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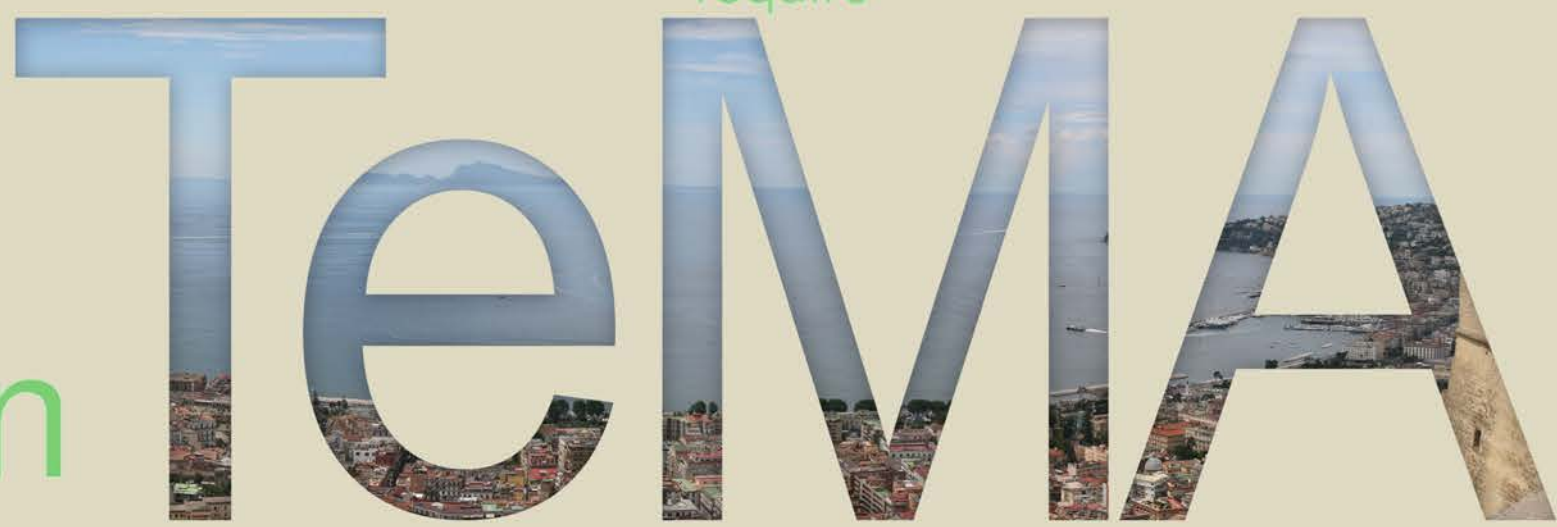
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METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES

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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 promote 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 first issue address some themes, such as the resilience capacity of urban system, the smart cities, the urban transportation planning, the urban water infrastructure, the socio-cultural facilities, the urban green spaces and the governance of metropolitan areas.

The section "Focus" collects two articles. The first one, "Conurbations and resilience. When growth makes us fragile" by Valerio Cutini (University of Pisa), is focused on the conurbations, extensive urban areas resulting from the expansion and coalescence of several neighbouring cities. The work of research is based on two theses. The first is that in the development of a conurbation, traffic has actually a role of maker and breaker of cities and the second is that the merging of the nuclei and their embedding into a conurbation reduces the resilience of the whole settlement. The author selects a specific configurational technique named axial analysis to study the effect of conurbations, that was applied to the case study of Florence and to the Versilian conurbation.

The second article, titled "The Water Sensitive Future of Lahijan", by Masoumeh Mirsafaa (Polytechnic University of Milan), tackles a crucial topic on the uncontrolled expansion of the cities and the human activities, causing a growing frequency and intensity of extreme events, producing significant impacts and being one of the most serious challenges faced by society in coping with a changing climate. The author presents an interesting analysis of the stormwater management development for Lahijan city in the history and a final reflection on the future strategies to reduce the impact of climate change.

The section "Land Use, Mobility and Environment" collects four articles. The first one, titled "The Effectiveness of Urban Green Spaces and Socio-Cultural Facilities" by Mehmet Faruk Altunkasa (Çukurova University) addresses an important issue in urban planning that is related with the distribution of public facilities such as urban parks, libraries, museum and concert halls. It presents a useful and transferable methodology for assessing intra-urban variation in the provision of these services and applies the proposed methodology in the city of Adana, the 5th largest Turkish city. The results of this application provide useful

insights for local authorities and policy makers interested in achieving a more equitable and effective distribution of public services.

