

Fig. 20 The square of St. Severina

From our analysis of the case of Calabria, it emerged that the action of designers must be strong and decisive both on a small scale (single center) and a large scale (territorial system of the individual centers). Such actions must be open not only to aesthetics, but a humanly deeper and shared dimension: they must know how to interpret the continuous process of modification of the community places whilst favouring the connection between new and old anthropized contexts and between suburbia and compact centers. The overall objective is to help develop a wider urban design, aimed at generating social and economic development; specific targets for these spaces are substantiated, however, in: making them desirable again, reclaiming their respective anthropological properties; assigning them the role of urban connection, as well as integration and social cohesion between people belonging to different cultures; associating a role of collective service and

struggle against settlement desertification and the abandonment of old buildings[22]. The concept of memory, therefore, can have a significant and transversal relevance if it is not considered as a stronghold of values at risk of extinction or the foundation of the embalming of parts of the territory to be subtracted from the historical development and from the use of the people. Memory should be considered as "context" in which it is possible to find elements of the past which are still alive and current to relate to modernisation in a system that is dynamic, flexible, open and ready for exchange and interaction. Innovative development programs, stimulating revivification, to be continually rebuilt redrawing boundaries, must be founded on it.

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[22] It is for this reason that Unesco, as well as preserving the material aspects of sites, also intervenes in the maintenance of intangible culture (such as the wealth of the Jamaa El Fna Square of Marrakech).

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IMAGE SOURCES

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Fig. 11, 12: aerial view takem from Google maps

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Fig. 17: from Land Agency of Cosenza

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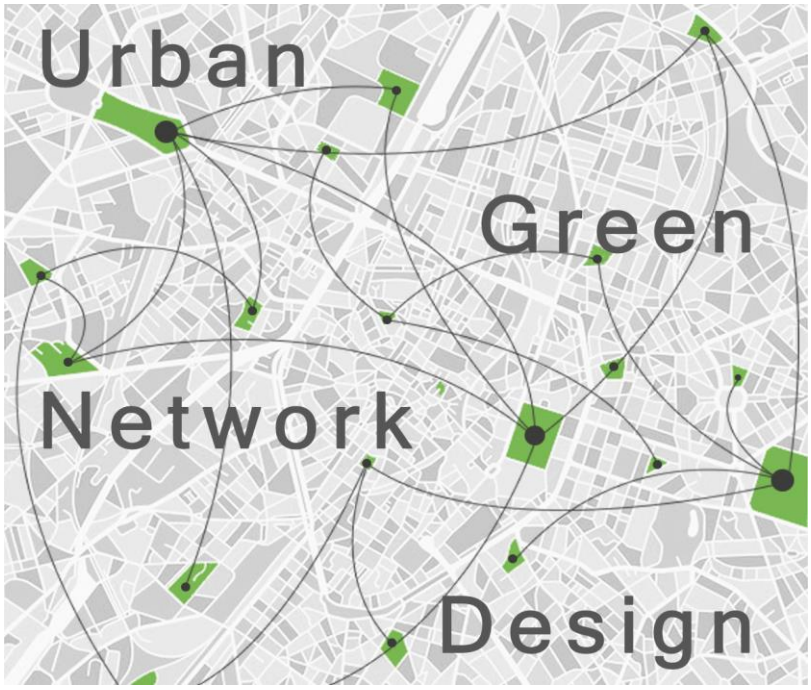

URBAN GREEN NETWORK DESIGN

DEFINING GREEN NETWORK FROM AN URBAN PLANNING PERSPECTIVE

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ABSTRACT

From the theoretical context of Smart City various studies have emerged that adopt an analytical approach and description of urban phenomena based on the principles of "network design"; this line of research uses the network systems theory to define the principles that regulate the relationships among the various elements of urban sub-systems in order to optimize their functionality. From the same theoretical basis, urban greenspaces have also been studied as networks, by means of the creation of models capable of measuring the performance of the system in its entirety, posing the basis of a new multy-disciplinary research field called green network. This paper presents the results of research aimed at clarifying the meaning of green network from an urban planning perspective through a lexical analysis applied to a textual corpus of more than 300 abstracts of research papers that have dealt with this topic over the last twenty years. The results show that the concept of green network appears still fuzzy and unclear, due to the different meaning given to the term "green" and to an incorrect use of the term "network", often referred to as a generic set of natural areas present in a city, without any reference to the network system theory or to the basic rules linking these elements together. For this reason, the paper proposes a unique definition of green network from an urban planning perspective that takes into account the contribution of other research areas to effective green infrastructure planning. This is the concept of "urban green network design" defined as "an urban planning practice, supported by decision support tools able to model green infrastructure as network, composed by natural and semi-natural areas, whose connections are modelled according to specific variables, in order to deliver an equal distribution of public services for enhancing the quality of life as well as a wide range of ecosystem services".

KEYWORDS:
Green network; Urban greenspace; Ecosystem services; lexical analysis.

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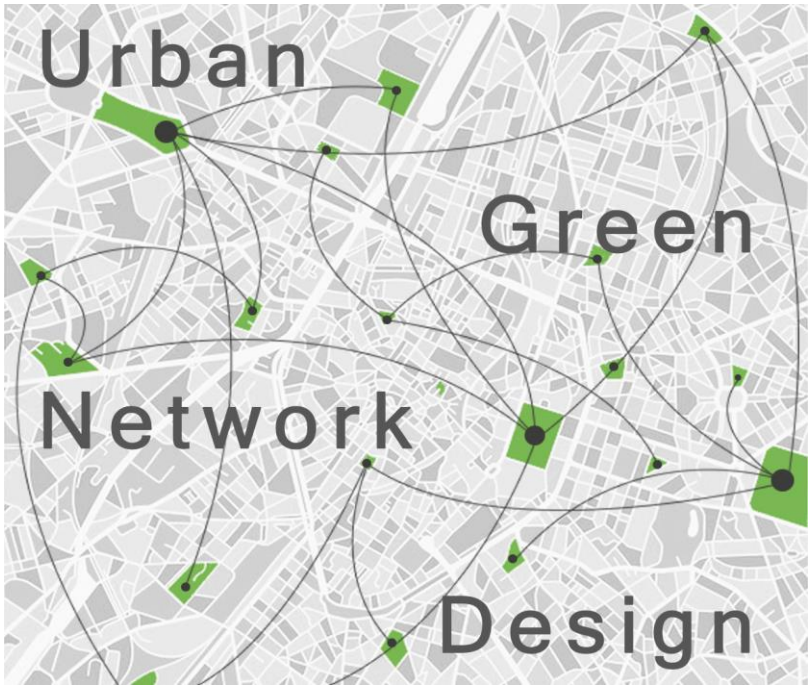

城市绿地网络设计：

从城市规划视角定义绿地网络。

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摘要

各种以“智慧生活”理论为背景的研究示例层出不穷，大部分研究都以“网络设计”原则为基础采用解析法和城市现象说明的方法进行；这一系列研究都使用了网络系统理论对调节不同城市子系统之间关系的原则进行定义，以尽可能优化各系统功能性。以相同理论基础为起点，学者们还将城市绿地空间作为网络进行研究，通过创建能够测量系统整体性能，构成一个被称为“绿地网络”的崭新跨学科研究领域。本文对研究的结果进行分析，旨在从城市规划角度入手，通过对 300 多篇近二十年来与本主题相关的研究报告的文本本身进行词法分析，阐明绿地系统的真正含义。结果表明，由于众人对“绿”一词的定义不同且对“系统/网络”一词使用不当，绿地系统的概念依然模糊不清，常常被解读城市中的自然区域统称，从未提及网络系统理论及与这些元素相关的基本规律。因此，本文从城市规划的角度出发，同时考虑其他研究领域对绿色基础设施规划的积极作用，提出了独特的绿地网络定义。这个“城市绿地网络设计”概念被定义为“以可将绿色基础设施建模为网络的决策支援工具为支持，由关系建模根据具体变量而定的自然和半自然区域组成，旨在提供提升生活质量及众多生态系统服务等公共服务的公平分配的城市规划实践”。

关键词：
绿地网络、城市绿地、生态系统服务、词汇分析

1 INTRODUCTION

In recent years, urban studies have begun to employ ecological rationality in planning cities and have therefore introduced techniques, methods and tools to integrate natural elements within the urban environment as part of the whole complex urban system. Consequently, Green Infrastructure (GI) has come to play a decisive role in redefining urban growth in many cities through a genuine green structural integration with the build environment (the creation of urban gardens in wooded areas, habitat for wild animals, ponds and wet areas, in addition to natural and artificial corridors of vegetation.) On a territorial level, GI may be conceptually defined as a 'green corridor' with a high level of bio-diversity (Jongman, Pungetti 2004; Bennet & Mulongoy 2006), while on an urban level this is conceived as a network created through strategic interventions, including a wide range of greenspaces and other elements of environmental importance (Aly & Amer, 2010); while green corridors have a purely environmental protection value, GI is characterized by its multi-functionality (Li et al., 2005). This leads to a wider perspective that entails the redefinition of anthropic systems and their relation with the urban structure in terms of ecological functions (Ahern, 2007). The EU commission defines GI as a "strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation" (EU Commission, 2017).

GI can be, therefore, defined as an element that enables the development of ecological relations between the city and its environmental context, whilst catering for social needs that are fundamental for the attainment of a high standard of urban life. Over the past few years, to this function has been added the recognition that greenspaces are effective tools in combatting the impact of climate change especially in terms of mitigation and adaptation policies (Matthews et al. 2015; Salata & Yiannakou, 2016). The idea is that the location and dimension as well as the intrinsic features of greenspaces (use of vegetation, functionality, the permeable/impermeable surface ratio etc.) depend on their interaction with other social, economic and geometric characteristics of the build environment (Gargiulo & Zucaro, 2015).

In order to manage the complexity of the relations mentioned above, in the last few years scientific and technological research in the field of urban studies has started to use research findings in the latest developments in network modeling (Ding et al., 2015; Fichera et al., 2016; Velásquez et al., 2017). Networking with its many variants, is one of the most active research areas in computer science involving researchers from System, Networks, Algorithm Design, Graph Theory. According to this theory, a network is a simplified representation that reduces a system to an abstract structure. Through the studying of these models, it is possible to gain insight into the nature of individual components (i.e. vertices), connections or interactions between those components (i.e. edges), as well as the pattern of connections (i.e. network). Any modifications of the structure (or pattern) of any given network can have a significant effect on the behavior of the system it depicts. Such models are starting to be used from outlining the fundamental concepts of urban development to the description and optimization of both physical networks, such as power, water or telecommunications, and human interactions within cities, with particular applications in quality of life and the flow of people and goods. Within this theory, the natural environment could be modeled and managed as a network, thus creating a new research field called green network design. This perspective appears realistic due also to the recent advances in digital geographic information which are fostering innovation in urban and regional planning (Massa & Campagna, 2014).

By reviewing the various research findings which have focused on this subject, it is evident that these theories, when applied to the concept of green network, are still in an experimental phase. Even from a conceptual point of view there is some debate as to the proper application of this approach in the wider field of intelligent, sustainable cities (Salvati et al., 2013). This applies also at a semantic level where the definition of green network has a different meaning according to the point of view of the respective discipline.

Based on these premises, this work intends to define on a purely scientific level and from the analysis of different scientific papers, which deal with the role of greenspaces in urban planning in general and the use of the green network concept in particular, the current developmental stage of this approach and its possible future applications with respect to the following questions:

- What are the principal functions implied by greenspace within the urban system?
- Is there any relationship in the current debate between the concept of green network with the network system theory?
- What is the contribution of different disciplines to the definition of the concept from an urban planning perspective?

2 DATA COLLECTIONS AND METHODOLOGY

In order to respond to the above questions, a textual corpus of more than 300 selected abstracts of scientific papers were analyzed by using lexical analysis tools. It has allowed the extraction of the main semantic dimensions of the discussion in order to highlight the current meanings and related fields of application of the green network concept, especially from an urban planning perspective.

For the application of the method a data collection was carried out in two different steps:

- collation of the abstracts of the most cited scientific papers in the field of urban studies over the last 20 years with green as the main topic;
- selection of those containing specific reference to the green network concept.

The abstracts were collated and organized by using the following selection and data process phases:

- journal selection: Selection of the main scientific journals in the field of urban studies according to the ranking of the two main scientific databases available on line, http://www.scimagojr.com/ and https://scholar.google.it/;
- download of data: By using web of knowledge database, the first 20 papers for each selected journal, filtered using "green" as main topic key and ordered by number of citations, were downloaded in the .csv file1 format;
- data processing of the csv file: The collated information was systematized in a spreadsheet table, organized in the following columns: 1. Title of the paper; 2. Authors; 3. Year of publication; 4. Abstact; 5. doi reference.

This data was analyzed with the Lexical Correspondence Analysis (LCA), an analytical tool capable of detecting the latent meaning in a group of texts; it is mainly based on "differences" and not on "measures" (Trobia, 2005); in other words, a term is all the more significant as it is specific to certain groups of texts. The software SPAD was used to analyze these connections and to break down the lexical table in a series of factors, each of which represents an aspect of the latent type of association present in the data. The process of analysis used is explained in the paper Less Smart More City (Papa et al., 2015); in this case the modes are represented by the years of publication, grouped on the basis of number of papers selected. In this way, the analysis allowed us to verify if the role of greenspaces in urban planning has been evolving towards specific topics within the scientific community and to extract the main concepts characterizing the steps of this evolution over the last 20 years.

By filtering the abstract in the obtained table, just 4 of the selected papers explicitly referred to the green network. For this reason, a further data collation was conducted like the previous one by using "green network" as the main topic key, and broadening the collection of abstracts to other disciplines, in order to understand

[1] Not every selected records contained the paper abstract as downloadable info in the csv file. For this reason some papers were not considered in the study.

the connections among disciplines concerning this concept. Therefore, a new column was added to the resulting spreadsheet table related to the research area of each selected paper. For this group of texts, a network text analysis was carried out using a free online software tool available on the website textexture.com; this tool visualizes any text, or group of texts, as a network and enables one to use this interactive visualization to read through the text in a non-linear fashion. Using the network, one can see the most relevant topics inside the text organized as distinctively colored clusters of nodes, their relationship to one another, and the most influential words - those responsible for topic shifts - inside the text. The resulting node-edge structure is encoded in a graph format and is processed by Gephi server-side Java toolkit, which calculates the basic metrics and applies community detection algorithms to the graph. If we imagine the scientific community as a network of scientists dialoguing through their papers, a word that is in a position which permits direct contact with many others can be considered as a major channel of information; in a certain sense, it represents the focal point of information flow in the network.

3 RESULTS AND DISCUSSION

3.1 LEXICAL CORRESPONDENCE ANALYSIS: EVOLUTION OF THE GREEN SPACES ROLE IN URBAN PLANNING OVER THE LAST 20 YEARS

Based on the technique of analysis of LCA results described in the paper Less Smart More City (Papa et al., 2015), one can see quite clearly the evolution of the concept over the last 20 years, especially along the first axis (fig. 1).

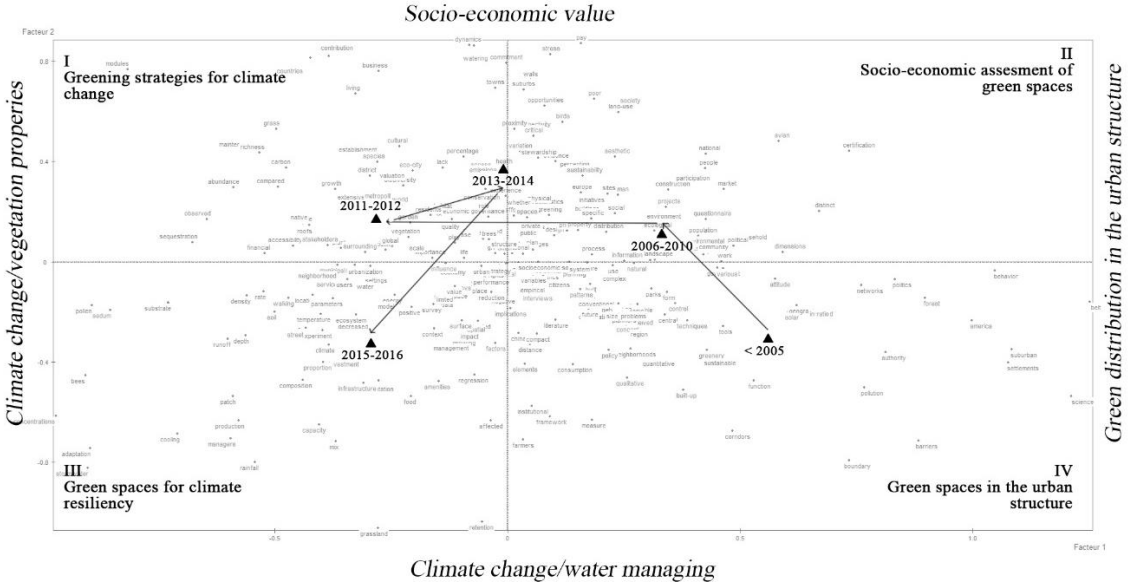

Fig. 1 LCA result describing the evolution of the concept of *green* within the most cited articles of urban studies journals over the last 20 years

In particular the scientific debate prior to 2005, concerning the role of greenspaces in urban planning, represented by the group of papers located in quadrant IV (*green spaces in the urban pattern*), seems to be characterized by greater attention to their spatial location in the urban pattern conceived as public space connecting different parts of the city; the presence of words like *belt, suburbs, politics, settlement*, characterizing the right hand side of the first axis, in fact, refers to the growth of urban centers and the related spatial planning solution especially in the growing suburban areas; at the same time, the presence of words

like *cooling, effect, lowering* represents the first signs of interest in greenspaces as elements to mitigate the effect of the urban heat island.

The necessity of new interventions in the existing urban patterns characterizing most of the cities, that appears an inadequate response to the catastrophic vision of climate change forecasts (IPCC, 2014), and the simultaneous economic crisis, that reduces the economic possibility of local governments to address adequately the security and emergency response needs, increase the number of papers addressing the topic of the economic value of the green spaces; therefore more studies, in the group of papers written in 2012 and 2013, use an approach based on the evaluation of green infrastructure in terms of economic benefits, by comparing the costs of green practices to "hard" infrastructure alternatives, the value of avoided damages, or market preferences that enhance value, such as property value.

Finally the last group of papers (2014-2015) is characterized by two different sets of terms:

- the first one, characterized by words like *adaptation, stormwater, cooling*, is clearly connected with the urban resilience concepts, thus confirming the growing interest in this topic and the main role of greenspaces in adaptive planning policies. Greenspaces became important planning elements to manage flooding with infiltration-based practices, prepare for drought by infiltrating water where it falls, reduce the urban heat island effect by planting trees (Inostroza, 2014; Gargiulo et al., 2016, 2017) and building green roofs, lowering building energy demands by reducing indoor temperatures and shading building surfaces (Gargiulo & Tulisi, 2016), using less energy to manage water by reducing rainwater flows into sewer systems (Zhang et al., 2015) and protecting coastal areas with living shorelines, buffers, wetlands, and dunes to help reduce coastal erosion and storm impacts;
- the second one, strictly connected with the previous one and characterized by words like *bees, pollen, organic, watering, substrate*, refers to the inherent characteristics of ecological systems working together and within the whole urban system. It shows a pronounced interest in other disciplines, such as biology, hydrology, and ecology (Brunetta & Voghera, 2014): the biodiversity of urban ecosystems, characteristics of vegetation, fauna and soil, have become part of the urban planning debate.

In the middle of the word cluster, the most transversal topics, characterizing the whole corpus of text, are present. It shows that concepts such as *accessibility, health, air pollution, quality of life,* are constantly present in the scientific community debate throughout the analyzed period.

Summing up, the current scientific panorama shows an increasingly fragmented framework concerning the issue of greenspaces in urban planning, motivated by the necessity to include new parameters to describe and design green infrastructure, and to discover new scientific evidence as to the relationship between natural processes of nature and the relative effects on the build environment, particularly in respect to the increasing attention given to the consequences of climate change.

3.2 NETWORK TEXT ANALYSIS: TOWARDS A DEFINITION OF GREEN NETWORK FROM AN URBAN PLANNING PRESPECTIVE

In this complex panorama of scientific research about the role of the greenspaces in urban planning, the necessity emerges of discovering new methods and tools to design and localize these spaces in the urban system according to the challenges that cities are facing. In this perspective, greenspaces are increasingly considered as nodes of a wider network interacting with the urban system. This is why the term "green network" is becoming part of the vocabulary of different research areas.

By analyzing a group of texts with "green network" as main topic through lexical analysis tools, it was possible to provide insight to the other two main questions placed in the introduction:

- Is there any relationship in the current debate between the concept of green network with the network system theory?

– What is the contribution of different disciplines to the definition of the concept from an urban planning perspective?

By simply collating the papers with "green network" as the main topic in the last 20 years from the Web of Science database, and categorizing them according to different research areas, firstly one can observe that the term green network recurs in a large amount of papers in the research areas of Telecommunications, Computer science and Engeneering, and is still little used in the fields of urban studies, ecology, geography and business economics (fig.2). Just considering this data, it would seem that, in the last few years, the concept of green network has become an important topic for the first group of disciplines, focused on the creation of tools, theories and methods to model the natural environment as a network; while, on the other hand, the second group of disciplines seem to start integrating these findings within their field of research.

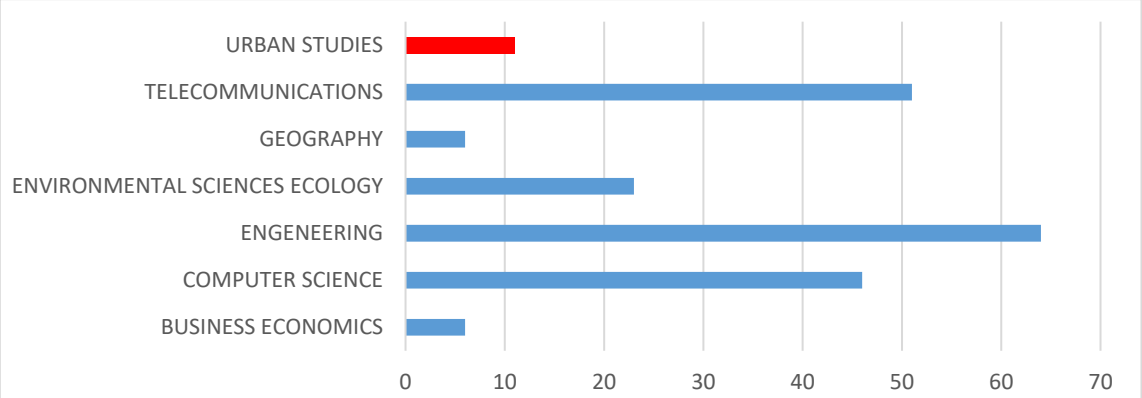

Fig. 2 Number of scientific papers written in the last 20 years, indexed on web of science, with "green network" as research topic key per different research areas

Thanks to a deeper analysis of the content of the papers, carried out with a network text analysis tool, a first disambiguation of the term appears clear, thus contradicting the above-mentioned hypothesis. In fact, by analyzing the most influential keywords per group of texts belonging to the different research areas (tab.1), the different meaning of the term becomes clear for the two main research areas groups:

Group 1 is composed of Urban Studies, Geography and Environmental Science Ecology research fields. In this case, the term is clearly related to the function of greenspaces in the urban context. Group 2 is composed of Computer Science, Telecommunication and Engineering research fields.

Research Area	1st Keyword	2nd Keyword	3rd Keyword	4th Keyword
Business Economics	Green	Network	Product	System
Geography	Urban	Green	Greenspace	City
Urban Studies	Urban	Green	City	Area
Environmental Science Ecology	Green	Network	Urban	City
Computer Science	Network	Energy	Power	Consumption
Telecommunications	Network	Energy	Power	Consumption
Engineering	Network	Energy	Power	Consumption

Tab. 1 Network text analysis results: most influential keywords per research area

In this case, the term is fundamentally connected with the reduction of energy consumption through the optimization of the power network (Matke et al., 2016); the term "green" has an evocative meaning, which

brings to mind the clean air of natural green landscapes in contrast to the gray polluted air due to the excessive use of carbon-based fuel for energy production.
Business Economics research field differs from the two groups. In this case, the term "green network" seems to refer to the analysis of eco-oriented economic product systems.
It suggests that the network theory coming principally from the Computer science field is still not used to defining the greenspaces strategy in urban planning. This is confirmed also by the number of studies about green network in the field of Urban studies, belonging also to other research areas according to the web of science classification (fig.3). The major contributions to the discipline of urban studies on the theme of the green network seem to come from the field of Urban Geography and Environmental Sciences Ecology.

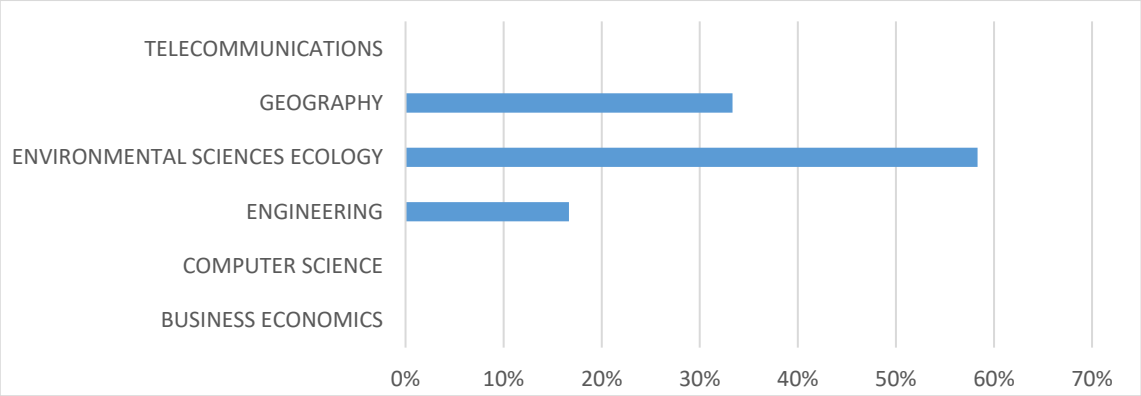

Fig. 3 Percentage of papers with "green network" as main topic in the field of Urban studies belonging also to other research areas according to web of science classification

For this reason, a deeper analysis was carried out considering the first group in order to understand better the main contexts in which the concept of green network is used for research areas and the main contribution of other disciplines in the field of urban studies. The Business economic field was also analyzed in order to understand in greater detail if the concept of green network represents an unequivocal discussion topic for the decision makers of public administrations.
In particular, the analysis of the most influential contexts and the related network was carried out by using the network text analysis tool available on the website textexture.com (Fig.4).
By interpreting these results, it was possible to extract a different definition of green network according to the content of the most influential contexts for each research area:

- **Geography:** The first context defines the scale of intervention (*city, area)* and the topic (*green, planning)*, the second one, the scope (*urban*, *future development)*, the third, the elements of the analysis (*plan, greenspaces, quality)* and the fourth, the approach used to analyze the characteristics of the elements (*ecological, base)* and the relationship among them (*network, system)*. The graph shows that four contexts are very interconnected, thus giving the possibility to suppose a single definition to the meaning of green network in this research area. To sum up, we can conclude that green network mainly represents a strategic element in urban structure for a sustainable future of cities (Li et al., 2005) through an approach that takes into account the quality of greenspaces (Moseley et al.2013) connected in a network (Frazier & Bagchi-Sen, 2015) and based basically on ecological principles (Jim & Chen, 2003);
- **Business economics:** In this case the contexts are not as clear as the previous ones. The main theme of urban ecology (*urban, ecological, green)* seems to have different and unconnected approaches (shown by the minimal amount of mutual interconnection among the terms of the different context). The first (*network, system, culture, development)* is connected with the green network culture for an ecology

system within the wider field of network culture in the information age, with the main goal to augment the eco-city notion (Xie & Zang, 2008); the second (*product, externality, environmental, brown)* refers to the cost benefit analysis of a green product network as opposed to the brown one (Brécard, 2013); the third (*greenspace, landscape, station)* refers to the integration of greenspaces in public transport strategies;

- **Urban Studies:** The first context defines the main boundaries of the corpus in terms of scale (*urban*, *area*), main elements (*greenspaces*) and main action (*greening*); The second context refers to the use of the green network as the main element for city planning strategies (*city, strategy*) for sustainable development (*environmental, development*). The third context shows a clear intent to include specific notions of natural science (*specie, corridor, forest, level*) in public policies; the fourth context refers to the interaction of the green infrastructure (*green, network*) with the urban system (*space, system*). To sum up, we can conclude that in the research area of urban planning green network is mainly considered as a system of elements characterized by ecologically based relationships interacting with the other urban systems (Jim & Chen, 2003; Mahmoud & El-Sayed 2011; Oh et al., 2011);
- **Environmental Sciences Ecology**: The presence of the terms *green* and *network* in the first context underlines the centrality of the theme in this research area, while the terms *city* and *area* define its application to the specific context of urban environment. By analyzing the dimension of the circles, representing the between centrality of these words, the graph (fig.5) reveals that they are "the most connective" words in the analyzed group of text; it means that all the other contexts are strictly connected with the first one. From this perspective, the second context shows that ecology science uses the same principles applied to larger ecosystems (*landscape, forest*) to describe natural science phenomena on an urban scale (Weller & Ganzhorn, 2004; Ouin et al., 2008; Hladnik & Pirnat, 2011), and that the latter are studied as networks (Yang et al., 2015). In the third context, a specific insight into this field emerges in the relationship between the characteristics of green spaces (*greenspaces, quality*) and their position in the urban pattern (*urban, land*) (Jim, 2013). By reading the terms contained in the fourth context, it can be seen that many papers in this research area propose analytical methods (*methods, analysis*) to evaluate green infrastructures (*GI*) in terms of network (Kang & Kim, 2015). Summing up, this research area appears to have the highest degree of maturation in the green network concept, thus producing a more in-depth analysis of method and tools in order to evaluate the effectiveness of green infrastructures in a specific urban context;

By comparing the results of specific research areas, some observations can be made about the above-mentioned findings:

- the green network concept in general, and in the fields of Urban Studies and Business Economics in particular, still appears fuzzy and unripe;
- the Environmental Science Ecology research area seems to give the main contribution to the definition of the green network concept, due to the presence of a terminology typical to the ecology vocabulary in all the main contexts of the analyzed groups of text;
- the role of greenspaces as public spaces able to enhance quality of life in terms of accessibility and human and environmental health, and the proven central role of green infrastructure in climate change mitigation and adaptation strategies don't appear clearly in any of the analyzed main contexts; it could mean that, in relation to these issues, greenspaces are still far from being conceived as networks; another hypothesis is that they are considered not as an independent network but as a functional part of wider ones;
- the lack of terms in Business Economics research area dealing with the consequences on the real estate of urban greening strategies, appears in contrast with that stated in the previous chapter in which the

economic value of green spaces is one of the main topics of the scientific community in the field of Urban Studies over recent years. It means that green network is not considered as a concept to describe the distribution of greenspaces in the urban pattern; it is seen to be more connected to the ecology culture network and to the green product market;

– in the urban studies research area, green network seems to be a synonym of green infrastructure with few elements related to the network system theory.

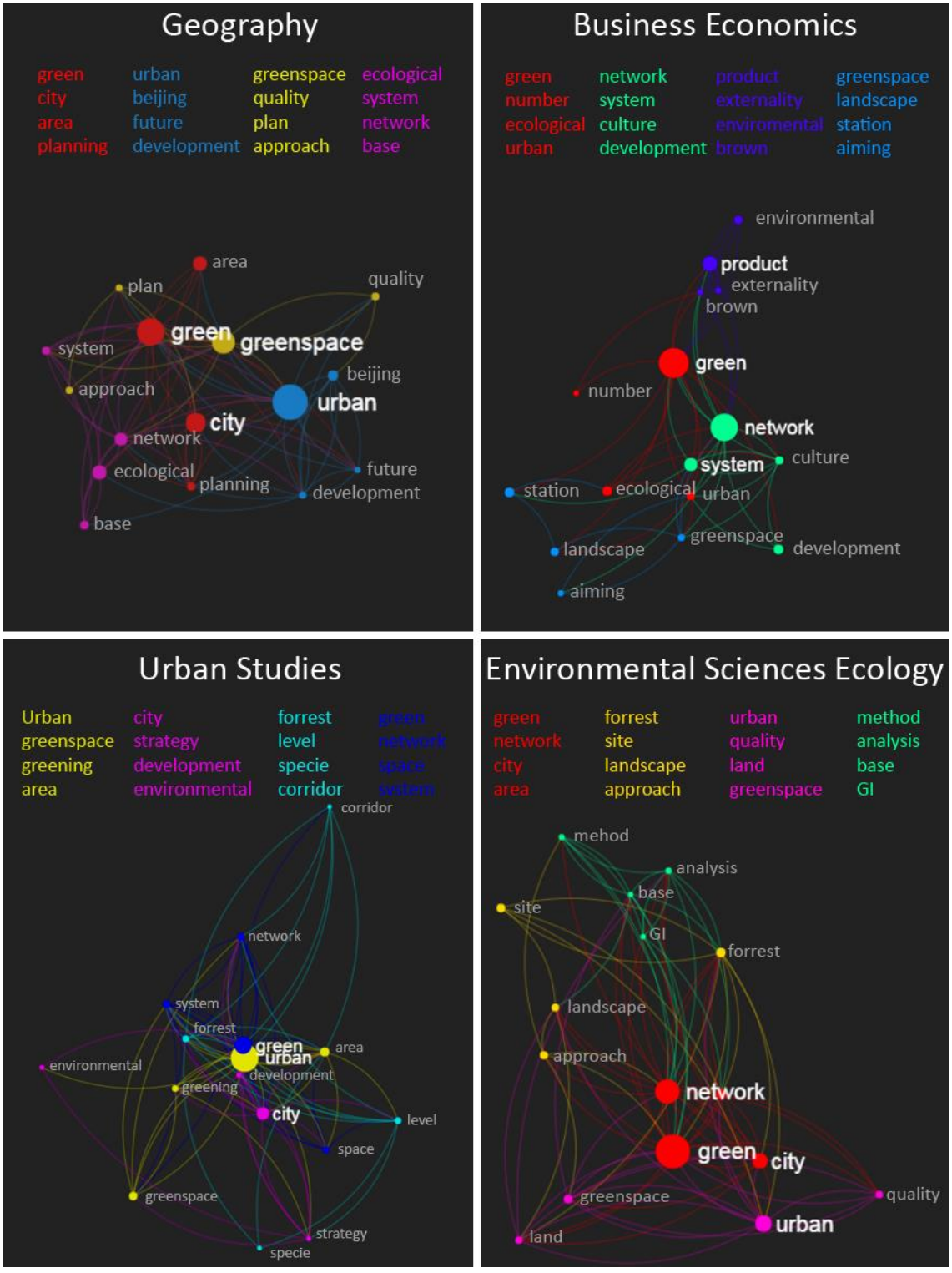

Fig. 4 Network text analysis results: most influential context per research area

4 CONCLUSION

Extensive urbanization has made the complexity of cities greater than ever before. For this reason, a new "science of cities" is emerging in the scientific debate and increasingly advanced mathematical models, especially networks ones, have been developed in order to describe and optimize both physical networks, and human interactions. From this perspective, natural environment elements in the urban patterns could also be modeled and managed as networks, by amalgamating findings in natural and social sciences within a multidisciplinary approach. Therefore, the increasing attention paid to the different roles the greenspaces could have for a sustainable development of urban areas, together with the above-mentioned networking theories applied in urban studies, has led the scientific community to include the green network concept in its vocabulary.

Nevertheless, by analyzing the results of the present study carried out with lexical analysis tools, it emerges that the meaning of the concept, from a semantic point of view, is still fuzzy and unclear. The reason for this confusion is due firstly to the meaning of the two terms included in the concept: green and network. In some research areas the term "green" is used in its evocative meaning, to define products, strategies or processes which bring to mind the concept of sustainable development based on living conditions and resource use meeting human needs without undermining the integrity and stability of the natural systems. From this perspective, the green network concept can be referred not just to the urban natural areas system but also to other groups of interconnected elements such as systems for controlling energy storage devices in power networks with a high share of fluctuating renewable energy sources, or even consumer networks for environmentally oriented marketing strategies. For this reason, a Lexical Correspondence Analysis (LCA) was carried out just considering scientific papers published over the last 20 years in the principal urban studies journal with *green* as main topic key; it shows that the debate on the function of greenspaces in urban studies is still very lively and an ongoing process characterized by a growing use of terms coming from different disciplines such as economy, ecology, geography etc. Therefore the term *green* related to the city doesn't describe greenspaces just as public services but in a wider perspective of ecosystem services, thus opening the debate to new scientific evidence concerning the relationship between ecological processes of nature and the relative effects on the build environment, especially important due to the increasing attention given to the consequences of climate change.

This open discussion of the different functions attributed to the natural areas in the urban context, has probably led to an incorrect use of the term *network*, whose general definition is "system consisting of many similar parts that are connected together to allow movement or communication between or along the parts". It becomes clear from further analysis, carried out with network text analysis techniques, applied to a restricted group of scientific papers clearly related to the system of natural and semi-natural areas in the urban context. In fact, from the analysis of the results, the term *network* seems to be referred to as a generic set of natural areas present in a city, without any reference to the network system theory or to the basic rules linking these elements together, except for the ecological field, that uses the same principles applied to larger ecosystems to describe the relations among *green elements* on an urban scale and evaluate the ecological effectiveness of green infrastructures in a specific urban context.

To sum up, it is evident that green network concept cannot yet be considered as a defined topic in urban planning. To avoid any form of disambiguation, and to provide a unique definition of the terms from an urban planning perspective, we might talk about *urban green network design* defined as an urban planning practice, formulated by decision support tools able to model green infrastructures as networks, composed of natural and semi-natural areas, whose connections are modelled according to specific variables, in order to deliver an equal distribution of public services for enhancing the quality of life as well as a wide range of ecosystem services. From this perspective, the green network concept could open a multi-disciplinary field of research

which combines natural and social science with computer science findings, in order to provide public administration with tools able to evaluate consequences of their choices in terms of accessibility to public services and urban resilience.

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IMAGE SOURCES

Fig. 1, 2, 3, 4: elaborated by the author

Tab. 1: elaborated by the author

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DECISION-MAKING TOOLS FOR URBAN REGENERATION PROCESSES:

FROM STAKEHOLDERS ANALYSIS TO STATED PREFERENCE METHODS

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ABSTRACT

Urban regeneration operations are connected to the creation of a multiplicity of benefits, both economic and extra-economic, that range from the increase in the environmental quality to the amelioration of the urban image, from the valorization of the cultural heritage to the creation of economic development processes. The articles aims at proposing an integrated evaluation approach for addressing decision problems in the context of urban regeneration operations. Starting from the real case of the regeneration programme of the city of Collegno (Italy), the contribution proposes an original evaluation model based on the combined use of Stakeholders Analysis and Stated Preference Methods. The results of the research shows the people's perception about the social value of urban regeneration programme and their Willingness To Pay for specific transformation operations.

KEYWORDS:
Social benefits, contingent valuation method, urban planning, social network analysis, community participation.

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城市复兴决策工具：

从利益相关者分析到偏好方法。

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摘要

城市复兴行动与创造利益多样性密切相关，包括经济利益和超经济利益，其中超经济利益包括环境质量的提升、城市形象的改善、文化资产的价值化过程和经济发展过程的创建。文章旨在提出解决城市复兴行动背景下决策问题的综合评价方法。本文从科莱尼奥市（意大利）复兴计划的实例开始，结合“利益相关者分析”和“陈述性偏好法”，提出一种原创评估模型。研究结果显示了人们对城市复兴项目之社会价值的理解和为特定转换操作支付价格的意愿。

关键词：
社会效益、条件价值评估法、社会网分析、社区参与

1 INTRODUCTION

According to Roberts (2000), urban regeneration can be considered as the outcome of the interplay between the different elements that characterize urban systems, such as political power, physical components, social dynamics, environmental impacts and economic processes. In this sense, urban regeneration operations refer to interventions that aim at strengthening the relationships between physical conditions and socio-political responses, increasing housing, health and well being, boosting social improvement and economic progress, containing urban growth, soil consumption and urban shrinkage, to name a few.

It has been generally agreed that urban transformations can be described as complex systems, defined by a plurality of actors with different values and objectives, and characterized by a great deal of uncertainty. Taking into consideration this complexity, it is of particular importance to provide the Decision Makers with integrated evaluation tools, able to consider the multiplicity of visions when dealing with urban regeneration processes, to include the opinions and the needs of the different stakeholders involved and to assess the impacts and the consequences of each decisions (Bottero & Mondini, 2017; Tyler et al., 2013; Altunkasa et al., 2017).

The paper focuses on an integrated approach based on the combination of Stakeholders Analysis and Stated Preference Methods for supporting the evaluation of the benefits that urban regeneration programmes generate on local community. In particular, the research addresses the decision problem under investigation through the integration of the Social Network Analysis (SNA, Dente, 2014; Knoke & Yang, 2008) from the side of the Stakeholders Analysis and Contingent Valuation Method (CVM, Mitchell & Carson, 1989; Carson, 2000) from the side of the Stated Preference Methods.

It can be noticed that multi-methodological approaches are getting more and more important for supporting decision problems in the context of urban and territorial transformations as the diversity of the methods reflects the multifaceted nature of urban desing and planning (Cerreta & De Toro, 2010; Bottero, 2015, Berta et al. 2016). However, to the knowledge of the authors, the paper presents the first application of the combined use of SNA and CVM in this domain. Starting from a real case related to the urban regeneration programme for the city of Collegno (Italy), the research considers the application of integrated methodology for the estimation of the social benefits that the operation is able to deliver (Bottero & Mondini, 2016). After the introduction, the rest of the paper is organized as follows: section 2 illustrates the integrated methodological approach, clarifying the theory of Stakeholders Analysis and Stated Preference Methods; section 3 presents the application of the proposed method to the real case of the urban regeneration programme for the city of Collegno, focusing on the different phases of the evaluation; section 4 discusses the main findings of the research and summarizes the conclusions that can be drawn from the work done.

2 INTEGRATED METHODOLOGICAL APPROACH

2.1 STAKEHOLDERS ANALYSIS

In decision making processes Stakeholders Analysis (SA) is a procedure for supporting strategy formulation by identifying the key actors, and assessing their respective interest in that system. It has been generally agreed that in the field of urban development projects it is of particular importance to identity and analyze the interests of the various individuals involved in the process in order to try to accommodate possible conflicts among them and to better focus on their needs and requirements (Yang, 2014).

In SA, the stakeholders groups can be classified according to the points of view adopted in their interventions and of the criteria upon which they base their decisions (Dente, 2014). Therefore, it is possible to divide stakeholders into five categories, namely political stakeholders, bureaucratic stakeholders, special interests, general interests and experts. Moreover, in order to understand the dynamics of the actors within the decision

process it is also important to analyze the resources that they have at disposal. These resources can be classified according to four categories: political, economic, legal and cognitive resources.
Different practical methods are available to analyze and to map stakeholders and actors, such as Power/Interest Matrix, the Stakeholders Circle methodology and the Social Network Analysis.
Power/Interest Matrix (Olander & Landin, 2005) is a method for mapping and classifying stakeholders by producing a grid where power and interest are relevant elements; each stakeholders is evaluated according to the aforementioned elements, allowing to understand who are the crucial players in the process.
Another interesting method for developing SA is the Stakeholders Circle methodology developed by Bourne and Walke (2008). This method allows the stakeholders to be prioritized and mapped by means of the examination of their power, proximity and urgency in the process.
A third method for developing SA is related to the Social Network Analysis (SNA, Knoke & Yang, 2008). SNA is particular useful in the context of urban projects as it allows the solution dynamics of collective problems to be highlighted. SNA emphasizes the fact that in a given decision process each individual is connected in different ways to other individuals. In this sense, SNA pays attention on the examination of the relationships that pairs of individual exchange in the created network. The method allows the actors' network to be graphically represented and quantitative measures representing the network to be calculated, namely complexity, density and centrality indexes. The evaluation of these parameters will be explained in details in section 3.2 of the present article, with reference to the application of the SNA to the considered case study.