The second article, titled "Planning Assignments of the Italian Metropolitan Cities. Early Trends", by Giuseppe Mazzeo (Consiglio Nazionale delle Ricerche), proposes to analyse the first activities taken by the Italian Metropolitan Cities in the sector of territorial government, three years after the adoption of Act 56 of 2014. Focal point of the analysis is the jurisdiction in the formation of two plans (the Strategic Plan and the Metropolitan Territorial Plan) and the following relationships among them, in the logical assumption that between them a necessary and strict consistency there should be. Other interesting element are the connections of the new institution with the previous institutional subject (the Province), especially with regard to the experience of the Provincial Territorial Plans (PTCP) and their use as metropolitan planning tool.

The third article, titled "Smart city planning and development shortcomings", Margarita Angelidou (Aristotle University of Thessaloniki) by the analysis of about eleven cases of smart cities tries to underline the shortcomings that occurred during the realization of their smart projects. The analysis shows that the economic aspects as well as the bureaucratic problems are among the top challenges that hinder the advancement of smart city strategies. Some mitigation propositions are suggested in order to support the smart city project upon a clear and simple business and governance model.

The fourth article, titled "Active Transport to School and Children's Body Weight: A Systematic", by Houshmand E. Masoumi (Technische Universität Berlin), proposes a systematic review by screening of 310 English scientific papers published between 2005 and 2015, about the themes of Active Transport to School, Body Mass Index and Childhood Obesity. The study focuses the final analysis on the 13 selected papers to verify the correlation between the three study themes. The study has been conducted as a part of the project "Multisport Against Physical Sedentary"-M.A.P.S. funded by the ERASMUS+ program of the European Commission.

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) Transitioning towards Urban Resilience and Sustainability project; (ii) Flood Resilient City project and (iii) The Institute for Social and Environmental Transition-International. The Books section by Gerardo Carpentieri briefly reviews three relevant books related to the Issues' theme: (i) Metropolitan Governance: A Framework for Capacity Assessment; (ii) Financing urban adaptation to climate change and (iii) The lightweight city. Smart city and operative planning. The Law section by Laura Russo keeps readers up to date with comparison of three different national laws on the governance of metropolitan areas (Italian, French and German). The Urban Practices section by Gennaro Angiello presents two examples of sharing mobility plan in the US: (i) Los Angeles Metro Bike Sharing Plan and (iii) Philadelphia Bike Sharing Plan. The News and Event section by Andrea Tulisi, proposes a selection of conferences on the topic of green infrastructure and its multiple-use role in the increasingly pressing challenges that cities have to face.

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CONURBATIONS AND RESILIENCE. WHEN GROWTH MAKES US FRAGILE

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ABSTRACT

This paper is focused on the conurbations, extensive urban areas resulting from the expansion and coalescence of several neighbouring cities. Two theses underlay the research. The first is that, in the development of a conurbation, traffic has actually a role of '*maker and breaker of cities*', just to paraphrase the title of a well-known article by Colin Clark, focusing on the double role of roads and traffic in urban development: on a one hand, the making of a unique road network, encompassing the whole grid, actually allows movement and interaction all over the settlement, making possible the working of the conurbation as a wide urban system; on the other hand, the resulting pattern of movement concentrates its major flows on few roads connecting the original nuclei and the new development areas, actually bypassing the pre-existing urban fabric and diverting a significant amount of local traffic from the streets of the urban grid, what involves the loss of the fertilisation benefit the irrigation of through movement provides. The second thesis, complementary to the former, is that the merging of the nuclei and their embedding into a conurbation reduces the resilience of the whole settlement, in that it affects the capability of the system to adsorb accidental events and transformations without significantly changing its global behaviour.

The phenomenon of conurbations and the diachronic analysis of their resilience will here be observed from a configurational point of view, analysing by means of space syntax techniques the urban settlement of Florence, here assumed as an ideal case study. The results are expected to objectively describe the role of inter-urban roads in the making of a conurbation, and to appraise the extent to which their entanglement within the whole concur in transforming its inner geography and enhancing its global vulnerability. More in general, the configurational approach, suitable for appraising the urban grid as the interface between the physical city and the phenomena that occur along its paths, once again proves its usefulness in linking spatial issues and traffic questions, so as to bridge the traditional gap between urban design, focused on the morphologic features of blocks and buildings, and transport analysis, strictly concerned with the distribution of movement flows on the streets network.