2.2 STATED PREFERENCE METHODS

The benefits delivered by urban regeneration can be difficult to estimate. In fact, while some economic impacts can be easily calculated (this is the case, for example, of the increase of real estate values or the creation of new jobs), other impacts can be more difficult to be evaluated (as, for example, the increase in landscape quality, the improvement in the environmental system and so on). Indeed, urban regeneration operations are related to a series of urban and environmental improvements that refer to positive externalities and that contribute to an increase in the quality of life and in the welfare of individuals.
Generally speaking, from an economic point of view, the urban regeneration benefits can be examined with reference to a particular family of economic goods called public economic goods. A public good is a good that is both non-excludable and non-rivalrous in that individuals cannot be effectively excluded from use and where use by one individual does not reduce availability to others. For public goods, market prices either do not exist or only capture a small part of the total value (World Bank, 1998). It has been generally agreed that the Total Economic Value (TEV) approach is suitable for dealing with the economic valuation of this typology of goods and services (Mazzanti, 2002; Bottero, 2014).
According to Pearce and Turner (1990), the TEV is composed by two principal components that are related to the use and non-use values.
In particular, as far as the use value is considered, this can be further divided in:

- direct use value, that derives from goods which can be extracted, consumed, or directly enjoyed;
- indirect use value, that derives from the services the environment provides;
- option value, that is a special case of use value and corresponds to the value obtained from maintaining the option of taking advantage of something's use value.

With reference to the non-use value, this can be subdivided in:

- bequest value, that is the value derived from the desire to pass on values to future generations;
- existence value, that derives from the benefits the environment may provide which do not involve using it in any way.

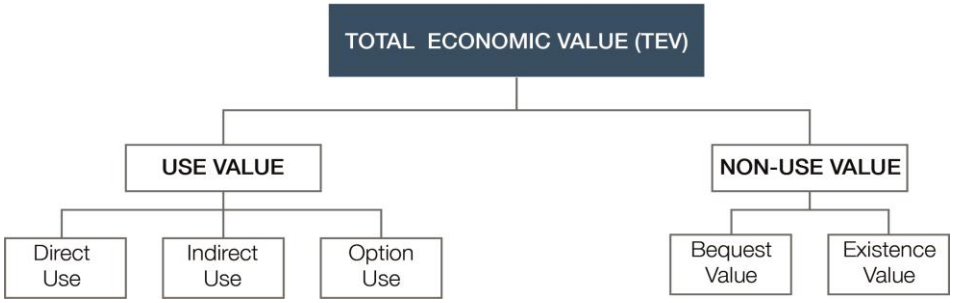

Fig. 1 The concept of Total Economic Value

Different evaluation techniques are available for estimating the TEV. According to the literature (Pearce & Turner, 1990), the methods can be divided in two main families:

- revealed Preference Methods (RPM); these methods derive the value from data that are collected through direct observations of individuals responses to goods/services that are complement or substitute to the good/service under investigation. Examples of these methods include Travel Cost Method and Hedonic Pricing method.
- stated Preference Methods (SPM): these methods are based on the creation of a hypothetical market data in which the data are derived by asking individuals for their opinions or views (Louviere et al., 2000; Pearce & Ozdemirouglu, 2002). Important parameters for the estimations are the Willingness To Pay (WTP), that is the willingness to pay of the society for using a certain good or service, or Willingness to accept (WTA), corresponding to the willingness to accept for abandoning a certain good. Among these method, it is possible to recall the Contingent Valuation Method (Mitchell & Carson, 1989; Carson, 2000), which will be described in details in section 3.3 with referent to its application to the case study.

Figure 2 shows the relationship between Total Economic Value and the two aforementioned categories of valuation techniques.

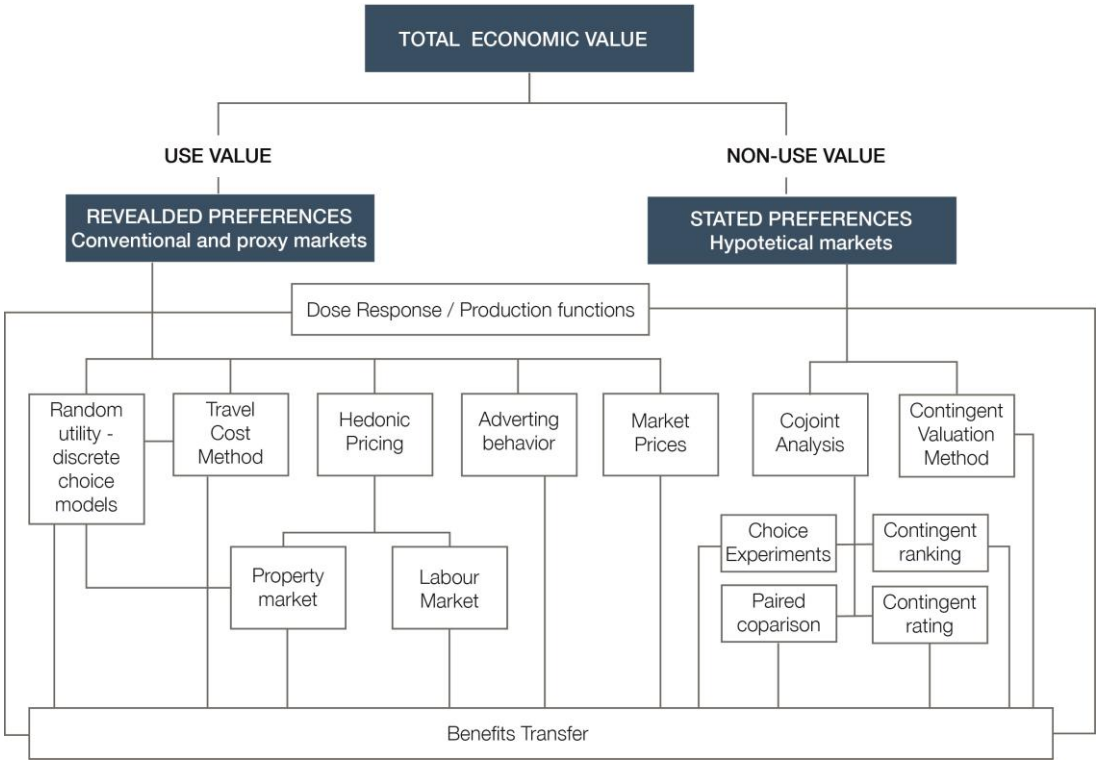

Fig. 2 Valuation techniques for estimating the Total Economic Value

With specific reference to SPM, the technique refers to a multi-stepped procedure that is organized according to different phases (Fig. 3). Firstly, it is necessary to precise the context of the research, clarifying the object under estimation. The second phase involves the choice of the evaluation method and of the way of developing the survey. Then, it is necessary to clarify the target population for the selection of the sample and the form of the questionnaire for the estimation. Once having defined the questionnaire, it is necessary to develop a pilot study for testing the readability of the questions. Subsequently, the method requires the development of the survey and the application of econometric analysis for the elaboration of the data collected. Finally, the results have to be examined by means of validity and reliability tests in order to formulate robust conclusive recommendations and guide lines.

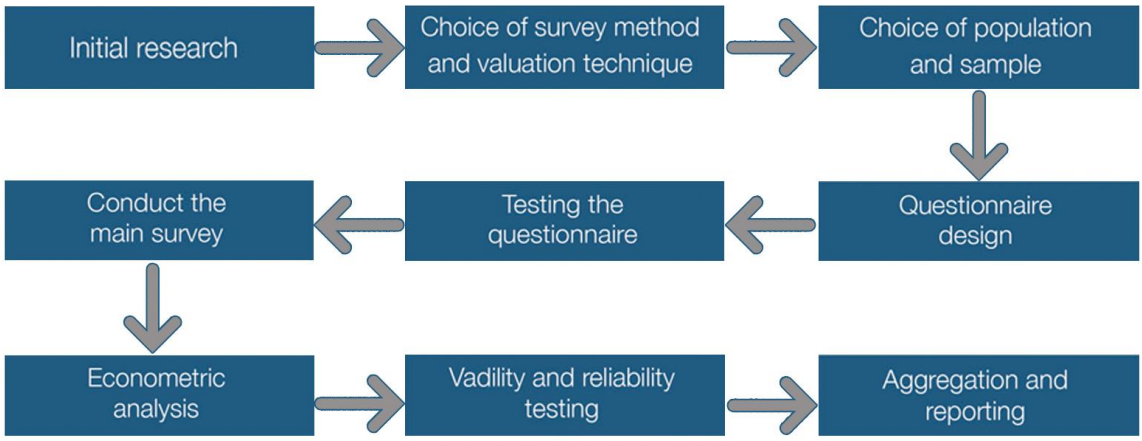

Fig. 3 The multi-stepped procedure for the development of the SPM study

Among Stated Preferences Methods, a very important role is played by the Contingent Valuation Method (CVM, Mitchell & Carson, 1989; Carson, 2000). The CVM is widely applied in environmental cost benefit analysis and is based on the development of a survey for collecting data about the good or service under examination. In a CVM survey the respondents are asked what they are willing to pay towards the preservation or an improvement of a certain asset. The research can then estimate the monetary value of the asset by calculating the average WTP of respondents and multiplying this by the total number of potential consumers.
Applications of CVM method can be found in the domain of environmental evaluation (Boxall et al., 1996) while the scientific works that develop CVM investigations in the context of urban design and planning are more limited (Strazzera et al., 2010; Del Saz-Salar & Garcia-Menendez, 2003).

3 CASE STUDY

3.1 DESCRIPTION OF THE AREA OF INTERVENTION

The case study considered for the application of the integrated approach refers to urban regeneration programme named "Collegno Rigenera", that interests the city of Collegno, located in the metropolitan area of Torino (Italy)[1] (Fig. 4).

[1] The data used in the present application were collected in the design studio "Architecture and Urban Economics", Master Programme in Architecture Construction City, Politecnico di Torino, a.y. 2015/2016.

Fig. 4 Geographical location of the site under investigation

The program, promoted by the Municipal Administration, aims at finding answers to the economic and social needs of the city and to give uniformity to a territory afflicted by an unregulated development and to the presence of many decommissioned areas, both industrial and not. The area of intervention affects a very large area of the municipal territory, characterized by the presence of numerous industries and abandoned buildings (Fig. 5).

Fig. 5 The masterplan for the urban regeneration programme

The objectives of the program are related to the qualification of the city as "Collegno Social Town", to the creation of a nice and livable place and to the elimination of physical and environmental barriers.
A crucial point of the programme is the requalification of area of the Fermi metro station, including the site of Campo Volo, which is located in the Northern part of the area of intervention. In particular, the programme aims at the creation of a new public park in this portion of the territory.

3.2 RESULTS OF THE SOCIAL NETWORK ANALYSIS

According to the methodological framework described in section 3, groups of organized stakeholders have been identified that can have an interest in the transformation of the area under examination. Table 1 surveys

the most relevant stakeholders of the problem, with specific reference to the level, the type of actions, the nature of the resources at stake and the goal that they pursue in the process.

Figure 6 illustrates the map of the Social Network Analysis that has been constructed for the analysis of the decision process related for the program "Collegno Rigenera". The choice of the type of analysis is closely dependent to the context of the application. In this case, in fact, the Social Network Analysis has been chosen for its ability to investigate the urban project as a complex system, through the identification and consideration of the full range of stakeholders involved in the process, identifying the relationships between them and defining the resources that are exchanged. As it is possible to see from the analysis of Figure 6, the stakeholders are represented by dots and the exchanged recourses are represented by arrows. The network obtained from this exercise can be classified as "nested network" (Dente, 2014), in which almost all the actors exchange resources with all.

N	Stakeholders	Level	Type of actor	Actor's resource	Goal
1	European Community	European	Political - Bureaucratic	Political - Economic - Legal	Co-financing of the project, improvement of the conditions of the community, promotion of economic activities
2	Torino Metropolitan Area	Metropolitan	Political - Bureaucratic	Political - Legal	Efficient management of the the metropolitan area
3	City of Collegno	Municipal	Political - Bureaucratic	Political - Economic - Legal	Political consensus, improving the area in urban, social and economic profitability
4	Superintence of architectural heritage	Regional	Experts - Bureaucratic	Legal - Cognitive	Preservation of existing structures (necropolis)
5	Private investors	Local - National	Special Interests	Economic	Maximization of economic profit
6	Neighbourhood committees	Local	Special Interests	Cognitive	Representation of the local residents, satisfaction of the residents' needs
7	Consultants of the city of Collegno	Municipal	Experts	Cognitive - Economic	Increase in the participation in urban decision making processes
8	Residents	Local	Special Interests	Cognitive - Economic	Amelioration of the negative aspects of the area (domestic security and public areas availability)
9	Traders	Local	Special Interests	Cognitive - Economic	Creation of business activities, increase in the security in the area
10	Public transport users	Local - Metropolitan	Special Interests	Cognitive - Economic	Increase of underground connections, improvement of the station, security in the car park
11	Workers	Local	Special Interests	Cognitive	Increase in services and parking security
12	Future residents and traders	Local	Special Interests	Cognitive - Economic	Creation of a full-service neighbourhood, transport networks, recreation areas and new employment opportunities
13	Designers (architects, planners, landscapers)	International - National- Local	Experts	Cognitive	Creation of opportunities, formulation of well performing project proposals
14	Construction companies	Local - National	Experts	Cognitive - Economic	Maximization of the economic profits from construction activities
15	Commuters	Local - National	Special Interests	Cognitive- Legal	Reduction in connection time
16	Associations (environmental, historical, cultural)	Local - National	Special Interests	Legal - Cognitive	Prevention of further degradation and environmental problems, valorization of the identity of the place
17	Local Transport Authority	Metropolitan	Special Interests	Economic - Cognitive	Improvement of public transport services, increase in the demand of public transport users

Tab. 1 Survey of the relevant stakeholders in the decision problem

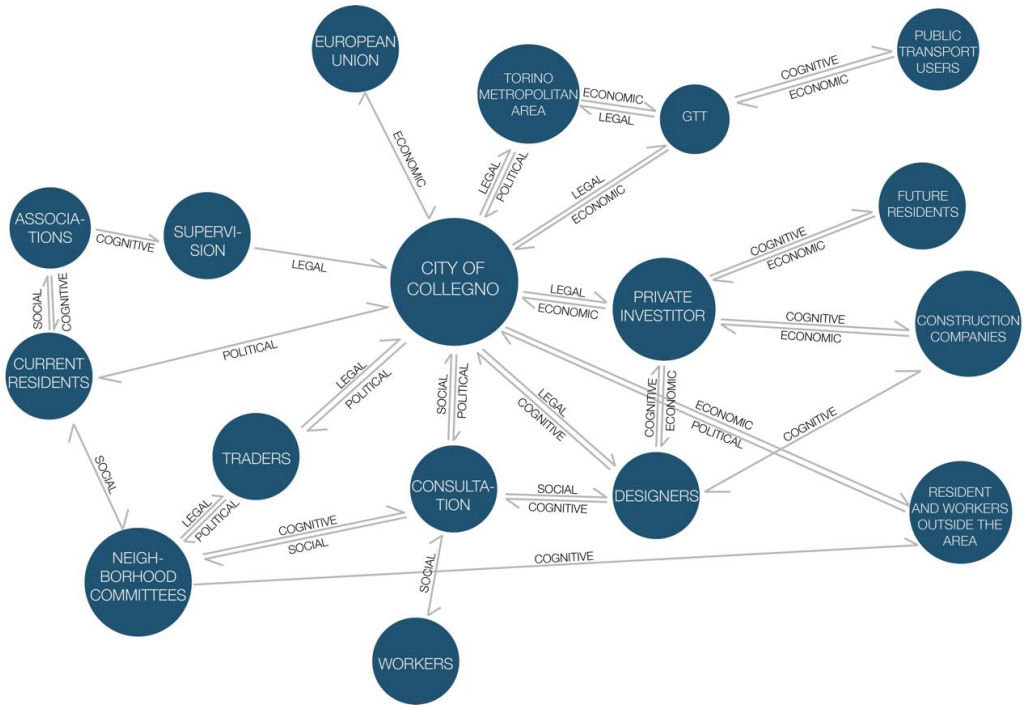

Fig. 6 Stakeholders map of the urban regeneration process under examination

The network can also be described by several indexes, such as: complexity index, density index and centrality index. The first two refer to the network in its globality, while the third refers to single stakeholders.
In order to measure the complexity of the decision network it is necessary to create a matrix that places the actors in different cells, according to the typology of the actors and the dimension of the interest (Table 2).

Dimension of the interest	Type of Stakeholders				
	Politicians	Bureaucrats	Experts	Special interest	General interest
International	EU				
National					
Regional		Superintendence			
Municipal	City of Collegno	Torino Metropolitan Area	Consultants	Public transport users, Commuters, Local Transport Authority	
Local			Designers Construction companies	Private Investors, Neighbourhood Committees Residents, Traders and Workers, Future residents and traders	Associations

Tab. 2 Complexity Index

Through the compilation of this matrix, the complexity of the network can be evaluated; if the stakeholders act at the level of all scales, then the complexity is be maximum. In our case, nine cells are occupied, so the complexity of the network is 9/25=0,39 which corresponds to a medium level of complexity.
A further characteristic of the network is the density, meaning the intensity of the relations between the actors of a decision-making process. The density can be measured trough the calculation of a specific index as represented in equation (1):

$$D = \frac{\sum K_i}{(n^2 - n)} \quad (1)$$

where D is the density index varying between 0 and 1, n is the number of actors and k_i is the number of relations in each group. In the present study, the application of formula (1) provides a density of 0,17. It is possible to state that in this case the medium complexity of the network is further weakened by the low density of the system, contracting both the benefits and the obstacles of the process.

Finally, it is possible to take into consideration the centrality of the different actors, namely the fact that one or few actors monopolize relations with participants. The centrality index of the network can be measured as in equation (2)

$$C_i = \frac{k_i}{\sum K_i} \tag{2}$$

where C_i is the centrality index of each stakeholder that varies between 0 and 1 and k_i is the number of relations of each actor. According to the numerical results provided by the application of formula (2) to the decision network under examination, it is possible to state that the most central actors of the process is the city of Collegno (Table 3). Other relevant stakeholders are the consultants of the city of Collegno, who have different technical expertises for addressing in a proper way the regeneration process, and the private subjects who could invest economic resources in the operation. The analysis also shows that an important role is covered by the residents of the area and by the local committees that express specific requirements and need for the transformation.

No.	Stakeholders	K_i	Σk_i	Centrality Index
1	European community	1	45	0.02
2	Torino Metropolitan area	2	45	0.04
3	City of Collegno	10	45	0.22
4	Superintendence	1	45	0.02
5	Private investor	4	45	0.09
6	Neighbourhood committees	3	45	0.07
7	Consultants	4	45	0.09
8	Current residents	3	45	0.07
9	Traders	2	45	0.04
10	Public transport users	1	45	0.02
11	Workers	1	45	0.02
12	Future residents and traders	1	45	0.02
13	Designers	4	45	0.09
14	Construction companies	2	45	0.04
15	Commuters	2	45	0.04
16	Associations	1	45	0.02
17	Local Transport Authority	3	45	0.07

Tab. 3 Centrality Index for the stakeholders

3.3 RESULTS OF THE SOCIAL NETWORK ANALYSIS

I Selection of the sample and development of the survey

Starting from the results of the SNA, the objectives and the values of residents and local associations in the areas have been further investigated by mean of the CVM approach.

In particular, following the CVM methodology, the first step in the application consisted in the selection of the sample for the development of the survey. In particular, the questionnaire was conducted in the city of Collegno in March 2016 and addressed both to residents and to visitors in the area under investigation. Mention has to be made to the fact that, before the development of the survey, a specific pre-test has been considered involving a small group of respondents. In particular, the questionnaire was firstly submitted to a sample of 15 people in order to verify the readability of the questions and to harm the credibility of the CVM estimations.

II Design of the CVM questionnaire

According to the CVM methodology, the questionnaire consisted of three components, that can be described as follows:

- attitude of the respondents towards the good under investigation;
- simulation experiment and WTP elicitation;
- background information.

The complete version of the CVM questionnaire that has been used for the application is reported in the Appendix of the present paper.

In the first part of the questionnaire, questions aiming at understanding the familiarity of the respondents with the site in Collegno were included.

Question were of the type: *"Are you interested in urban and territorial requalification operations?" or "How often do you spend time in public open spaces?".*

The second part presented the hypothetical scenario for the evaluation. The respondents were asked a question of this type: *"If the regeneration of the city of Collegno were to transform the site of Campo Volo with the creation of an urban park, how much would you be willing to pay for the construction of the new facilities by a one-off payment in the form of an income tax?".*

Figure 7 shows the representation of the transformation operation that was included in the questionnaire.

Scenario without intervention | Scenario with intervention

Fig. 7 Representation of the hypothetical scenario for the evaluation

This part included also specific questions which aimed at discovering the importance that the respondents attached to the different components of the Total Economic Value of the park (Table 4).

The final part of the questionnaire requested standard demographic information from the respondents, including sex, age, education, income level, location of residence and location of work or study.

According to your opinion, how much would you evaluate the importance of	Not important	Low	Medium	High	Very high
Being able to use a park with different function?	□	□	□	□	□
Knowing that the city of Collegno has a park with these characteristics?	□	□	□	□	□
Passing on to future generations the park?	□	□	□	□	□
Protecting with the intervention the site of the Campo Volo?	□	□	□	□	□

Tab. 4 Questions for evaluation the contribution of the TEV categories

III Data analysis

The data collected through the questionnaire were analyzed in order to estimate the mean WTP and to provide statistics about the respondents' socio-economic characteristics and other variables included in the questionnaire.

Around 100 interviews were conducted using face-to-face approach and on line questionnaire. Figure 8 reports the socio-economic characteristics of the sample considered in the questionnaire.

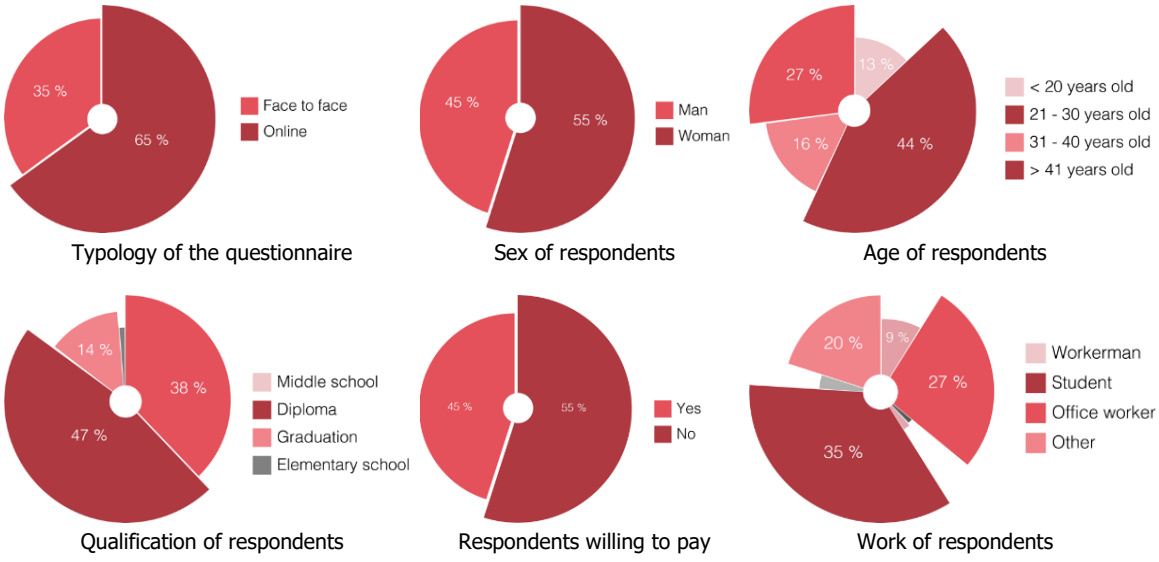

Fig. 8 Socio-economic characteristics of the respondents

According to the data collected in the questionnaire, different WTP were defined by the respondents. The respondents mean WTP was 31 €. This mean WTP value can be used for estimating the aggregated WTP amounts for the urban regeneration operation under investigation.

In a CVM study it is of particular interest to understand if the WTP measures perform in different ways in relation to other variables. For this purpose, Tables 5-8 report the relationships existing between the WTP values and the TEV components as resulting from the responses collected in the CVM questionnaire.

WTP classes		Sample	TEV According to your opinion, how much would you evaluate the importance of being able to use a park with different function?					
No.	WPT [€]	Frequency [%]	None	Low	Medium	High	Very High	I don't know
1	0	55	100%	100%	73%	49%	39%	50%
2	1 - 10	9	0%	0%	4%	14%	5%	25%
3	10 - 50	16	0%	0%	19%	16%	17%	0%
4	50 - 100	17	0%	0%	4%	19%	30%	25%
5	100 - 300	3	0%	0%	0%	2%	9%	0%

Tab. 5 Analysis of the correlation between WTP and direct use value

WTP classes		Sample	TEV According to your opinion, how much would you evaluate the importance of knowing that the city of Collegno has a park with these characteristics?					
No.	WPT [€]	Frequency [%]	None	Low	Medium	High	Very High	I don't know
1	0	55	50%	75%	6%	53%	33%	0%
2	1 - 10	9	50%	8%	7%	6%	12%	50%
3	10 - 50	16	0%	17%	20%	17%	11%	0%
4	50 - 100	17	0%	0%	7%	22%	33%	50%
5	100 - 300	3	0%	0%	0%	3%	11%	0%

Tab. 6 Analysis of the correlation between WTP and indirect use value

WTP classes		Sample	TEV According to your opinion, how much would you evaluate the importance of passing on to future generations the park?					
No.	WPT [€]	Frequency [%]	None	Low	Medium	High	Very High	I don't know
1	0	55	0%	0%	74%	58%	43%	100%
2	1 - 10	9	0%	0%	11%	6%	12%	0%
3	10 - 50	16	0%	100%	11%	19%	14%	0%
4	50 - 100	17	0%	0%	5%	14%	26%	0%
5	100 - 300	3	0%	0%	0%	3%	5%	0%

Tab. 7 Analysis of the correlation between WTP and bequest value

WTP classes		Sample	TEV According to your opinion, how much would you evaluate the importance of protecting with the intervention the natural site of the Campo Volo?					
No.	WPT [€]	Frequency [%]	None	Low	Medium	High	Very High	I don't know
1	0	55	67%	67%	52%	61%	42%	72%
2	1 - 10	9	33%	33%	4%	11%	4%	14%
3	10 - 50	16	0%	0%	22%	11%	21%	14%
4	50 - 100	17	0%	0%	22%	14%	25%	0%
5	100 - 300	3	0%	0%	0%	3%	8%	0%

Tab. 8 Analysis of the correlation between WTP and existence value

The analysis of the correlation between the WTP and the different components of the TEV shows that the respondents with higher WTP attribute more importance to bequest and existence values while respondent with lower WTP attribute more important to direct and indirect use values.
Other interesting results were provided by the analysis of the relationships between the WTP declared and the individuals' knowledge about the area under examination. In line with other findings coming from the literature (Maltese et al., 2016), there is a positive correlation between WTP and knowledge of the site and people who are familiar with the site are willing to pay more that people who do not know the area (Table 9).

WTP classes		Sample	TEV Do you know the area of the Campo Volo?	
No.	WPT [€]	Frequency [%]	Yes	No
1	0	55	57%	52%
2	1 - 10	9	6%	16%
3	10 - 50	16	13%	23%
4	50 - 100	17	22%	6%
5	100 - 300	3	3%	3%

Tab. 9 Analysis of the correlation between WTP and knowledge of the area

IV WTP aggregation

In order to provide an aggregate measure of the social benefits delivered by the transformation, the catchment area of the new park has been defined. In particular, an isochronous map showing the places from which the park will be accessible in 20 minutes by car has been created in order to understand the potential beneficiaries of the new facilities (Figure 9). The mean WTP was multiplied by the number of family units in the catchment area. According to the calculations done, the overall social benefit accrued from the regeneration project was estimated to be around 7 millions of Euro.
This value shows that the respondents pay attention to the conservation and valorization of the built environment and urban landscape.

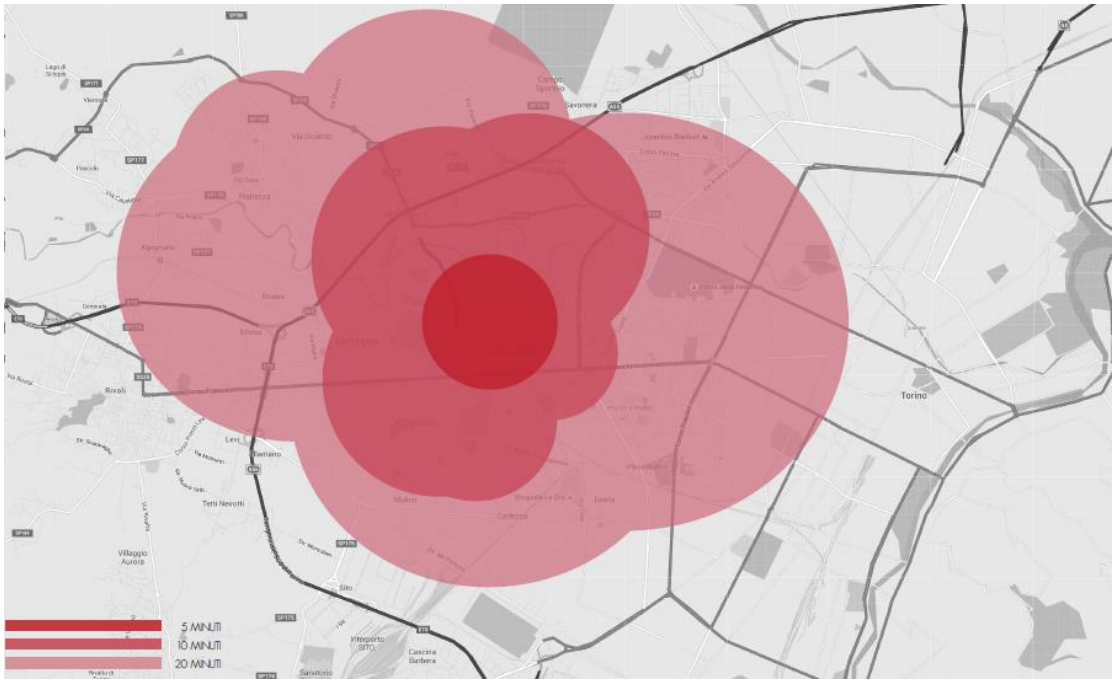

Fig. 9 Isochronous map for the definition of the catchment area.

4 DISCUSSION AND CONCLUSIONS

This paper focused on the evaluation of the social benefits that urban regeneration processes deliver on local community. In the research, the requalification programmes of the city of Collegno (Italy) has been considered and the benefits provided by the creation of a new urban park were estimated using the integrated approach which combined SNA and CVM approach. The results of the evaluation showed an overall benefit of around 7 millions of Euro, thus confirming the relevance of non-economic value of urban regeneration processes.

Apart from the estimation of the WTP, the results of the questionnaire highlighted other relevant issues about respondents' preferences towards the future transformation of the site, suggesting functions and services that could be included in the project.

The study shows the importance of adopting public participatory approaches in proposing and deciding new uses in urban regeneration processes. In fact, active involvement can ensure good decisions, able to match the public's preferences (Hing & Chan, 2015).

With reference to the perspective of the work, it would be useful to use the results of the present study in a cost benefit analysis (Hanley & Spash, 1993; Stellin & Rosato, 1998) that would allow to compare the social benefits delivered by the operation with the cost for undertaking the project, providing a benefit/cost ratio able to inform public Decision Makers about the social return of urban regeneration investments.

Further research could expand the econometric analysis of the data in order to provide better estimations of the WTP values by means of utility differences models.

Finally, future work could also consider the use of different protocols for the WTP estimation, such as the bidding game format with follow-up questions, that is able to better approximate the WTP values of the respondents.

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IMAGE SOURCES

Fig. 1: elaboration from World Bank, 1998

Fig. 2: elaboration from Pearce & Turner, 1990

Fig. 3: elaboration from Pearce & Ozdemirouglu, 2002

Fig. 4, 5, 6, 7, 8, 9: elaborated by the authors

Tab. 1, 2, 3, 4, 5, 6, 7, 8, 9: elaborated by the authors

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APPENDIX

QUESTIONNAIRE FOR THE CVM APPLICATION

A research group of the Politecnico of Torino is conducting an investigation on residents' and visitors' preferences about the transformation project for the site of Campo Volo in Collegno.
The purpose of the research is to determine the economic value of the social benefits that the project is able to deliver trough the implementation of the technique called Contingent Valuation Method.
We will mainly ask you questions on your preferences on the future transformation scenario for the area.
All the respondents of our investigation are chosen randomly and the whole interview may take you around 10 minutes.
All the information you will give us during the interview will be treated confidentially. All personal data will only be used for scientific research and will not be released to any third party.
We thank you in advance for your participation in our investigation.

PART 1_ATTITUDE OF THE RESPONDENTS TOWARDS THE GOOD UNDER INVESTIGATION

1 Do you usually frequent the Fermi metropolitan station?
- ☐ Yes
- ☐ No

1.2 If yes, for which purposes?
- ☐ Inter-mobility exchange
- ☐ Residence
- ☐ Shopping
- ☐ Services in general

2 Do you know the area of Campo Volo in Collegno?
- ☐ Yes
- ☐ No

3 How often do you spend time in public spaces?
- ☐ Often
- ☐ Sometimes
- ☐ Almost never
- ☐ Never

4 Are you aware about the program "Collegno Rigenera" promoted by the municipality for the regeneration of Fermi metropolitan station area?
- ☐ Yes
- ☐ No

5 Which development scenario would you choose for the metropolitan station area?
- ☐ Residential area
- ☐ Commercial area
- ☐ Regeneration of brownfields
- ☐ Environmental regeneration of the Campo Volo area
- ☐ No one of these alternatives
- ☐ Other _____

6 In the case of the creation of a new park in this area, which functions should you include? (one or more choice)

□ Sports activities
□ Urban gardens
□ Relax space s
□ Educational activities and laboratories
□ Installations and art exhibitions
□ Other _____

7 Do you think that the realisation of this new park could contribute to increase the market value of the property in this area?

□ Yes
□ No

PART 2_SIMULATION EXPERIMENT

Let us assume that the urban regeneration programme of the city of Collegno will consider the creation of a new urban park in the site of Campo Volo; the new park would host green areas for different activities, such as ports, urban gardens, playgrounds, educational activities and so on.

Scenario without intervention

Scenario with intervention

8 How much would you be willing to pay for the construction of the park and the new facilities by a one-off payment in the form of an income tax?

_____ €

9 If you are not willing to pay, which are the main reasons?

□ Improving the city image and its valorization should be a task of the Municipal Authority
□ I would to contribute, but I cannot afford it
□ I would like to have more information about the project
□ I will not get any benefit from the project
□ I prefer to contribute for my residential area projects

10 According to your opinion, how much would you evaluate the importance of:

	Not important	Low	Medium	High	Very high
Being able to use a park with different function?	□	□	□	□	□
Knowing that the city of Collegno has a park with these characteristics?	□	□	□	□	□
Passing on to future generations the park?	□	□	□	□	□
Protecting with the intervention the site of the Campo Volo?	□	□	□	□	□

PART 3_BACKGROUND INFORMATION

11 Residence municipality _____

12 Gender

□ Female

□ Male

13 Age _____

14 Educational background

□ Primary school

□ Secondary school

□ High school

□ University degree

□ Ph.D.

□ I do not know / I do not answer

15 Job

Sector

□ Agriculture

□ Industry

□ Commerce / Hotels

□ Transport / Communications

□ Credit / Insurance

□ School / University

Employment

□ Worker

□ Employed

□ Executive

□ Practitioner

□ Retired

□ Housewife

□ Student

□ Unemployed

□ Other

□ I do not know/I do not answer

16 Annual household income

Which is the average net income per year of your family, including all the revenues at disposal?

(We would like to highlight that this information has a fundamental importance for the correct development of the research work and we remind you that the data will be used only by the university staff for scientific purposes)

□ < 15.000 €

□ 15.000 € / 30.000 €

□ 30.000 € / 50.000 €

□ 50.000 € / 100.000 €

□ > 100.000 €

□ I do not know / I do not answer

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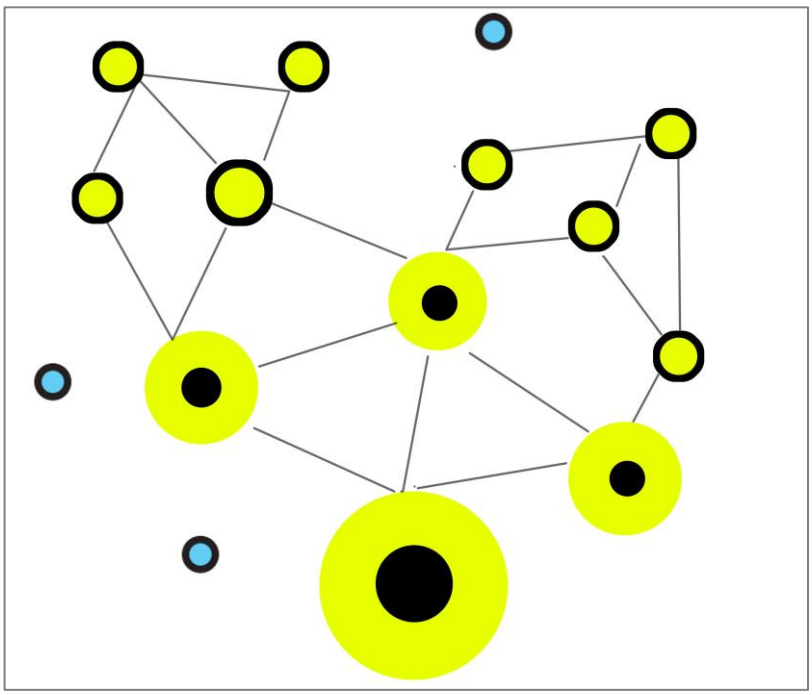

METROPOLITAN GOVERNANCE FOR TERRITORIAL COHESION

SUSTAINABLE DEVELOPMENT POLICIES FOR URBAN AND INLAND AREAS

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ABSTRACT

This paper proposes and defines new metropolitan governance strategies for territorial cohesion between inland and urban areas. Different reflections are here presented to comprehend how is it possible to implement cities' ability to understand and manage metropolitan dynamics. In Europe, urbanisation and land abandonment is a widespread phenomenon compared to many other parts of the world. According to research carried out by the European Union it is estimated that four out of five European citizens will be living in urban areas abandoning villages and rural areas.
Many European metropolitan areas are character-rized by overpopulated centres, degraded suburbs and different abandoned or almost abandoned inland areas. These areas, if well connected among them and to the main metropolitan centre, can contribute to solving many urban challenges. There is the necessity to image metropolitan areas as a single entity to increase the cohesion of lands. The latent capital of inland areas can be considered as driving factor behind territorial cohesion and development. This paper analyses in deep the case of the Italian Metropolitan Cities proposing a new governance approach to increase the capacity of urban systems to adapt to natural and man-made changes, considering the hinterland as a strong point rather than a disadvantage.
Strategic and Spatial Plans drive the growth of metropolitan areas in a competitive space-economy and support sustainable development policy by ensuring a balance between urban areas with strong competitiveness and inland areas.

KEYWORDS:
Cohesion; Metropolitan Governance; Urban and Inland Areas Relationship

TeMA

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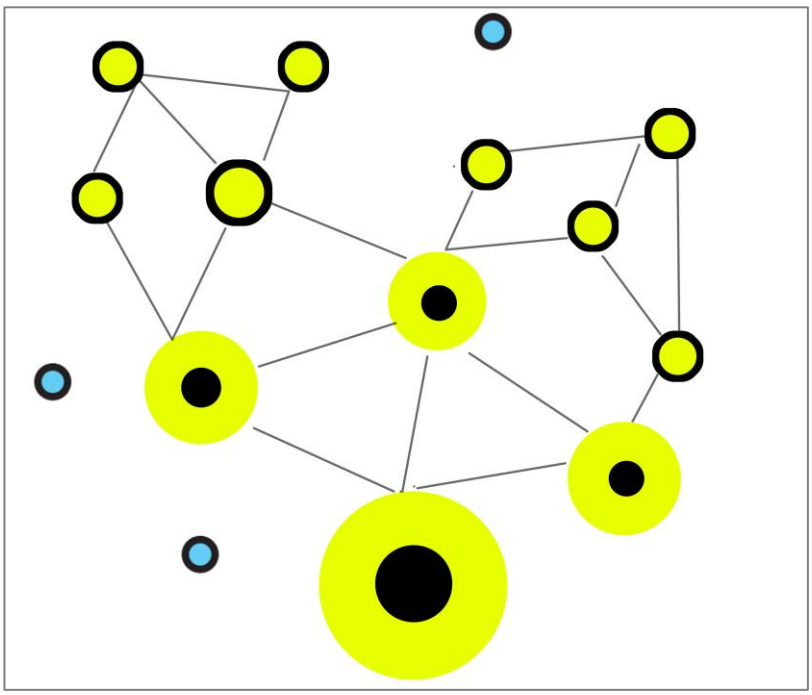

以区域凝聚力为目的的大都市管治

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摘要

本文提出并定义了新的有利于内陆地区和城市地区地域凝聚力的大城市治理策略。本文描述了如何实现城市理解和管理大都市发展动力的能力，提供了多种不同思路。与世界其它地区相比，欧洲的城市化与土地遗弃现象十分普遍。根据欧盟调查结果显示，80%的欧盟公民都将放弃乡村生活，选择在城市区域生活。
欧洲众多大都市区都有着市中心人口过多、郊区退化的特点，同时还伴随着不同程度或几乎完全被遗弃的内陆区域。如果能实现这些区域彼此之间以及与主要大都会中心之间的良好连接，可有助于解决许多城市问题。有必要将大都市区想象成一个可增加区域凝聚力的单一实体。内陆地区的潜在资本将成为国家增强凝聚力与发展的有力驱动因素。本文针对意大利主要大城市进行深入分析，提出了新的治理方案以提高城市系统适应自然和人为变化的能力，认为内陆地区是有利发展点而非不利因素。
政策和国土规划推动了大城市区域在竞争较强的空间经济的发展，并通过保证竞争力强的城市区域和内陆区域间的平衡，支持可持续发展政策。

关键词：
凝聚力、大城市治理、城市与内陆地区关系

1 INLAND AREAS AS AN OPPORTUNITY FOR METROPOLITAN CHALLENGES

Metropolitan areas have to manage a really diversified territory: overpopulated cities and less-populated, sometimes almost abandoned, hinterlands and villages. In Europe this configuration is more evident. Some Metropolitan areas organize part of territory as big as regions becoming the key public actor for land development. The big challenge of these Metropolises is to manage their territories in a homogenous way, considering urban centres, hinterlands and inland areas as part of the same machine. From this perspective, inland areas can be considered as an opportunity to solve some problems that are affecting urban areas. These problems are generally caused by man made changes such as migration flow, mass tourism, …. This paper proposes and defines a new metropolitan governance with strategies for territorial cohesion between the inland and urban areas. Different reflections are here presented to comprehend how is it possible to implement cities' ability to understand and manage metropolitan dynamics. The aim is to improve the competitiveness of cities exploiting the virtuous and synergic linkage between urban and inland areas. From this perspective metropolitan strategic planning can provide city solutions. Metropolization and urban sprawl are not sustainable anymore; there is a need of a balanced and polycentric development and of a new relationship between urban and rural regions.