KEYWORDS:

Urban sprawl, conurbation, resilience, configuration analysis

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城市圈与适应力。 城市发展让我们更脆弱

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摘要

本文重点介绍城市圈，即几个邻近城市的扩张和聚集所导致的城市区域扩张。研究从两个方面入手。首先，在城市圈的发展中，交通实际上扮演着“城市创造者和破坏者”的双重身份，这里套用了 Colin Clark 的一本名著的书名，书中主要讲述了道路和交通在城市发展中所起的双重作用（Clark, 1958 年）：一方面，建造一个四通八达的独特公路网，人们便可以相互来往，城市圈便可以像广域市那样发挥作用；而另一方面，主要人流集中在连接原先核心区与新开发区的几条道路上，实际上绕开了原有的城市干道，分散了城市街道的大量本地人流，与此同时还会因人口密集区的人流分流而导致经济损失。第二点，作为对上一条的补充，核心区整合为城市圈会削弱整个居民区的适应力，反过来影响社会应对意外事件和改变的能力，但不会显著改变其整体行为。这里将从全局角度来研究城市圈现象及其适应力的历时性分析，而佛罗伦萨城市居住区被当成了理想的案例研究对象，对其进行了空间句法分析。结果将客观地描述城市圈建设中各城际道路的作用，并探讨在改变内部地理环境和加强整体危机防范方面的一致性程度。通常，顺理成章地将城市网视为连接实际城市及沿路景象之间纽带的全局方法，再次证明了它有助于在空间问题与交通问题之间建立联系，从而缩小关注街区和建筑的形态特征的传统城市设计与严密关注四通八达的街道中人流分布的交通分析之间的差距。

关键词：

城市扩张；城市圈；适应力；全局分析

1 INTRODUCTION

This paper is focused on the conurbations, extensive urban areas resulting from the expansion and coalescence of several neighbouring cities. A special attention will be devoted to the property of their resilience, assumed in relational terms and intended as the capability of an urban system, thanks to its own spatial features, to adsorb accidental events and transformations without significantly changing its inner geography and global behaviour. Such property is today to be considered a key issue, as related to the capacity of the system to continue effectively operating even in case of exceptional occurrences, and, in ordinary conditions, to the flexibility of the road network to adapt to the changing functional asset of the settlement.

Two theses underlay the research. The first is that, in the development of a conurbation, traffic has actually a role of 'maker and breaker of cities', just to paraphrase the title of a well-known article by Colin Clark, focusing on the double role of roads and traffic in urban development (Clark, 1958)': on a one hand, the making of a unique road network, encompassing the whole grid, actually allows movement and interaction all over the settlement, making possible the working of the conurbation as a wide urban system; on the other hand, the resulting pattern of movement concentrates its major flows on few roads connecting the original nuclei and the new development areas, actually bypassing the pre-existing urban fabric and diverting a significant amount of local traffic from the streets of the urban grid, what involves the loss of the fertilisation benefit the irrigation of through movement provides.

The second thesis, complementary to the former, is that the merging of the nuclei and their embedding into a conurbation reduces the resilience of the whole settlement, in that it affects the capability of the system to adsorb accidental events and transformations without significantly changing its global behaviour.

The phenomenon of conurbations and the diachronic analysis of their resilience will here be observed from a configurational point of view, by means of space syntax techniques, stressing the role of spatial relationships within the grid as the primary element of the effects of their development.

Several reasons suggest to assume the specific case of Florence as an ideal case study: the presence of a prominent and dense inner core, a wide recent urban development area, the presence of an important motorway that touches the conurbation so as to remain embedded into its local road network.



Fig. 1 The area of Florence: site plan

Since the beginning of this modern growth, in the post-war years, the presence of steep hills on the southern and eastern sides of Florence induced the development of Florence in a North-West direction, so as to determine the progressive urbanization of the so-called 'piana fiorentina' (literally 'Florentine plain'), binding together within a unique conurbation a number of pre-existing nuclei, namely Calenzano, Campi Bisenzio, Lastra a Signa, Sesto Fiorentino and Signa, up to the edges of Prato and Pistoia.

Over time, the urban congestion and the poor vehicular accessibility of the ancient inner core have gone inducing more and more prominent activities to shift towards this development area, which now houses the administrative departments of Tuscany Region, the regional hospital, the Penal and Civil Court, several departments of the University of Florence, the airport, several huge shopping centres, hypermarkets and department stores. As a result of such a dense concentration of activities, the Florentine plain is today one of the most attractive parts of the whole settlement, counterbalancing the traditional representativeness and the attractiveness of the historic centre of Florence, as well as the evocative strength it holds in the collective imagination.