The new strategy Europe 2020 for smart, sustainable and inclusive growth, states the need to develop territorial policies according to a multilevel governance approach responding to the structural weaknesses in the European economic model. This strategy promotes the so called 'Territorial Cohesion Policy' where Economic and social cohesion – as defined in the 1986 Single European Act – is about 'reducing disparities between the various regions and the backwardness of the least-favoured regions'. The EU's most recent treaty, the Lisbon Treaty, adds another facet to cohesion, referring to 'economic, social and territorial cohesion'. The idea is that cohesion policy should also promote more balanced, more sustainable 'territorial development' – a broader concept than regional policy, which is specifically linked to the ERDF and operates specifically at regional level. The final objective of the EU 2020 is to deliver high levels of employment, productivity and social cohesion in each European region, while reducing the impact on the natural environment. These regions often correspond with a Metropolitan area or they have a strong connection with a metropolis. With the 'partnership agreement' each Member State declares to follow the European framework in planning their territories. For this reason, Metropolitan Authorities have to consider in their strategic plans policies on territorial cohesion. Moreover, the European Union has recognized the centres of metropolitan zones as direct partner in the same way as the Regions and in addition to them to pursue the territorial cohesion. In this way, the European Union showed the need to sustain and enhance the territorial growth developing the territory around the metropolitan zones taking concrete actions on the Lisbon strategy for territorial competitiveness. Territorial cohesion is important to guarantee a form of equality between all the citizens of the European Union, irrespective of where they live. There are different elements that could demonstrate progress in territorial cohesion such as access for all to high-quality public services, economic and social development at regional and metropolitan level or more generally the quality of life of a place.

Even though the Territorial Cohesion strategy is at the heart of any European development policy, its implementation at local level did not produced, in the last few years, significant results. Most of the time the Territorial Cohesion polices have focused on subsidies to enterprises or on sectorial actions, to create new jobs or improving the transport network (enhancing the physical connections between territories). In this way, Regional Authorities have realized pilot actions for a balanced development, following the top-down approach. The international debate on territorial cohesion has recently stressed the need of place-based interventions for local context, identifying and aggregating the knowledge and the preferences of local actors. This approach is very different from the previous one used by many regional authorities, that only aims at addressing the territorial disparities in terms of gross domestic product and employment. A place-based policy is a long-term

strategy aimed at tackling persistent underutilisation of potential and reducing persistent social exclusion in specific places through external interventions and multilevel governance; it promotes the supply of integrated goods and services tailored to contexts, and it triggers institutional changes (Barca F., 2009).
The place-based policy is sometimes incompatible with the key priorities established by the European Union in the Territorial Agenda 2020. This is because each Region chooses only four of these priorities where all the EU funds (ERDF) - for territorial cohesion - will be concentrated. With so few choices, it seems impossible to define the best opportunities of development in relation to territorial specificities. For this reason, the paper proposes to include territorial cohesion strategies in Metropolitan Spatial and Strategic Plans using a place-based approach, in order to promote harmonious development and to tackle disparities of municipalities. To this end the starting point of the research set out here is a survey on the organisational structure and the policy instruments currently used by European metropolitan regions.
The second paragraph is entirely devoted to an explorative study that tries to characterize the various dimensions and variants of metropolitan governance in Europe. Metropolitan regions are considered the practical testing ground for EU cohesion strategies but they represent a no uniform sample. For this reason, the authors have identified and highlighted the repeated elements making a classification of the main governance models. Thanks to this classification, it has been possible to highlight the main metropolitan functions and the topic usually talked in Metropolitan Spatial and Strategic Plans. Well-studied urban governance policies are fundamental for efficient cohesion and place-based strategies. Based on this analysis, the paper suggests more harmonized Spatial an Strategic Plans that gradually increased recognition of the importance of territorial cohesion. In the second paragraph, the authors introduce another fundamental concept strictly related to territorial cohesion: the so-called territorial capital. Territorial capital is defined as the system of territorial assets of economic, cultural, social and environmental nature that ensures the development potential of places (Perrucca G., 2013). Inside Metropolitan regions, inland areas are the ones with more unused capital as a result of a de-anthropic process. This capital can include: cultural and cognitive traditions, architectural heritage, natural areas , the productive systems (agricultural, tourism, manufacturing), ... In a local development strategy, the unused capital should be considered as a measure of potential development, the presence of innovative subjects that do exist in internal areas may represent the trigger; the local development policies are, first, the activation of the latent capital (Fazia C., Passarelli D., Foresta S., 2016). In this context, Metropolitan policies can be considered as the main driving factor of territorial sustainable development because they can be a concrete instrument able to use the latent capital of the inland areas. In a globalized world, metropolitan areas are more and more seen as magnets of innovation and economic growth, but it is evident that the distribution of the rise in productivity is unequal across the district managed. Territorial cohesion must comply with the current need for sustainable development, which is why we wish to state right from the beginning that the dense urban model guarantees a sustainable development in Europe, and must consist of strong metropolitan urban centres and smaller peripheral centres, providing social and economic structure (Auran, 2013). The latent capital of inland areas can be considered as driving factor behind territorial cohesion and development. Unfortunately, a lot of small centres in the hinterlands of big Metropolis are on the way of being abandoned. This phenomenon connected to man-made changes is threatening the traditional relationship between urban and inland areas.
In the third paragraph, the authors present different best practices for improvement in metropolitan policies. There are many examples of innovation and resilience across Europe and in Italy that can be shared. This research shows the most up-to-date and relevant examples. The presence of innovative subjects, tourism and local-regional productions can be seen as real job opportunities. A deep and comprehensive cooperation between all the actors involved, is the key to innovation and development: between inland areas and metropolitan institutions and between academics and business. Metropolitan regions are the central actors

that can establish new cohesion policies. In the third paragraph, are also describes tools and methods for a good metropolitan governance adopted by different European metropolitan region in order to develop a resilient and sustainable territory.
The final paragraph analyses in deep the case of the Italian Metropolitan Cities proposing a new metropolitan governance approach to increase the capacity of urban systems to adapt to natural and man-made changes, considering the hinterland as a strong point rather than a disadvantage. In particular, the authors discuss methodologies in creating and implementing metropolitan Strategic and Spatial Plans for territorial cohesion. These plans drive the growth of metropolitan areas in a competitive space-economy and support sustainable development policy by ensuring a balance between urban areas with strong competitiveness and inland areas.

2 METROPOLITAN GOVERNANCE

According to Eurostat, the Commission for European statistics, metropolitan areas are districts or a combination of districts which represent an agglomeration of at least 250 000 inhabitants. They are named after the principal functional urban area inside their boundaries. These districts generally include a commuter belt area around a big city which concentrates people, institutions, business and industries. These large cities assume service functions for a large surrounding area and sometimes their influence goes beyond this area. There are around one hundred major metropolitan districts in Europe, where are concentrated the majority of economic activities and people – each of these areas has more 1,000,000 residents -. According to the Eurostat definition, the number of metropolitan areas – with more than 250.000 inhabitants - goes up to 305. It is evident that these areas are fundamental for the future development of the whole Europe becoming the predominant form of human settlement. European metropolitan regions account not only the majority of EU population – 59% - but also 62% of EU employment and 67% of EU GDP[1].
In some EU Member States, capital cities exert a form of 'capital magnetism', through a monocentric pattern of urban development which attracts investment/resources so these are concentrated in the capital; whether such disparities have a positive or negative effect on the national economy is open to debate, as capital cities that dominate their national economies may create high levels of income and wealth that radiate to surrounding regions and pull other cities/regions up (Eurostat, 2016).
According to the Eurostat definition, in Europe there are three types of metropolitan regions: capital city metropolitan regions; second-tier metropolitan regions; smaller metropolitan regions. With 13.6 million and 11.9 million residents respectively, London and Paris are by far the largest metropolitan district in Europe. However, considering the first fifteen metropolitan areas, there are great differences between the number of residents that live inside the metropolitan capital or outside, in suburbs or inland areas. As stated in the table below (Fig. 1) only six out of fifteen European major metropolitan areas have more than the 50% of their residents inside the capital city of the area. Extending this analysis to all the other major metropolitan areas; approximately 1/3 of the metropolitan population lives in the main urban cores. This ratio is smaller for metropolitan areas with more than 5.000,000 of citizens.
In the last few years, European metropolitan areas have increased again their population as a result of the international migration and the constant flow from rural areas to urban centres. Madrid and Rome registered the most significant growth in residents, with a positive trend (1.5 and 1.4 respectively). The increase in population in urban areas has resulted in a large gap between urban and inland areas. Policies on metropolitan developments should reduce regional disparities: urban areas have to be considered as the asset for the development of the whole territory inside the metropolitan area.

1 European Commission data, 2014.

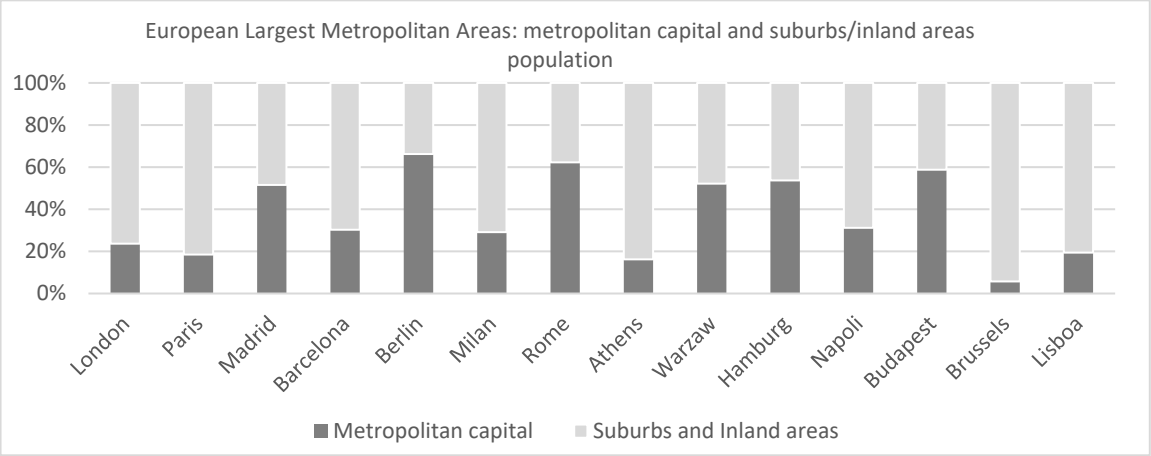

Fig. 1 Percentage of European metropolitan residents that live inside the metropolitan capital or outside (suburbs and inland areas)

The European Territorial Agenda 2020 is the most important strategy about territorial cohesion in Europe. The place-based approach is defined as the best tool to be applied in cohesion policies to reach tangible results. This approach is designed at a local level to meet unique conditions and it engages stakeholders from a diverse range of sectors. The Agenda enhances the leading role of EU Metropolitan Regions: local authorities responsible for cohesion policy implementation. Metropolitan Regions are presented as drivers of innovation and growth, with the responsibility for the development of their wider surroundings. However small and medium-sized towns can play a crucial role at regional level: policy efforts should contribute to reducing the strong territorial polarisation of economic performance, avoiding large regional disparities in the European territory by addressing bottlenecks to growth in line with Europe 2020 Strategy (Territorial Agenda of the European Union, 2011). From this perspective Metropolitan governance tools play a key role to design a competitive and resilient territory where urban areas are the dynamic core.

Metropolitan Regions in Europe are characterized by different size and form and follow different governance structures. In particular, according to a research carried out by the OECD (Organisation for Economic Co-operation and Development)[2], there are: informal/soft coordination; inter-municipal authorities; supra-municipal authorities; special status 'Metropolitan Cities' (Fig. 2).

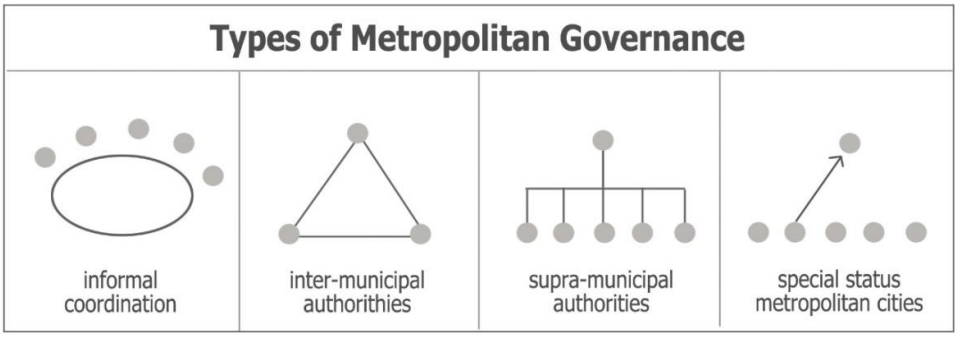

Fig. 2 Types of metropolitan governance in Europe according to the Organization for Economic Co-operation and Development

The first type gives an informal support across an area and all the municipalities involved have the same importance sharing expertises and problems. This solution is adopted by different metropolitan areas such as Athens-Attica in Greece and 'Delta Metropool in the Netherlands'. The second type is an official authority with members from all the municipalities inside a geographical area. There is any kind of hierarchy between the

2 OECD, 2015. Governing the City, OECD Publishing, Paris

members inscribed. In Europe, the Metropolitan area of Frankfurt is considered as an inter-municipal authority. The third type foresees an upper level of government exercised by the biggest municipality inside the group. It is a vertical structure such as the Greater Paris, The Metropolitan city of Milan or the London Authority. The fourth type is referred to international megalopolis. These metropolises, because of their incredible dimension, have a special status. In Europe, there are not examples of Metropolis with this last type of governance, famous international cases are Hong Kong in China or Daejon in Korea.

Metropolitan areas are also determined by different roles. They can be 'International centres of attraction', a magnet for capital, labour, goods, services and culture like London, New-York or Milan. Other metropolitan areas are 'Key actors for national economy', developing and supporting innovative areas of expertises and productive sectors like Bordeaux, Munich and Genoa. Finally there are 'Crossroads metropolises', important hubs for transport and goods, which gather different services, styles and culture. It is evident that even if the metropolitan level is openly encouraged by the European Union, there is a varied situation where metropolitan authorities are far from one Country to another. There are even more dissimilarities if we analyse metropolitan governance tools and strategies. However, it is possible to identify which are the main functions and topics tackled. In general, European metropolitan areas deal with:

- transport and mobility. This is one of the main metropolitan functions. It is needed to respond to the travel demand of residents and goods, enhancing the existing network and developing sustainable connections over the whole metropolitan area. Good linkages lay the groundwork for territorial development and cohesion;
- innovation and growth. This is one of the main European priorities that should be applied at all territorial levels. Metropolitan areas have a key role in creating jobs and boosting growth supporting research and innovation establishing links between research institutions, universities and the business community;
- territorial cohesion. Territorial cohesion policies are essential for sustainable growth. They boost productivity and specialisation throughout the territory of the metropolitan region reducing economic and social disparities. In particular, metropolitan areas should develop a tailored, place-based development policy that takes into account the diversities over the whole covered area.
- tourism and culture. Tourism and culture are important sectors that can be drivers of economic growth. Metropolitan areas should promote a balanced approach between the needs to boost tourism on one side, and the preservation of natural and historical sites, and local traditions on the other.

These topics should be the main elements of metropolitan Spatial and Strategic Plans. Unfortunately, only few metropolitan districts in Europe have already defined their definitive governance tools. It is important to shift from symbolic to decision-making functions. Metropolitan governance requires political influence and leadership within institutions, recognition of regional geographical scope of metropolitan areas, and concerted efforts to encourage cooperation through established and recognized authorities (World Bank, 2011). This does not mean that metropolitan areas should have only political functions but they might have an economic role, establishing new networks and using the latent territorial capital for the economic development of the whole territory covered. In these terms, metropolitan governance should be a process by which governmental and non-governmental actors, such as civil associations, private stakeholders work together establishing new policies for territorial development. In the fifth paragraph the authors propose innovative ways to implement metropolitan governance Plans in order to better exploit the territorial capital working in an integrated manner. Considering the great differences, over mentioned, between European metropolitan areas this research is focus on Italian Metropolitan Cities where it is possible to compare and to analyse in deep the current metropolitan governance. Before doing that the main reasons of abandonment of inland areas and some best practice on metropolitan governance are reported. These arguments are the basis of the policies proposed after.

3 INTERNATIONAL BEST PRACTICES, TOOLS AND METHODS FOR METROPOLITAN GOVERNANCE

Metropolitan regions/areas have become an increasingly important topic of debate all around the world in recent years. The Metropolitan Area of Guadalajara (MAG -Mexico) has established an 'International Forum on Metropolitan Governance Innovation' to define an innovative metropolitan approach. This International event represents an opportunity to learn and exchange good practices on Metropolitan Governance. The Forum serves as a space to disseminate relevant contents of the existing public debate, mainly focused on the definition of the necessary measures to improve urban regions and cities. Furthermore, it actively contributes to the global agenda that UN-Habitat promoted during the Third United Nations Conference of Human Settlements - HABITAT III, hold in Quito, Ecuador. In Europe a similar experience is carried out by EMI, the European Metropolitan network Institute. EMI was set up in The Hague in 2010 to create innovative knowledge about European metropolitan areas. It supports the sharing of experiences and competences between research institutions, public authorities and EU institutions to fill the gap between research and practices.

This chapter collects and presents some of the best practices, tools and methods implemented at an international level for innovative and sustainable metropolitan governance. There is not a unique efficient model because metropolitan regions are very different all around the world. In the metropolitan areas of Vienna and Budapest more than 70% of the population lives in the core city; in Paris only the 20% and the other population lives in the metropolitan conurbation. There are also many other different examples such as the metropolitan area of Genoa, Cagliari or Nice where the surfaces covered by the main city are respectively one-seventh, one-fourteenth and one-forty-first of the surface managed by the metropolitan authority. These diversities cause very different governance needs. A series of good governance approaches are listed below.

The Greater Stuttgart Region is composed of 179 municipalities, including the city of Stuttgart and many other small and middle-sized towns. Because of their location and size, these municipalities have very different problems and needs. For this reason the metropolitan assembly includes urban and a rural lists ensuring equal representation. Both parts cooperate on transport and economic issues enhancing the urban-rural relationship for territorial cohesion. The area covered by the Greater Stuttgart Region is managed according to three main tools: the Regional Land Use Plan, the Public Transport Development Plan and the Economic Development Strategy. The Regional Land Use Plan protects the natural environment preventing urban sprawl; it designs green corridors and landscape parks. The Public Transport Development Plan is probably the most important document for territorial cohesion. It ensures good connections between central and marginal, urban and inland areas, keeping affordable costs. The Economic Development Strategy aims at creating innovative centres over the whole territory supporting start-ups and networks. From this perspective, the Greater Stuttgart Region decided to establish the Centre for Satellite Communication – called 'DeSK' - in a rural area near Backnang considered unattractive for investments.

This area also suffered from depopulation, above all young and skilled people had left Backnang to find a better job in Stuttgart. After the establishment of the DeSK many young engineers moved back to this rural area strengthening the local economy. New linkages with the main hubs of the region were built, enhancing the transport network and increasing the quality of life of the citizens in Backnang. The Amsterdam Metropolitan Area is distinguished by strong and solid rural activities in contrast to the urban areas around it. In the last few years, this metropolitan district developed many best practices to boost the relationship between the urban and rural municipalities within its borders. One of these experiences is called "The Amsterdam Food Strategy". This strategy aims at developing rural and peri-urban areas thanks to food and agricultural initiatives. In particular, a metropolitan food chain has been established giving to urban citizens the possibility of eating fresh and healthy food coming from the surroundings, improving their eating habits. Before this project the 40% of Amsterdam's footprint was caused by the provision of food from abroad.

The Amsterdam Food Strategy enhanced the relationships between urban consumers and the neighbouring rural areas with their farmers. This project contributed also to strengthen the local economy, creating a strong linkage between the city of Amsterdam and the surrounding area. Another interesting experience launched by the Amsterdam Metropolitan Area is the project "Garden for West" against land abandonment. Thanks to this initiative many abandoned peri-urban farmlands have been reintegrated in the metropolitan landscape. New urban farmers are now cultivating these lands reducing food miles and making productive unused territories.
The City-Region of Warsaw in Poland includes 29 municipalities in a range of 100 Km around the core of Warsaw. This metropolitan area is at the forefront of providing a good and sustainable transport system. The best practice of the City-Region is the realization of the 'Joint metropolitan transport ticket' which constitutes the most important element for the functioning of a metropolitan area. This ticket is almost only funded by the city of Warsaw; the other municipalities give one twentieth of the subsidiary cost needed for each inhabitant. The city region is also realizing a communication axis for commuters in order to serve all the municipalities localized around the capital city. The main problem is that currently in Poland there are not incentives for actions and projects developed by metropolitan areas. It exists only voluntary spatial plans and new urban policy visions prepared by the existing metropolitan regions without a common national framework.
In Italy, the *Strategia Nazionale per le aree interne* (National Strategy for inner areas) represents an interesting opportunity for the territorial cohesion supporting inland areas development. This Strategy is applied by metropolitan areas or by unions of municipalities and its objective is to promote the correct relationship between urban and inland areas. This document states that every citizen has the same rights (mobility, education, health and digital connection) wherever he lives. In addition, this Strategy will be realized with the direct cooperation of local stakeholders (through a participatory process). Some other best practices in Italy have been realized by the metropolitan city of Genoa and Milan.
This first metropolitan area is preparing a Strategic Plan which aims at enhancing the relationship between urban and inland areas. The Plan foresees common territorial services and infrastructures, a sustainable waste management strategy and specific interventions for the economic development. Five main strategic topics have already been identified according to the following hierarchy of priorities: education, mobility, tourism, sense of belonging and spatial relationships and correlations.
The Metropolitan City defined a participatory strategy in implementing this new policy instrument, involving local stakeholders (civil associations, public-private partnerships, unions, enterprises, etc.) to cooperate in terms of public goods. In particular, many best practices have been selected to recognize all the interesting experiences already adopted throughout the metropolitan territory. All these practices will be the basis of the future policies. In the meantime, the Metropolitan City of Genoa has developed a web site called *Fuori Genova* (Outside Genoa).
The site is above all a database which gathers different information about the whole metropolitan area organized according the following categories: public spaces, companies, artisan, civil associations, historical sites, parks, natural sites and tourism. It is a contact point between public and private actors, where it is possible to share personal opinions about metropolitan projects and policies. It offers also the possibility to discover development opportunities creating new networks. All information is geo-referenced on an interactive map (Fig. 3).
The Metropolitan City of Milan is the first Italian metropolitan area adoption a Strategic Plan (Fig. 4). The Milan Metropolitan Area includes 248 municipalities and its urban agglomeration has more than 7 million inhabitants. It is a typical polycentric area dominated by the city of Milan that is driver of the local and even national economy. Since Milan is gradually running out of space to accommodate new developments, the city is increasingly more dependent on possibilities offered in the broader region; this requires Milan and the surrounding region to cooperate better with each other (Hollander, Meijers, 2012).

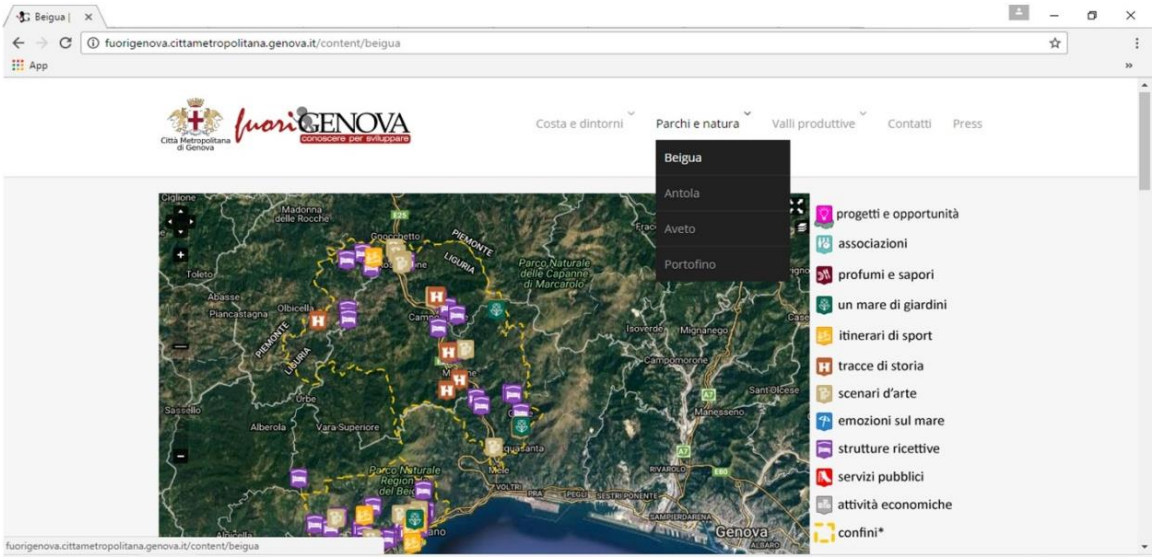

Fig. 3 The web site realized by the Metropolitan City of Genoa to promote and valorise all the metropolitan area

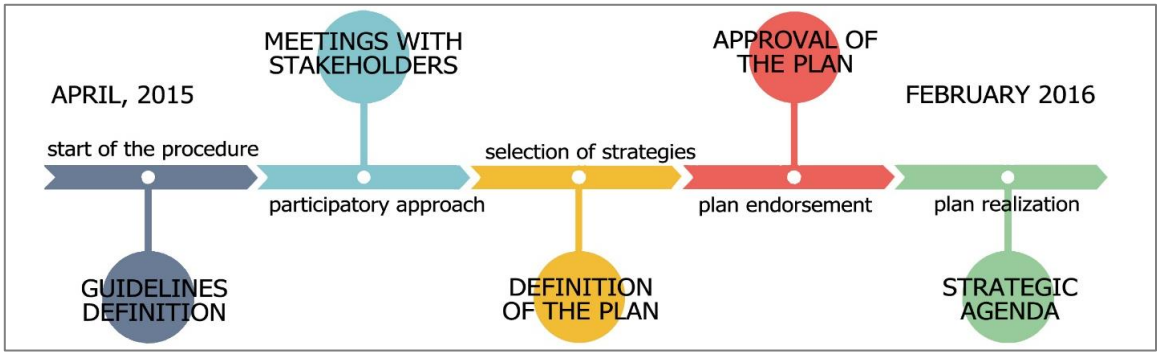

Fig. 4 The Strategic Plan of the Metropolitan City of Milan: The planning process

The Strategic Plan of Milan follows a twin-track approach: at the local level defining policies and instruments for territorial cohesion (public transport, water and energy supply, environmental protection, waste management, tourism and economic development) and considering the Metropolitan City as the aggregator of all the services needed; at the international level strengthening the role of the Metropolitan City of Milan in the global market. Another interesting approach identified by the Strategic Plan of Milan is the six strategies procedure. Considering the polycentric structure of the metropolitan area, the Plan defines six different place-based strategies taking into account spatial diversities.

The examples above mentioned can be all considered as best practices for territorial cohesion but address different topics. They are place-based solutions to straight territorial cohesion focusing on diverse emerging challenges: transport, employment, tourism and resilience (Tab. 1). The solutions presented here contribute to the jobs agenda, enhance physical connections, develop new sustainable tourism itineraries and cope with changes. The most complete case among these examples is the Strategic Plan of Milan. This plan considers all the main topics related to territorial cohesion (transport, waste management, tourism, employment…) in a single document. From this perspective, all the other best practices can be considered as single actions inside an integrate vision/plan. But it is a more challenging strategy, which presents political and organizational challenges of combining resources, priorities and actions. For this reason, the paper proposes - in the following chapter - a new metropolitan governance approach to implementing metropolitan Strategic and Spatial Plans supporting territorial cohesion.

BEST PRACTICES FOR TERRITORIAL COHESION ACROSS EUROPE

Topic addressed	Example
Transport/ Better physical connections between territories	- 'Joint metropolitan transport ticket' City-Region of Warsaw
Job opportunities/ Better level of employment	- 'DeSK' The Greater Stuttgart Region - 'Food chain' Amsterdam Metropolitan Area
Tourism/ Sustainable tourism, new touristic itineraries	- 'Fuori Genova web portal' Metropolitan City of Genoa
Resilience/ Practices against inland areas abandon	- 'National Strategy for inner areas' Italian national strategy
Governance strategy	- 'Strategic Plan of Milan' Metropolitan City of Milan

Tab. 1 Best practices for territorial cohesion across Europe

4 TOWARDS METROPOLITAN GOVERNANCE FOR TERRITORIAL COHESION. CASE STUDY: ITALIAN METROPOLITAN CITIES

As stated in the previous paragraphs, there is an increasing need for governance strategies at the metropolitan level. This research proposes new governance models for Italian metropolitan cities to increase territorial cohesion. The governance strategy of European metropolitan areas depends on local and national circumstances (laws, culture, economic situation …). There are more diversities than similarities. For this reason the authors focused on the specific case of the Italian metropolitan areas where it is possible to make comparisons and specific propositions. In Italy there are 14 Metropolitan Cities established with the law 142/90 (article 114) and the subsequent laws 3/2001 and 56/2014. According to the 56/2014, 'Metropolitan cities' are recognized as local authorities for large areas instead of the previous 'Provinces'. Italian Metropolitan cities have been operative since 1 January 2015 and their basic tasks are:

- adoption and annual update of the three-year Strategic Plan for the metropolitan region. This plan is a guidance, a framework program for all the municipalities within the metropolitan area;
- general urban planning tools including communication strategies and infrastructure services;
- public services management. In accordance with local municipalities, Metropolitan cities can prepare procurement documents, organize public competitions and supervise service contracts;
- mobility and transport services and infrastructures, ensuring the compatibility of the metropolitan plan with the local plans;
- promotion and coordination of social and economic development, supporting economic activities and innovative researches as defined in the strategic plan;
- promotion and coordination of the digital agenda inside the entire metropolitan region.

Urban planning is a key function for all the Italian Metropolitan Cities. This role is carried out thanks to two governance tools: the Strategic Plan and the Metropolitan Spatial Plan. The three-year Strategic Plan is the most important instrument able to design mid and long term scenarios. It is updated every year and approved by the Metropolitan Council. The Metropolitan Spatial Plan is a tool for urban planning which substitutes the previous Provincial Spatial Plan. Both these Plans are very important for urban development and territorial cohesion. Currently only the Metropolitan City of Milan and the Metropolitan City of Naples have approved respectively the Strategic Plan and the Spatial Plan. Almost all the other metropolitan areas have defined the guidelines for their plans, but they are far from getting their final strategies. Finally, the Strategic Plans of the Metropolitan City of Genoa and Florence are awaiting approval. The authors have deeply analyzed all the

metropolitan documents to implement the current strategies to support territorial cohesion. The approach used defines specific indicators according to three main topics that could significantly contribute to metropolitan sustainable growth: the relationship between urban and inland areas, cohesion policies and resilience policies. These indicators are reported in table 2.

METROPOLITAN SUSTAINABLE GROWTH – INDICATORS	
URBAN INLAND RELATIONSHIP	– **INTEGRATED TERRITORIAL VALORIZATION AND CONSERVATION** – supporting compatible activities (tourism, services and training) to: produce new economies, protect the natural environment, maintain the hydrologic asset, valorise local traditions and biodiversity. – **SERVICES IMPROVEMENT AND INNOVATION** – transport, healthcare, education… – **INNOVATIVE AGRICULTURE -** short food supply chains, local food protection, agriculture development economics – **ECONOMIC, SOCIAL AND ENVIRONMENTAL REVITALISATION –** above all in the outskirt and inland areas
COHESION POLICIES	– **SOCIAL INCLUSION** – disadvantaged people supports, integration and welcome plans, educational activities – **BIODIVERSITY AND ECOSYSTEM SERVICES** – green infrastructures to enhance social inclusion – **CLIMA CHANGE MITIGATION –** natural capital protection
RESILIENCE POLICIES	– **CLIMA CHANGE** – Risk mitigation planning, territorial security – **SOCIAL ECONOMIC DEVELOPMENT** – smart growth

Tab. 2 Indicators used for the analysis of the Metropolitan Strategic Plans

This research addresses the issue of resilience considering this phenomenon according to its general definition: the capability to react to an external cause that disturbs the original form. From this perspective the progressive abandonment of inland areas can be seen as the disturbing element able of compromising the original territorial balance. Resilient metropolitan areas are territories that react to this phenomenon finding new ways of cooperation between urban and inland areas. In table 3 is reported an analysis on all the existing Metropolitan Plans in Italy, in according to proposed indicators in table 2.

Metropolitan Area	Municipalities	Surface_(km^2)	Residents Istat 2016	Planning process	Urban Inland relationship	Cohesion policies	Resilience policies
Reggio Calabria	97	3210,37	555.836	2013 Strategic Plan (proposal)	yes	yes	no
Naples	92	1178,93	3.113.898	2016 Spatial Plan (approved)	yes	yes	no
Bologna	55	3702,32	1.005.831	2016 Strategic Plan (guidelines)	no	yes	no
Rome	121	5363,28	4.340.474	2015 Strategic Plan (guidelines)	yes	yes	yes
Genoa	67	1833,79	854.099	2016 Strategic Plan (awaiting approval)	yes	yes	yes
Milan	134	1575,65	3.208.509	2016 Strategic Plan (approved)	yes	yes	yes

Turin	315	6827,00	2282197	2016 Strategic Plan (proposal)	yes	yes	no
Bari	41	3862,88	1263820	- Provincial Plan	no	no	no
Cagliari	17	1248,68	431657	- Provincial Plan	no	no	no
Palermo	82	5009,28	1271406	- Provincial Plan	no	no	no
Catania	58	3573,68	1115535	- Provincial Plan	no	no	no
Messina	108	3266,12	640675	- Provincial Plan	no	no	no
Florence	42	3513,69	1013348	2016 Strategic Plan (awaiting approval)	yes	yes	no
Venice	44	2472,91	855696	2015 Strategic Plan (guidelines)	no	yes	no

Tab. 3 Analysis on all the existing Metropolitan Plans in Italy

After the analysis on the current policies[3] and strategies adopted or defined by Italian metropolitan cities, the research presented here proposes innovative ways to implement these tools in order to better exploit the territorial capital working in an integrated manner on the whole metropolitan area. In particular, the research defines the topics and elements that should be included in the metropolitan strategic and spatial Plans. These topics are:

- **inland and urban areas relationship:** metropolitan spatial and strategic Plans should pay particular attention to the relationship between inland and urban areas inside the metropolitan area. It is essential to understand the mutual potential for common synergies and benefits contributing to territorial cohesion;
- **public endorsement:** metropolitan Plans should be politically supported but they should also get public endorsement to be truly effective. Many non-governmental actors (civil associations, private companies, universities, professional associations, etc.) should be involved in the planning procedure and declare publicly their support. This procedure strengths the actions and the strategies defined by the metropolitan plan. Private and public partnership should be encouraged; they can have a key role for the financial sustainability of the Plan;
- **time-bound objectives:** the strategic Plan is a long-term plan with wider strategies for future development and growth. The spatial Plan is a short-term plan with more immediate objectives. In both cases, it is important to establish a reasonable timetable with mid-term and final goals;
- **pilot actions:** both the strategic and the spatial Plan should foreseen specific pilot actions to test the strategies proposed. It is important to establish for each pilot action the budget, the actors/stakeholders involved, quality/quantity assessment indicators, mid-terms and final outputs;
- **hierarchy of priorities**: it is important to establish a hierarchy of priorities to understand which actions and strategies are firstly needed and more effective. It is suggested to do a sustainability analysis to define the social, economic and environmental benefits and costs. Through this analysis it will be easier to compare the strategies and the actions defined by the plan;
- **participatory process**: it is suggested the participation of governmental and non-governmental actors in the planning process (above all during the preparatory phase and the definition of common strategies

[3] The authors have analyzed all the documents (plans and policies) produced by Italian metropolitan cities since they creation in 2015. Three main topics of analysis (urban and inland relationship, cohesion policies, and resilience

and goals). The participatory process is a fundamental element for territorial cohesion, because everyone is invited to give its opinion. This process could be a workshop, a forum or a public debate with direct or indirect stakeholders. Every municipality inside the metropolitan area should take part in these events;

- **innovation and growth**: innovation and growth are a transversal topic to all the other elements. They are important to revitalize the metropolitan area supporting sustainable economic development;
- **territorial cohesion**: as stated in the first paragraph territorial cohesion is a necessary precondition for sustainable growth and development. It is one of the main European priorities for 2020 that should be pursued at every governmental level. Metropolitan Strategic and Spatial Plans should be inspired by international best practices to plan their territorial cohesion strategies (the 'Joint metropolitan transport ticket' of Warsaw, the web portal '*Fuori Genova*' realized by the Metropolitan City of Genoa and called 'DeSK' centre of Stuttgart). Some important aspects to be considered are the transport system and the territorial capital (culture, tourism, etc.);
- **resilience**: A resilient metropolitan area is able to address the challenges of today and tomorrow. Resilience strategies are needed to tackle the abandonment phenomenon of inland areas. Also in this case some best practices should be considered like those showed in the previous paragraph (the 'Food chain' of Amsterdam and the Strategic Plan of Milan).

In table 4 is reported a possible scheme to be followed during the planning process to include the over mentioned topics.

PLANNING PHASE	DESCRIPTION	ISSUES TO BE CONSIDERED
Planning of the organizational structure and team	Procedures required as preparatory works: identification of the organizational structure and team that will follow all the planning phases.	- Inland and urban areas relationship - Public endorsement - Participatory process
Spatial analysis	Background analysis on the state of the art over the whole metropolitan district with a focus on the current relationship between inland and urban areas. It is suggested a SWOT analysis.	- Inland and urban areas relationship - Territorial cohesion - Resilience - Participatory process
Goals definition	Strategies selection, strategic goals definition and approaches identification.	- Inland and urban areas relationship - Time-bound objectives - Hierarchy of priorities - Territorial Cohesion - Resilience - Participatory process - Innovation and Growth
Definition of the Plan	Setting goals, determining actions to achieve the goals, and mobilizing resources to execute the actions.	- Inland and urban areas relationship - Territorial Cohesion - Resilience - Pilot actions - Time-bound objectives - Public endorsement - Innovation and Growth
Implementation	Implementation of Pilot actions and strategies.	- Inland and urban areas relationship - Territorial Cohesion - Resilience - Pilot actions - Innovation and Growth
Monitoring	Results assessment to verify the implementation of the plan and the achievement of the objectives.	- Time-bound objectives

Tab. 4 Planning process scheme for Metropolitan Strategic and Spatial Plans

Metropolitan governance strategies should be seen first of all as a tool for territorial cohesion developing and reinforcing the competitiveness of Europe as a whole. From this perspective urban areas are considered, as metropolitan regions, centers for development able to transfer innovation to the inland areas around them. These areas, if well connected among them and to the main metropolitan centre, can contribute to solving different urban challenges. Many cities have social, economic and environmental problems resulting from pressures such as overcrowding, pollution, traffic, mass tourism. Rural areas have social and economic problems resulting from the abandonment of land, agriculture and livestock activities, but generally the quality of life is better than a lot of peripheral urban areas. Finding the balance between these two realties inside metropolitan regions is one of the major challenges for the territorial cohesion in Europe. The economic gap between coastal/central and inland parts of a Country prevents a harmonious and sustainable development. There is the necessity to image metropolitan areas as a single entity to increase the cohesion of lands.

The latent capital of inland areas can be considered as driving factor behind territorial cohesion and development. The paper suggests following a place-based strategy developed locally to address local conditions. This strategy goes beyond the list of goals followed by Regional Authorities on the basis of the EU Territorial Agenda 20-20.

The metropolitan level is of particular interest because it can address territorial challenges in a more effective way if compared to the municipal level. It is also more direct and practical rather than the regional level which deals with general orientations.

In conclusion, Metropolitan Strategic and Spatial Plans should support development and networking policies and by ensuring a balance between densely inhabited urban areas with strong competitiveness and inland areas with a great unexploited territorial capital. For this reason, here are proposed some innovative topics and elements that should be considered by Metropolitan Authorities towards an effective metropolitan governance for territorial cohesion.

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IMAGE SOURCES

Cover: authors' elaboration

Fig. 1: authors' elaboration from Eurostat data (2016)

Fig. 2: reworked version by the authors from a research of the OECD (2015)

Fig. 3: fuorigenova.cittametropolitana.genova.it

Fig. 4: http://www.cittametropolitana.mi.it/PSM/

Tab. 1, 2, 3, 4: authors' elaboration

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REVIEWS PAGES

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 2(2017)

Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always remaining in the groove of rigorous scientific in-depth analysis. During the last two years a particular attention has been paid on the Smart Cities theme and on the different meanings that come with it. The last section of the journal is formed by the Review Pages. They have different aims: to inform on the problems, trends and evolutionary processes; to investigate on the paths by highlighting the advanced relationships among apparently distant disciplinary fields; to explore the interaction's areas, experiences and potential applications; to underline interactions, disciplinary developments but also, if present, defeats and setbacks.
Inside the journal the Review Pages have the task of stimulating as much as possible the circulation of ideas and the discovery of new points of view. For this reason the section is founded on a series of basic's references, required for the identification of new and more advanced interactions. These references are the research, the planning acts, the actions and the applications, analysed and investigated both for their ability to give a systematic response to questions concerning the urban and territorial planning, and for their attention to aspects such as the environmental sustainability and the innovation in the practices. For this purpose the Review Pages are formed by five sections (Web Resources; Books; Laws; Urban Practices; News and Events), each of which examines a specific aspect of the broader information storage of interest for TeMA.

01_WEB RESOURCES
The web report offers the readers web pages which are directly connected with the issue theme.

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02_BOOKS
The books review suggests brand new publications related with the theme of the journal number.

author: Gerardo Carpentieri
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03_LAWS
The law section proposes a critical synthesis of the normative aspect of the issue theme.

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04_URBAN PRACTICES
Urban practices describes the most innovative application in practice of the journal theme.

author: Gennaro Angiello
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05_NEWS AND EVENTS
News and events section keeps the readers up-to-date on congresses, events and exhibition related to the journal theme.

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评述页：

提高城市系统对自然及人为变化顺应能力的方法、工具和最佳实践

TeMA 从城市规划和流动性管理之间的关系入手，将涉及的论题逐步展，并始终保持科学严谨的态度进行深入分析。在过去两年中，智能城市（Smart Cities）课题和随之而来的不同含义一直受到特别关注。
学报的最后部分是评述页（Review Pages）。这些评述页具有不同的目的：表明问题、趋势和演进过程；通过突出貌似不相关的学科领域之间的深度关系对途径进行调查；探索交互作用的领域、经验和潜在应用；强调交互作用、学科发展、同时还包括失败和挫折（如果存在的话）。
评述页在学报中的任务是，尽可能地促进观点的不断传播并激发新视角。因此，该部分主要是一些基本参考文献，这些是鉴别新的和更加深入的交互作用所必需的。这些参考文献包括研究、规划法规、行动和应用，它们均已经过分析和探讨，能够对与城市和国土规划有关的问题作出有系统的响应，同时还对诸如环境可持续性和在实践中创新等方面有所注重。因，评述页由五个部分组成（网络资源、书籍、法律、城市实务、新闻和事件），每个部分负责核查 TeMA 所关心的海量信息存储的一个具体方面。

01_WEB RESOURCES
网站报告为读者提供与主题直接相关的网页。

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02_BOOKS
书评推荐与期刊该期主题相关的最新出版著作。

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03_LAWS
法律部分提供主题相关标准方面的大量综述。

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04_URBAN PRACTICES
城市的实践描述了期刊主题在实践中最具创新性的应用。

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05_NEWS AND EVENTS
新闻与活动部分让读者了解与期刊主题相关的会议、活动及展览。

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01

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 2(2017)

REVIEW PAGES: WEB RESOURCES

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In this number
TOOLKITS FOR URBAN ADAPTATION PLANNING

Urban areas are particularly vulnerable to impacts of climate change (IPCC, 2014). Even if many efforts have been done to reduce GHG emissions, considered as one of the main reasons of climate change, their effects will be betrayed for decades to come. In the last twenty years there was an increasing awareness on climate change mitigation, while only in the last few years policy makers have implemented adaptation strategies and actions at local level (De Gregorio Hurtado et al, 2015). As opposed to mitigation strategies, based on consolidated approaches and tools (i.e. SEAP by Covenant of Mayors), the urban adaptation to climate change is interpreted in different ways from city to city. Adaptation, indeed, depends both from climate risks and resilience features of the urban community (Pinto, 2014).