The administrative fragmentation of the whole settlement, which overlaps the territories of 11 municipalities, prevented the provision of a global infrastructure development and an efficient public transport system all over the area; on the other hand, its local road network seems strongly supported by the national motorway A1, which touches Florence on its western side and actually works as a local road, internally connecting the conurbation.

The distribution of configurational values over time, as a result of the growth of the conurbation and according to the progressive transformation of its grid, will here be determined by means of a diachronic analysis since the beginning of XIX century and up to the present time. Such analysis is expected to provide some significant information on the transformation of the inner geography of Florence and its movement pattern with the making of the conurbation. The same results are also expected to pinpoint the role the motorway actually plays within the present pattern of urban vehicular movement, highlighting the degree to which it substitutes the connecting role of the local streets, what causes their impoverishment and decline: maker and breaker of cities, as stated.

2 BACKGROUNDS

Two main issues, variously crisscrossed, appear here interwoven. On the one hand, a wide issue is the growth of the urban settlement, which sprawls over time so as to form a conurbation, merging and binding together several pre-existing urban nuclei; such growth and merging involves the modification of the inner geography of the original nuclei and the shifting of the higher values of centrality towards the new development areas; accordingly, also the movement pattern is affected by these changes, which cause a different distribution of traffic flows. Another general issue is the matter of vehicular traffic in towns, the problems and the benefits it brings to urban settlements, as 60 years ago Clark pointed out; the presence of a motorway within the conurbation enriches the matter in the case study of Florence, thus extending the attention to the issue of the inclusion of motorways within the urban road network, and their use for local movements. Despite their evident connection, those two issues - urban morphology and dynamics, on the one hand, and traffic distribution, on the other hand - are generally approached from different points of view, as a result of a disciplinary division entrusted by a long-lasting traditional split.

The matter of the split between the treatment of roads as traffic channels and their assumption as streets - composing the public space of a settlement and narrowly connected with blocks and buildings - has been so far deeply investigated. The question of vehicular traffic in towns in fact dates back to the middle of the 20th century, when the increase of car traffic imposed the need for solutions, suitable for making the presence of vehicles compatible with buildings, pedestrians and urban life. The key idea of Modern Movement, explicit in

the Athens Charter and destined to widely affect town planning in the decades to come, was to split buildings and roads, liberating their own forms from each other, providing the urban roads with the unique role of circulation route and thus hierarchically classifying them with reference to traffic flow and road capacity. It is worth reminding that the split between urban roads and buildings necessarily involves the removal of traffic away from the building fronts, and hence the extinction of the street as intended so far: *'il faut tuer la rue-corridor'* (Le Corbusier, 1930) is the well known battle cry with such position.

Setting aside its effect on architecture and urban morphology, such traffic-driven approach was equated to a 'cataclysm' (Llewelyn-Davies, 1968) or even a real schism, definitely partitioning the two fields of traffic engineering and street (urban) design (Marshall, 2005). Since the middle of the 20th century, the main focus on the matter of vehicular traffic suggested the severe distinction between roads for traffic and access paths to buildings as well as their classification as 'entirely different and mutually antagonistic' (Tripp, 1950; p. 297), prelude to the subsequent hierarchical classification of urban roads by the Buchanan Report: *'basically, there are only two kinds of roads – distributors designed for movement, and access roads to serve the buildings'* (MoT, 1963; p. 44). Such distinction hence involved the assumption of the 'traffic conduits' as incompatible with the urban fabric and preventing them from approaching and giving access to buildings (Tripp, 1950); Oxford Street, London, is here cited as a very bad example of dangerous promiscuity, causing that *'on average, one pedestrian is injured by the traffic every shopping day'* (Tripp, 1950; p. 297).

The division between 'urban corridors' and 'urban rooms', represented by the metaphor of the hospital, whose departments are individually accessible and cannot be affected by through routes (MoT, 1963), as well as the paradigmatic planning of Radburn, in New Jersey, is well suited to represent this method, whose basic rule is to facilitate origin-destination movement and to repel through traffic: *'shopping, business and residential areas must be kept quite separate from all arterial and sub-arterial roads, and confined to local roads (...); the layout of systems of local roads must be such as will afford no short-cuts to through-traffic'* (Tripp, 1950; p. 310). On the whole, the result is what was said *'a division of traffic and towns into separate areas of priorities'* (Marshall, 2005; p. 48).