In this context, researchers have started to define cognitive frameworks to help policy makers in order to develop adaptation plans and better manage adaptation processes. In particular, as regards adaptation plans, they are characterized by two elements:

- the definition of future climate scenarios;
- the definition of adaptation measures.

While climate scenarios are based on available data and are uncertain in many cases, proposed adaptation measures are synergist with policy decisions and are referred not only to technical aspects, but also urban planning, contingency planning, etc. (Johnson and Brail, 2012).

In this number, three websites are presented. They illustrate some web platforms that local authorities, urban planners and other professionals can consult in order to define strategies and actions of urban adaptation associated with climate change. Those platforms include a toolset for adaptation planning.

The first one is the Climate-ADAPT, a platform developed by European Commission for supporting EU adaptation policy and decision making both at national and local level to implement adaptation policies and strategies. The second platform is U.S. Climate Resilience Toolkit born by a partnership of agencies and organizations for implementing urban resilience in U.S. federal governments. Finally, the third website is developed by Medellin Collaboration on Urban Resilience (MCUR) at international level in order to collect different kind of tools that local authorities can use to develop their adaptation plans.

CLIMATE-ADAPT – EUROPEAN CLIMATE ADAPTATION PLATFORM
http://climate-adapt.eea.europa.eu/

Climate-ADAPT – European Climate Adaptation Platform is a website developed by the European Commission (DG CLIMA, DG Joint Research Centre and other DGs) and European Environment Agency. It supports the EU nations to develop and implement policies, strategies and actions in adapting to climate change. It contains several information and data related to:

- future European climate change scenarios;
- vulnerabilities of EU regions and adaptation sectors;
- adaptation case studies;
- tools to support adaptation planning.

The platform is organized in seven sections: *About*, *Database*, *EU policy*, *Countries, regions, cities*, *Knowledge*, *Network*, *Help.* The *About* section introduces the website and contains general information about its organization, as well as web links to the Climate-ADAPT partners. The *EU policy* section collects all the EU policies referred to adaptation to climate change. In detail, the section is composed by five pages about EU Adaptation Strategy, EU mainstreaming in sector policies, EU funding of adaptation and Mayors-Adapt initiative. In *Countries, regions and cities*, organized in four subsections, there is an overview about information on strategies and actions related to adaptation, developed or under development, in the EU transnational Regions, in the EU States and, finally, in some European cities, which represent the cores of the adaptation challenges. The *Knowledge* section includes adaptation information and a variety of tools and methods to support adaptation policy and decision-making by European stakeholders. It is divided into three sub-sections. While the first one describes the section's contents, the *Adaptation information* includes information on: future climate scenarios; vulnerability assessments for EU region or sector; potential adaptation options considering specific climate impact and/or adaptation sector; the adaptation strategies of EEA Member countries; the research projects on climate change adaptation performed on European transnational and national level. The last sub-section, *Tools*, contains seven specific tools: the *Adaptation Support Tool*, which assists users involved in development of climate change adaptation policies; the *Case Study Search Tool*, which allows to find case studies in Europe for different locations as well as for various impacts and sectors; the *Uncertainty guidance*, which provides guidance on handling uncertainty in the process of decision making on adaptation; the *Climate-ADAPT Map Viewer*, which provides observations and projections of climate change impacts, vulnerability and risks; the *Urban Adaptation Support Tool*, which supports adaptation practitioners in cities and towns; the *Urban Vulnerability Map Book*, which provides maps on potential impacts of climate change, vulnerabilities and adaptation actions of European cities; the *Guidelines for project managers*, which provides guidance on making investment projects resilient to climate variability and change. Furthermore, there is an additional page that collects supplementary tools. The *Network* section provides an overview of the main networks that are active on climate policies, and of the most important knowledge sharing platforms. In the *Help* section a wide variety of materials are collected. Its purpose is set up for new users to offer guidance through the platform. In particular, the section provides a *Glossary* with relevant terms related to climate change adaptation, *Tutorial Videos* dedicated to specific user needs. Moreover, there are *FAQ for Users* and a *Guidance to search function* for using the platform and a *Share your information* page that show how to submit content to Climate-ADAPT. The Database section allows to search and select all the information of the platform both for Keyowrds and specific selection criteria (Type of Data, Adaptation sectors, Climate Impacts, Adaptation Elements, Countries and Year).

U.S. CLIMATE RESILIENCE TOOLKIT
https://toolkit.climate.gov/

U.S. Climate Resilience Toolkit is a website which collects and provides useful tools, information and also subject matter expertise about climate resilience. In particular, the Toolkit is intended for the U.S. federal governments. It aims "*to improve people's ability to understand and manage the risks and opportunities arising from climate change beyond and to help communities and businesses to be more Resilient in case of extreme climatic events*". The platform was developed by a partnership of federal agencies and organizations led by the NOAA (National Oceanic and Atmospheric Administration) within the U.S. Department of Commerce and launched in 2014. Specifically, a user can access the platform information in different ways. The *Home Page* collects general information about the Toolkit and its features and how to explore them.
The Toolkit content is grouped into six sections:

- *Steps to Resilience*, which illustrates a framework, organized into five steps – Explore Hazards, *Assess Vulnerability & Risks*, *Investigate Options*, *Prioritize & Plan* and *Take Action* - in order to discover climate hazard and develop solutions to lower climate risks;
- *Case Studies*, where several case studies of actions implemented in the U.S. to reduce vulnerabilities and build resilience to climate impacts are collected. Users can filter case studies considering four criteria which are threat/stressor (i.e. sea level rise, temperature extremes), topic (i.e. coast, built environment), resilience (i.e. explore hazards, assess vulnerability & risks) and U.S. region;
- Each case study provides a description and the references to the corresponding step to resilience framework and also to the related tools;
- *Tools*, which collects more than 200 digital tools that can support local authorities to take steps to build resilience. The section permits to select tools considering two criteria, topic (the same ones of Case Studies) and tool function (i.e. identify vulnerabilities, view past/current conditions);
- For each tool there is a description about its main features and additional information (Webpage, Documentation, Training/Tutorials and Partners);
- *Expertise*, organized into three sub-sections, *Find Experts*, *Reports* and *Training Courses*. In the *Find Experts* sub-section regional and local centres across the U.S. that are useful to build resilience are collected. Through the *Reports* sub-section it is possible to access climate-relevant reports issued by government agencies and scientific organizations;
- Finally, the *Training Courses* collect several free courses, selected by category (i.e. Climate Change, Climate Adaptation & Mitigation), type of training (i.e. Tool Tutorial) and difficulty scale (i.e. Beginner, Intermediate, Advanced), that can help users acquire tools, skills and knowledge useful to manage climate risks and opportunities;
- *Regions,* which reports three U.S. regions, Alaska and the Artic, Hawa'i and Pacific Islands and Northeast. For each region there is a description of the main climate issues. Moreover, all the Toolkit information are referred to these three regions;
- *Topics,* where are identified ten main topics/sectors related to climate change, Built Environment, Coasts, Ecosystems, Energy, Food, Health, Marine, Transportation, Tribal Nations and Water. For each topic there is a synthetic description of the potential climate change impacts on it. Furthermore, as well as for *Regions* section, the information collected by the Toolkit can be referred to these ten topics.

RESILIENCETOOLS.ORG – EMPOWERING RESILIENT CITIES

http://resiliencetools.org/

ResilienceTools.org is a web platform launched during the World Urban Forum held in Medellin in 2014 and was developed by Medellin Collaboration on Urban Resilience (MCUR), which includes among its member organizations such as C40 Cities Climate Leadership Group; Cities Alliance; Global Facility Disaster Reduction and Recovery (GFDRR); ICLEI-Local Governments for Sustainability; Inter-American Development Bank; UN-Habitat; UN Office for Disaster Risk Reduction (UNISDR); Rockefeller Foundation; 100 Resilient Cities-Pioneered; World Bank Group.

The aim of such website is to provide local governments with the necessary and useful skills to use tools that can assess, measure, monitor and improve the resilience of cities. In this regard, the platform collects tools of a different type, in order to allow local decision makers to choose the one most suited to meet their needs.

It is organised into five sections:

- *Home*, which provides an overview of the main site content;
- *About us*, where are illustrated the main objectives of the platform, its history and with a *Contact* subsection;
- *Tools*, which includes useful information and it is articulated in two sub-sections, *Case Studies* and *Tools Overview*. In the *Case Studies* sub-section there is a review of case studies. Instead, the *Tools* sub-section collect numerous decision-making tools in order to improve urban resilience;
- *Terminology*, where are collected the most important terms related to the theme of urban resilience;
- *Partners*, which collects all the partner organisations involved in the definition of the platform;
- *Resources*, which includes audio-visual material, technical reports and information related to the activities related to urban resilience, organized into three sub-sections *News*, *Pocket Guide to Resilience* and *Publications*.

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IMAGE SOURCES

The images are from: https://it.pinterest.com/johorrocksnz/communitycity-resilience/?lp=true; http://climate-adapt.eea.europa.eu/; https://toolkit.climate.gov/; http://resiliencetools.org/.

02

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 2(2017)

REVIEW PAGES: BOOKS

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In this number
CLIMATE CHANGE AND URBAN PERSPECTIVES

The international scientific community, aware of the extreme gravity of the "congestion crisis" that characterizes large cities and metropolitan cities in particular, is increasingly committed to developing methodologies, models and techniques that can reverse trends, especially for environmental sustainability. With 1.5 million people moving into cities every week, managing urban growth is one of the most important development challenges facing the world today.

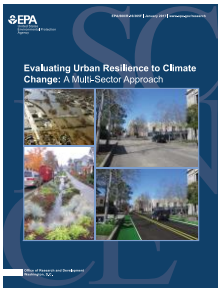
Furthermore, the global greenhouse gas emissions continue to rise and have been shown to lead to a range of major and potentially adverse effects on the environment and public welfare.

This is two topics to the process of urbanization and all human, social and behavioural activities related to it, which have intensified environmental problems (Salata and Yiannakou, 2016).

The climate change impacts are diverse, long-term, and not easy to predict. Adapting to climate change is difficult because it requires making context-specific and forward-looking decisions regarding a variety of climate change impacts and vulnerabilities when the future is highly uncertain. Cities are on the front line for responding to potential climate change impacts, but often do not know precisely the qualities or characteristics that make them vulnerable or resilient to different impacts.

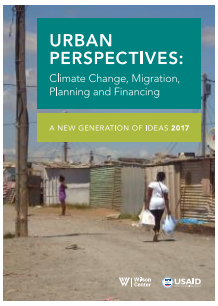
A conceptual framework was developed based on our definition of urban climate resilience: a city's ability to reduce exposure and sensitivity to, and recover and learn from gradual climatic changes or extreme climate events. This ability comes from a city's risk reduction and response capacity, and includes retaining or improving physical, social, institutional, environmental, and governance structures within a city. The components of urban climate resilience reflected in the conceptual framework include three measures of vulnerability (exposure, sensitivity, and response capacity), as well as the process of initiating responsive action, learning from mistakes or ineffective responses, and building risk reduction capacity (reducing exposure and sensitivity, and increasing response capacity).

According to these themes, this section suggests three books and reports that help to better understand the issue of this number: Evaluating Urban Resilience to Climate Change: A Multi-Sector Approach, Urban Perspectives: Climate Change, Migration, Planning and Finance - A New Generation of Ideas and Integrating Land Use, Transport and Energy Planning.



Title: **Evaluating Urban Resilience to Climate Change: A Multi-Sector Approach**
Author/editor: United States Environmental Protection Agency
Publisher: Office of Research and Development
Publication year: 2017
ISBN code: -

This report was realized by the U.S. Environmental Protection Agency's Air, Climate, and Energy research program, located within the Office of Research and Development, with support from the Cadmus Group.
One of the objectives of this office within the U.S. Environmental Protection Agency is to provide the scientific basis for climate adaptation choices that support sustainable, resilient solutions at individual, community, regional, and national scales. To support this objective, the Office developed a tool that measures urban communities' resilience to climate change. The tool incorporates both indicator data and input from local sector managers to assess urban resilience for eight municipal management sectors: water, energy, transportation, people (public health and emergency response), economy, land use/land cover, the natural environment, and telecommunications. The tool is intended to provide local-level managers with a way to prioritize threats to resilience using locally available data across multiple sectors to inform adaptation planning. This report describes the tool in detail and discusses the results of applying it in two communities as case study examples: Washington, DC and Worcester, MA. These two cities representing different endpoints of a broad spectrum of resources, planning, and risk. The Technical Steering Committee developed a four-step process to establish qualitative indicators best suited to determine climate resilience. In the step one, it was identifying climatic changes/events of concern. In the step two, it was discussing related climate stressors. In the step three, it was discussing urban services potentially exposed to drought and urban sectors potentially responsible for managing the sensitivities of these services. In the step four, it was evaluating the ability to reduce exposure/sensitivity, enhance response capacity, and learn. To organize and obtain detailed data sets relevant to urban resilience, the project team created a database of more than 1,400 quantitative and qualitative indicators or metrics derived from the literature on climate change and urban resilience.
The application of the qualitative indicators fosters and requires interaction with and between sector stakeholders, providing greater learning and coordination opportunities that can be used to further refine the resilience assessments and prioritize activities in response to the assessment findings.
For each of the quantitative indicators, threshold values were established defining the upper and lower boundaries of the four resilience categories. Initial thresholds were established through a review of published academic literature, panel data, case studies, and other reports. Thresholds for the quantitative indicators were based on the literature when possible, accounting for the full range of values the indicator takes on in cities across the United States. Beyond the numeric values of resilience and importance collected across the sectors during the case studies, this effort collected important information regarding the challenges that emerged in identifying and confirming appropriate and relevant data sources to effectively assess the proposed indicators.
A major challenge encountered in applying the tool was gathering city-specific knowledge. Different methods were attempted in the two case studies in this report: a workshop approach in Washington, DC and one-on-one discussions in Worcester, MA.
This project resulted in a comprehensive, transparent, and flexible tool for identifying the greatest risks, successes, and priorities for decreasing urban vulnerability and increasing resilience to climate change. The results can easily be analysed with respect to the concepts of exposure/sensitivity, response capacity, or learning, as the qualitative and quantitative indicators are characterized accordingly.



Title: **Urban Perspectives: Climate Change, Migration, Planning and Finance - A New Generation of Ideas**
Author/editor: Woodrow Wilson International Center for Scholars, US Agency for International Development
Publisher: Urban Sustainability Laboratory
Publication year: 2017
ISBN code: 978-1-938027-66-6

This publication marks the seventh year of the "Reducing Urban Poverty" paper competition and includes a range of perspectives on urban challenges and policy solutions. To select the winning papers for this publication, a panel of urban experts representing each of the sponsoring institutions reviewed 157 abstract submissions, from which twenty-seven student authors were invited to write a full-length paper. Of these, eight papers were selected to be included in this publication. The chapters in this volume critically examine urban policies and projects, offering original, solutions-oriented research and strategies. In particular, the contributes are divided by four main research themes are listed below:

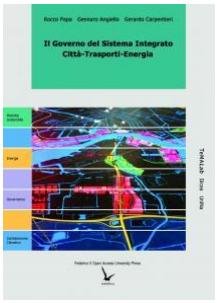
- *Arrival Cities: Responding to Migrants and Refugees;*
- *Climate Change;*
- *Innovation in Urban Planning;*
- *Financing Sustainable Urban Development.*

For the first theme, it was examining the incremental housing model of the Urban Shelter Program of the Norwegian Refugee Council. The program provides financial assistance for house expansions and interior finishings to homeowners in cities of Northern Jordan in exchange for rent-free accommodation to Syrian refugee families. Authors Francis Goyes, Sera Tolgay and Valeria Vidal combine quantitative and qualitative analysis to explore the benefits of the project, making the case for incremental housing as a shelter strategy for refugees in urban settings.

For the second theme, Kwame Owusu-Daaku and Stephen Kofi Diko analyse the sea defence project in the Ada East District of Ghana, analyse differences in national, district and community level discourse on climate change adaptation, exploring the implications for policy formulation and implementation. The authors put forth a set of recommendations for improved stakeholder engagement for effective urban climate change adaptation. The second contribute wrote by Lakshmi Rajagopalan on the case study of Chennai, India to emphasize the need to integrate climate resilience into urban planning and development policies. Rajagopalan examines key factors that cause flooding, concluding with policy recommendations for increased coordination and integration of strategies and implementation frameworks for land use development and urban food control.

For the third theme, Jakub Galuszka draws from research conducted in the Philippines and South Africa to analyse the role of evidence-based planning and evaluation regimes in housing policies. The second author, Emily Hall investigates how urban morphological analysis can be used as a tool to assess and develop policy responses to multiple deprivations in data poor cities of the developing world.

For the last theme, Devaditya Mukherjee draws from fieldwork conducted in Bhilai Township to examine strategies to leverage public land for public housing development in India. Yuxiang Luo examines the intricacies of public-private partnership for urban redevelopment in a case study of Dachong Village Redevelopment in Shenzhen, China. Nicolás Valenzuela-Levi examines the impact of social housing policies in Chile on the creation of jobs and access to opportunities.



Title: **Integrating Land Use, Transport and Energy Planning**
Author/editor: Rocco Papa, Gennaro Angiello, Gerardo Carpentieri
Publisher: FedOApress
Publication year: 2017
ISBN code: 978-88-6887-013-3

This book has been published on the open access platform FedOABooks of the University of Napoli Federico II, in the series Smart City, Urban Planning for a Sustainable Future.
The objective of the book is to identify the characteristics of the transport offer on which to adapt the modes and means of transport, in relation to the physical and functional components of the urban system.
The first chapter, "Urban System, Energy Consumption and Sustainable Mobility", proposed a scientific analysis on the extreme gravity of the "congestion crisis" that characterizes large cities and metropolitan cities in particular is increasingly committed to developing methodologies, models and techniques that can reverse trends in the pipeline, especially for environmental sustainability.
In the chapter, "Energy Consumption in the Urban Transport: Variables, Techniques and Models", it is drowned a cognitive framework is proposed for the complex relationship between mobility, energy consumption and the environment built also through a review of the latest scientific literature. In particular, the two main sources of energy consumption in urban areas (energy consumption in the residential sector and energy consumption of transport) are considered, which are the most important sectors in Italy, accounting for 32% and 35% respectively of end-use energy consumption. The chapter, "Energy Consumption in the Urban Settlements with an Application to the City of Naples", it is focused on the development of a technique for the representation and classification of energy consumption of urban settlements with a case study application to the city of Naples. It placed particular emphasis on the new opportunities offered by the Geographic Information Systems (GIS) and the growing availability of new data sources.
In the last chapter, "Instruments, Actions and Best Practices for Reducing Energy Consumption in Urban Mobility", the authors proposed an analysis of tools, actions and best practices for reducing energy consumption is proposed. In particular, the urban mobility instruments are presented, describing, for each of them, the main objectives, contents and modalities of implementation. In particular, the urban mobility instruments are presented, describing, for each of them, the main objectives, contents and modalities of implementation.

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03

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 2(2017)

REVIEW PAGES: LAWS

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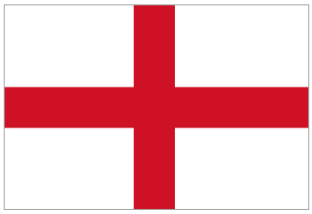
URBAN PLANNING AND GOVERNANCE IN EUROPE

Spatial planning affects a wide range of outcomes, from citizens' quality of life to the environmental sustainability of urban and rural areas, including the possibilities for climate change adaptation and mitigation. Not to mention the economic impacts of spatial planning and its consequences in terms of social inclusion. Therefore, planning policy is extremely important for both the economic growth and social development of territories. However, major reforms that completely change the character of the planning system are quite rare in European countries. Only few States have updated their planning legislation to better face the challenges of globalization and climate change.

Based on these considerations, in the previous issue of TeMa, this section of the Review Pages described and compared the organization of spatial and land-use planning in three European countries – Italy, France and Germany – that have recently modernized their government structure and their spatial organization in order to promote growth and innovation. In line with this topic, this issue of the Journal focuses on two other European countries – England and the Netherlands – where a major legislative reform has taken place in recent years. More specifically, England adopted the *National Planning Policy Framework* in 2012 and the Dutch parliament adopted the *Environment and Planning Act* in 2016. Both documents have the objective to consolidate all the previous national legislation under one simpler framework, thus allowing people and communities back into planning. Another point of convergence between the two planning laws is the key role played by sustainable development. In both cases, indeed, sustainability is crucial and also a binding element, as stated at the beginning of the *National Planning Policy Framework* – "*The purpose of the planning system is to contribute to the achievement of sustainable development*" (art. 6) – and at the beginning of the *Environment and Planning Act* – "*With a view to ensuring sustainable development, the habitability of the country and the protection and improvement of the living environment, this Act aims to achieve the following interrelated objectives: a. to achieve and maintain a safe and healthy physical environment and good environmental quality, and b. to effectively manage, use and develop the physical environment in order to perform societal needs"* (art. 1.3). This approach is in line with the recent recommendations of the European Commission, which has pointed out the importance of integrating environmental policy with other actions and updating tools and operational instruments for a more sustainable and inclusive urban planning (Papa et al., 2014). In the following pages, the two legislative documents are synthetically described in order to highlight the main innovations and present the key planning instruments introduced by the two Acts.



NATIONAL PLANNING IN ENGLAND – THE NATIONAL PLANNING POLICY FRAMEWORK

In England, the *National Planning Policy Framework* (NPPF) sets out how government policies should be applied and must be taken into account by local policy makers in the preparation of their own local and neighbourhood plans. The NPPF was published in 2012 and it replaced all *Planning Policy Statements* (PPS) and *Planning Policy Guidance Notes* (PPG) previously produced by the British Government.

"At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-making" (National Planning Policy Framework of 2012). Therefore, the main purpose of the NPPF is to support the achievement of the Brundtland principles of sustainable development, pursuing economic, social and environmental goals in an integrated way. In order to achieve this aim, the NPPF identifies 13 lines of actions that should be taken into account when delivering sustainable development:

- building a strong, competitive economy;
- ensuring the vitality of town centres;
- supporting a prosperous rural economy;
- promoting sustainable transport;
- supporting high quality communications infrastructure;
- delivering a wide choice of high quality homes;
- requiring good design;
- promoting healthy communities;
- protecting Green Belt land;
- meeting the challenge of climate change, flooding and coastal change;
- conserving and enhancing the natural environment;
- conserving and enhancing the historic environment;
- facilitating the sustainable use of minerals.

The Framework envisages that the starting point for any planning decision is the Local Plan and *"each local planning authority should produce a Local Plan for its area"* (National Planning Policy Framework of 2012). Local Plans should refer to a preferably 15-year time frame and should be based on a clear understanding of the main economic, social and environmental trends of the area. Moreover, Local Plans should be prepared based on *strategic priorities* set out to provide homes, jobs, infrastructures, and ensure health, public safety and environmental resilience. This strategic framework should be taken into consideration when preparing the Neighborhood Plan, which must be consistent with it. Neighborhood Plans gives communities direct power to develop a shared vision for their neighborhood and shape the development and growth of their local area.

When the final version of the Framework was released, the reaction of both public and private stakeholders was relatively positive, because the document extremely simplified planning process. However, in 2016, the Communities & Local Government (CLG) Committee asked for a comprehensive review of the NPPF in order to ensure that "*the Government, stakeholders in the housing and planning sectors, and local communities are able to have confidence in the effective operation of the NPPF*" (Consultation on proposed changes to national planning policy of 2015). In particular, the CLG Committee highlighted that, four years on from the publication of the NPPF, 34% of local authorities still have not adopted Local Plans.

URBAN PLANNING & GOVERNANCE IN FRANCE

On March 2016, the Dutch parliament adopted the Environmental Planning Act (EPA) and the Act is expected to take effect in 2019. *"The Act seeks to modernise, harmonise and simplify current rules on land use planning, environmental protection, nature conservation, construction of buildings, protection of cultural heritage, water management, urban and rural redevelopment, development of major public and private works and mining and earth removal and integrate these rules into one legal framework"* (Environment and Planning Act (Omgevingswet) of 2016). This document marks an important shift from the old environmental law dispersed across 26 different acts into one consolidated piece of legislation.

The legislative bill provides a uniform range of instruments with which to manage activities properly. These instruments reflect the national planning system that includes three levels of government – the national level, the provincial level and the municipal level – and other important public actors, such as 23 water boards. More specifically, the Act introduces three decentralized regulations

- The physical environment plan: *"The municipal council shall adopt a single environmental plan in which rules on the physical living environment will be included"* (Environment and Planning Act of 2016, art. 2.4).
- The water board regulation: *"The governing board of the water board shall lay down a single water board regulation containing rules relating to the physical environment"* (Environment and Planning Act of 2016, art.2.5).
- The environmental regulation: *"The Provincial Council shall lay down an environmental regulation containing rules relating to the physical environment"* (Environment and Planning Act of 2016, art. 2.6).

The term *physical environment* comprises *"buildings, infrastructure, water systems, water, soil, air, landscapes, natural environment, cultural heritage, world heritage"* (Environment and Planning Act of 2016, art. 1.2).

In addition to these three key instruments, the Environment Act introduces other two important policy development tools:

- environmental strategies: each municipal council and provincial council shall determine an environmental strategy containing "a. a description of the main features of the quality of the physical living environment, b. the broad outlines of the proposed development, the use, management, protection and preservation of the territory, c. the principal aspects of the entire policy to be pursued in relation to the physical environment" (Environment and Planning Act of 2016, art. 3.2). The strategy has a long-term planning horizon and it is mandatory for the State and provinces, while is optional for municipalities;
- environmental programmes: the State, the province, the water board and the municipality may adopt environmental programmes, which include *"a. an elaboration of the policy to be pursued for the development, use, management, protection or preservation of this, b. measures in order to fulfil one or more environmental values or to achieve one or more other objectives relating to the physical environment"* (Environment and Planning Act of 2016, art. 3.5). Compared to strategies, programmes work within a shorter time horizon, unless planning and management of investments are concerned. Moreover, while a strategy is characterized by a unique and integrated policy for the physical environment, a programme has a multi-sectoral approach and can relate to a domain or a part of the territory for which an administrative body is responsible.

Environmental strategies and programmes are binding upon the administrative body that determines them, are not subject to any hierarchy and do not have any legal effect, not even in dealings between different levels of government.

Together with the planning instruments previously described, the legislative bill also introduces two instruments for the creation of activities with an impact on the physical environment, which require prior permission. These two instruments for project decision-making are:

- the environmental permit: the activities subject to an obligation to obtain an environmental permit include *"a. a construction activity, b. a deviating activity, c. an activity concerning a nationally listed building, d. an earth removal activity, e. a deposition activity at sea"* (Environment and Planning Act of 2016, art. 5.1). An application for an environmental permit can be submitted for one or more activities simultaneously. Submitting one application for two or more activities enables a joined-up assessment of the activities concerned against the applicable assessment rules, and that regulations attached to a permit can be better coordinated in terms of content. This procedure simplifies things for the initiator, who will receive one decision from one administrative body;
- the project decision: it is a generic arrangement for decision-making that relates only to high-impact or complex projects with a public interest that involve either a provincial or national interest or a water management interest. The main goal of this instrument is to offer a flexible procedure for promoting both public and private initiatives that have a public interest. The main advantage of this instrument is that *"In so far as that has been expressly provided for in the project decision, the project decision shall be regarded as: a. an environmental permit for activities in implementation of the project decision, b. a decision designated by an order in council in accordance with the rules stated in that order"* (Environment and Planning Act of 2016, art. 5.52), which means that that all authorizations for the project are given through just one decision.

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04

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 2(2017)

REVIEW PAGES: URBAN PRACTICES

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In this number

ADVANCING CAR-SHARING: TWO ITALIAN CASE STUDY

Shared mobility options such as car sharing, bike sharing and ridesourcing have the potential to disrupt the current transportation system and to help creating a more sustainable one. This idea is supported by the incessant growth of shared mobility options worldwide and by a relatively large literature assessing its benefits. Car sharing (CS), in particular, has grown steadily over the past few decades, especially in densely-populated metropolitan areas, where the number of CS users has increased from 0.35 million in 2006 to 4.94 million in 2014 (Frost and Sullivan, 2014).

The primary elements that have fuelled the growing popularity of CS include the economic savings for CS users and the environmental benefits for the whole community. As car operation and maintenance costs have been increasing, CS has become an effective way to reduce car ownership costs, while providing new mobility options. The environmental benefits of CS use include reductions in vehicle ownership, vehicle kilometres travelled (VKT), and greenhouse gas emissions (Baptista et al., 2014).

Usage of relatively fuel-efficient CS vehicles is another environmental benefit. Other identified benefits include the growing use of public transit and non-motorized modes, and the contribution that CS can make to help resolve urban parking shortages (Shaheen et al., 2010). Furthermore, the reduced needs for off-street parking space can be used by governments to create additional public spaces for non-motorized modes (Shaheen et al., 2010).

The roots of today's car-sharing schemes can be traced back to the late 1940s, when the first schemes were conceived to share a useful, yet expensive, asset - the car. It was, however, only in the early 1990s that rising fuel prices and congested road networks paved the way for a successful revival of the idea of car-sharing. Since then, technology has played an increasingly important role in expanding this new potential by providing user-friendly systems and efficient allocation strategies, also leading to the development of new CS schemes such as peer-to-peer car-sharing, or free-floating car-sharing.

In Italy, CS has gained increasing importance over the last decade, due to the coexistence in the same market of state-level interventions, independent local operators, and international players (Laurino and Grimaldi, 2012). In this context, this contribution presents two relevant Italian case studies where CS schemes have been successfully implemented in recent years: Milan and Rome.

MILAN

Milan is capital of the Lombardy region and the second most populous city in Italy, with an urban population of over 1,369,000 inhabitants. Milan is served by the most extended public transport network in Italy and it is considered a leading city for sharing mobility both in Italy and abroad (Boscacci et al., 2014).

Milan is a pioneer in Italy for CS since it had formerly two organizations providing the service. The first one, *Carsharing Italia*, was created in 2001 by the environmental association *Legambiente*. The second one, *GuidaMi*, born in 2004, was a joint initiative of the Municipality of Milan and the Italian Ministry of the Environment. In 2007, *Azienda Trasporti Milano*, the Local Public Transport Authority, took control of *GuidaMi*, and, in 2010, it acquired the assets of the other CS operator in Milan, *Carsharing Italia*. *GuidaMi* is a two ways service (i.e. car should be returned to the initial location). Users can reserve their car by the internet or call-centre, choosing the time and the pick-up location, among 88 access points distributed within the city. GuidaMi has adopted a number of incentives to increase CS memberships, including free access to limited traffic zones, the use of public transport reserved lines, and discount on the annual fee. Furthermore, a one-year free membership is offered for people who decide to scrap their own car and become CS member.

The number of *GuidaMi* users has increased from 1000 in 2006 to 5000 in 2012 (Laurino and Grimaldi, 2012). The increase in the number of members can be partly attributed to the introduction, in January 2008, of a charging scheme, known as Ecopass, applied at the most polluting vehicles entering the city centre. The major effect has been a shift towards cleaner vehicles (including CS vehicles) and an increase in the use of public transport (AMAT, 2012). On January 2012, following a public consultation, the Ecopass scheme has been substituted by a new charging scheme, known as Area C, focused on congestion rather than pollution. This new scheme and the shift in the parking policy for CS cars from garages, to on street parking (entailing greater visibility) can in part explain the increase in membership from 2012 onwards.

While the *GuidaMi* initiative is considered a milestone for the development of CS in Milan, the business model has changed and, from 2012, a number of new players has started populating the Milan CS ecosystem. Services such as *E-vai* and *Eq sharing* has entered the market. The first one, *E-vai*, provides connections (through the use of electric vehicles) between the Linate and the Malpensa airports and 40 key destinations within the city. The second, *Eq sharing* (a partnership between the Municipality of Milan, Ducati Energia, Microsoft Internet Explorer and Telecom Italia) provides access to 120 electric vehicles that can be picked up in 15 different access points. Both *E-vai* and *Eq sharing* are station-based services (i.e. cars can be picked up and returned in predefined parking areas).

Beside these services, in the recent years, three new private free-floating services has entered the market. These includes *Enjoy* (Eni Group), *Car2go* (Mercedes Daimler group), and *Drivenow* (BMW group).

The importance of CS for the development of a more sustainable transportation system is widely recognized by the Municipality of Milan, and CS represents an integral part of Milan' strategy for greener and smarter transportation system, as described in the recently adopted Sustainable Urban Mobility Plan (Municipality of Milan, 2015). As of June 2016, there are more than 370.000 CS members in the city of Milan (ONSM, 2016) that can enjoy a mix of CS scheme (e.g. station-based and free-floating), different rates and vehicle typologies, and a variety of incentives that changes from one operator to another. These numbers make the city of Milan a leading city for CS initiatives both in Italy and abroad.

ROME

Rome is the capital of Italy and its largest city, with an urban population of 2,874,529 inhabitants. Rome is considered a car-oriented city, with a very high level of automobile ownerships (more than 700 for 1,000 persons) and high levels of traffic congestion.

Car sharing in Rome was first introduced in 2005 by *Roma Servizi per la Mobilità* (the Local Public Transport Authority) within a project funded by the European Commission. Despite its initial modest implementation, (i.e. only 200 members in its first year) the initiative soon proved to be popular and therefore worthy of progressive expansion within the city. The service initially covered only the central areas of the city but, from June 2007, it was extended to other central boroughs. In October 2009, Car Sharing Roma was implemented further, adding parking areas and cars within the boroughs already served. In order to integrate the car-sharing scheme with the public transportation service, all new car-sharing account holders were issued with regional public transport cards in 2009. By 2011, the service offered 106 cars and 61 parking lots.

Despite its continuous extension, the service do not cover the whole city. Some suburban areas such as Ostia and Tor Vergata are indeed not covered by the service. Car Sharing Roma is a station-based services (i.e. cars can be picked up and returned in predefined parking areas).

Beside Car Sharing Roma, in the recent years, several new player entered the market, offering new and more appealing free-floating services. The first one was Car2Go. Launched in March 2014, it has a fleet of 570 cars and covers a total area of 89 square kilometers. The main private competitor of Car2Go in Rome is the platform Enjoy that count of 455 vehicles that can be picked up and parked within a cover area of 52 square kilometers. Enjoy was also the first platform to introduce scooter sharing in Rome, a service that has been highly appreciated and that has been further developed by other sharing mobility initiatives such as *2hiresharing* (with a fleet of 100 electric scooters), Zig Zag (with a fleet of 400 three-wheels scooters), and *Scooterino*. The latter is a scooter pooling services, similar to Bla Bla Car, as it connects drivers and passengers willing to travel together and share the cost of the journey. Finally, *E-go* is another CS service that has been specifically developed for students and professors of the Roma Tre University. Another interesting aspect of CS in Rome is the development of new mobile phone app, such as *Everyride*, an aggregator of all CS (and bike sharing) services available in the city of Rome that displays on a single map all the shared mobility option for a predefined journey.

The Municipality of Rome considered CS as an important asset for the sustainable development of its transportation system. CS in Rome indeed play a key role in providing mobility options, especially for people living outside the city-center, where public transport options are relatively scares. For this reason, CS members enjoy significant benefits like entering the traffic restricted-areas (basically, the center) and free parking on the streets (that normally would cost at least 1 euro per hour). CS enhancement is also an important strategy in the Rome's Sustainable Mobility Urban Plan (Municipality of Rome, 2016) that consider CS as a complementary rather than concurrent mobility option and a prominent solution for the first/last mile transport problem.

As of June 2016 there are more than 220.000 CS members in the city of Rome and the number is expected to grow in the forthcoming years (ONSM, 2016).

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IMAGE SOURCES

The image shown in the first page is from http:// dribbble.com/; the image shown in the second page is from: http://architecturaldigest.com; the image shown in the third page is from http://visitphilly.com.

05

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 2(2017)

REVIEW PAGES: NEWS AND EVENTS

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In this number
DECISION SUPPORT TOOLS FOR RESILENT CITIES

A plethora of methods and tools has been used by professional planners over many years to support their various planning activities in different contexts. In particular, since the early Nineties, the scientific community has been questioned on tools and methods of application of the newly developed Geographic Information Science to town planning, with a focus on potential contributions in supporting the government of urban transformation (Huxhold, 1991; Batty & Densham, 1996). In fact, Geographic Information Systems (GISs) have the enormous capacity and speed to store, organize, access, and process data. Consequently, the use of GISs improved the availability and accessibility of the specific knowledge domain of the computer system to solve spatial problems. Furthermore, computerized systems may offer the facility of validation and verification of presented knowledge. A decisive step towards a strategic approach is the development of spatial decision support system (SDSS) and Planning Support System (PSS), defined as "geo-information technology-based instruments that incorporate a suite of components that collectively support some specific parts of a unique professional planning task" (Geertman 2008).

Until a few years ago, the lack of information was one of the main constraints in the development of spatial analysis in support of the government of urban transformation. Nowadays, thanks to the availability of new data sources offered by Web 2.0, a gradual sharing of information assets by public administrations (open data) is possible and it refers to the broader discipline of open government.

These data can be used to describe different urban phenomena as well as to predict and evaluate possible scenarios through the use of the above mentioned tools, thus helping decision-makers to weigh costs and benefits of different policies and justify investments. These possibilities given by the fast development of information technology are increasingly important nowadays when cities are expected to undertake concrete actions to adapt both to natural disasters exacerbated by climate change and climate variability and to the socio-economic changes affecting the advanced societies.

This is the reason why in the last years a big number of decision support tools where developed for supporting adaptation and mitigation policies at urban scale. The latest can be classified in two categories:

- web-based decision support tools basically designed to visualize climate change impacts such as storm surge, sea level rise, heat, habitat, forestry or agriculture, allowing users to display impacts based on two or three different climate change assumptions, such as predictions with or without mitigation;
- decision support tool software. These are designed mostly for technical users, in order to integrate local data with regional and national data, and to conduct comprehensive analyses of a limited number of issues or strategies such as the vulnerability of critical infrastructure, or cost/benefit analysis for measuring and balancing environmental and economic objectives.

Despite the increasing diffusion and the constant development of these tools, a few limits for their effective use in local climate mitigation and resilience planning still exist, such as:

- the gap in the availability of consistent locally relevant data for climate resiliency planning, unlike what happens at the national scale where climate science has collected a huge database of information throughout the last twenty years;
- the necessity to overtake the sectorial approach that characterize most of the developed tool; it results still unsuitable to describe the impact of an external event on the complex dynamics of the urban system;
- the necessity to develop a tool functionality that supports integration and collaboration among city departments that would enable regional planning with local implementation (Balaban & Senol Balaban 2015).

The selected conferences and workshops represent a fertile occasion to be updated on the latest developments in the field of the decision support tools for climate change in terms of both software evolution and future challenge to deal with.

IMPACTS WORLD 2017: COUNTING THE TRUE COSTS OF CLIMATE CHANGE

Where: Potsdam, Germany
When: 11-13 October 2017
www.impactsworld2017.org

Most cities have GHG reduction targets and mitigation goals; however, some of the climate mitigation benefits are harder to measure and monetize. This is the main topic of Impacts World 2017 Conference that will be focused on one of the most pertinent and pressing political questions of the day: counting the true costs of climate change. The conference will address this issue by considering four key challenges for quantifying climate-change risks and impacts:

- *Counting the economic costs of climate change*. Climate change can have huge impacts on the distribution of income, wealth, and adaptive capacities of cities. For this reason, economic-cost assessment requires a more comprehensive quantification of economic losses, reflecting risk and uncertainties, thus opening the debate on several questions, such as: How can economic costs be aggregated across spatial scales, e.g. using location-specific vulnerabilities? How can we incorporate and evaluate non-monetary losses? What about appropriate indicators of wellbeing beyond GDP; how are these affected by climate-change? How can we capture distributional consequences and what do these mean for poverty?
- *Climate change and human migration*. The frequency and intensity of extreme weather and climate events, together with the prolonged effects of enduring changes to climatic conditions on food systems and water availability, are contributing to the increasingly frequent migratory phenomenon. For this reason, understanding how can the influence of climate change on migration be separated from other

influences or what is the relationship between migrants and societies in regions of origin as well as destination, it becomes important to intelligently distribute the funds allocated to the fight against climate change on a global scale;

- *Climate Change and human health*. The propagation of diseases due to extreme heat stress, nutritional shortages, and the deterioration of air quality are among the most pressing issues likely to be addressed by considering also the possible economic consequences coming from the impacts on labor productivity;
- *Climate change and the Sustainable Development Goal*. This topic intends to investigate on the relationship between climate action and the other 16 Sustainable Development Goals adoped by the United Nations in 2015.

2017 SWAT CONFERENCE

Where: Selangor, Malaysia
When: 23-26 October 2017
http://swat.tamu.edu/conferences/2017-malaysia/

The Soil and Water Assessment Tool (SWAT) is a public domain model jointly developed by USDA Agricultural Research Service (USDA-ARS) and Texas AgriLife Research. It is a river basin-scale model developed in order to simulate the quality and quantity of surface and ground water and predict the environmental impact of land management practices on different soil patterns and land use patterns. It is widely used in assessing soil erosion prevention and control, non-point source pollution control and regional management in watersheds. 2017 SWAT conference represents an opportunity for professionals, scientists and researchers to review the results of researches carried on with this tool, to share information about latest innovations developed and to discuss further challenges to address. The conference proposes also practical SWAT workshop, organized in four parallel session, open to the participants in order to investigate hydrologic and water quality issues in watersheds and rivers.

THINKNATURE PLATFORM LAUNCH

Where: Internet
When: 27th October 2017
www.think-nature.eu/

In addition to the development of specific tools useful to address the phenomenon of climate change, in recent years, numerous web platforms are springing out for sharing best practices, innovative solutions and research projects on this issue.

This is the context of the project ThinkNature, a web platform founded by the EU Framework Programme for Research and Innovation, which will be launched on the web next October. The objective of the ThinkNature project, executed by a consortium of 17 partners originating from 8 countries across Europe led by the Technical University of Crete, is the development of a platform that supports the understanding and the promotion of nature based solutions (NBS).

NBS are solutions inspired and supported by nature that should provide, in a cost-effective way, social environmental and economic benefits, preserving ecosystem services that are necessary for human life and mitigating the negative effects of climate change.

WORKSHOP TOOLS FOR URBAN RESILIENCE AND CLIMATE ADAPTATION

Where: Amsterdam, Nederland
When: 3rd November 2017
https://www.deltares.nl/en/workshop-tools-for-urban-resilience-and-climate-adaptation/

The workshop is organized by Deltares, an independent institute based in the Netherlands for applied research in the field of water and subsurface. It provides the opportunity to learn about the functionality and application possibilities of tools that support the realization of urban climate adaptation and resilience to flooding. The tools that are presented in the workshop have been created to assist in dealing with this challenge. They can support urban planners, municipalities and other stakeholders in the process of identifying risks, selecting and designing solutions and making investment decisions. The tools that will be shown are the followings:

- Aqueduct Global Flood Analyzer useful to investigate river flood impacts;
- PEARL knowledge base platform, useful to prepare for extreme events in coastal regions;
- 3Di, instrument created for water management, calamity management and spatial planning;
- Circle, a software able to analyze and visualize the propagation of cascading effects of natural disasters through critical infrastructure networks;
- Adaptation Support Tool; this tool was developed as an instrument to select and design adaptation measures for an area and calculate their adaptive capacity.

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IMAGE SOURCES

The image shown in the first page is taken from: https://www.deltares.nl/en/people-living-cities/

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