Relevant and recurring criticisms have long been raised against such approach - milestones, among others, Jane Jacobs and Christopher Alexander -, mainly complaining the impoverishment of the streets it involves, the weakening of social life and the shifting of accessibility from the historic centre towards the periphery (Jacobs, 1961; Alexander, 1966); yet the split between movement and urban space still persists nowadays, and the question concerning the road network and the accessibility to places and activities are mainly faced as mere infrastructural issues and a specific matter of traffic engineers, or, as it was said, *'from the traffic point of view'* (Tripp, 1950).

In light of the above considerations, it will be clear why a configurational approach was here selected for the present case study. In that it assumes the urban grid as the primary element in the distribution of movement, such approach allows to consider the configuration of the streets network as the key element in the patterns of human behaviour (Hillier, Hanson, 1984) and hence in most urban phenomena (Hillier, 1996b); what does not involve that a configurational approach can substitute any transportation model, nor it can provide the numeric amount of traffic flows. Nonetheless, in a configurational view *'the discovery that the spatial integration pattern of the street network shapes movement is more important than perfect prediction. It puts us in a position to design space for movement, and then assign the land uses to the right places according to their need to be close to movement'* (Hillier, 2005; p. 99); since *'in shaping movement'*, the spatial pattern of the street network *'also shapes the patterns of human co-presence - and of course co-absence - that seems to be the key to our sense that good cities are human and social things as well as physical things'* (Hillier, 2005; p. 99). The matter is therefore not in movement itself, but in the relationship between movement and

urban space; what is exactly the matter this research is concerned with, that is the dual phenomenon of the urban sprawl of Florence and the actual distribution of traffic flows.

Two wide issues appear therefore crisscrossing in the matter that is here concerned.

The first one obviously is the matter of traffic, due to the presence of a motorway, lapping the western side of the conurbation and arguably playing in this area, to some extent, also an urban role. The second issue regards the properties of the whole conurbation and its road network, with special reference to its resilience. And both issues can be usefully investigated by means of a configurational approach.

For what concerns urban movement, an amount of researches have been conducted in the last decades, in a wide range of directions: discussing the role and importance of 'natural movement', uniquely referred to the grid configuration (Hillier et al., 1993), discussing the capability of space syntax based models to reproduce the pedestrian flows (Jiang, 1999), demonstrating the strong relationship of the configurational values with the distribution of pedestrian flows (Cutini, 2001), proposing the use of space syntax to enhance the safety of pedestrians (Raford, Ragland, 2004), discussing the relationship between cycling routes and urban morphology (Raford, Chiaradia, 2007), showing the possible use of space syntax to support the planning of cycling routes (Dalton, 2015), or suggesting the applicability of space syntax to bicycle facility planning (McCahil, Garrick, 2008). All these researches agree that the integration value and the choice value are to be acknowledged as useful and reliable indicators of centrality. Different notions of centrality, in hindsight: while integration reproduces the to-movement potential of a spatial element as a destination (Cutini, 2005), choice measures the through-movement potential of an element as a piece of route (Hillier et al., 1993; Hillier, 1996a; Penn et al., 1998; Hillier, Iida, 2005).

Also for what specifically concerns the analysis and improvement of vehicular traffic in urban areas, the use of space syntax has already been variously tried and tested, focusing on several issues; among others, the use of space syntax in transport analysis (Pereira et al., 2008), the correspondence between planning choices and traffic (Giannopoulou et al., 2012), the use of space syntax as a traffic assignment tool (Barros et al., 2007), centrality measures for traffic (Scoppa et al., 2009; Kazerani, Winter, 2009), traffic optimization (Zheng et al., 2008), car crashes (Dasanayaka, Jayasinghe, 2014), traffic noise (Dzhambov, 2014) and so on. Also different methods, using street-based representations for predicting traffic flows, have been proposed and successfully tested (Jiang, Liu, 2007). And interesting observations have stressed the strength of the law of scaling also with reference to vehicular movement, showing the street hierarchies as a good indicator for traffic flows (Jiang, 2008).

It is not the purpose of this paper to discuss on the most reliable method for narrowly approximating traffic and thus predicting the distribution of its flows. It will rather address the matter of the relationship between traffic and urban fabric, discussing the way the distribution and pattern of traffic change with the sprawling growth of the settlement, as the whole grid goes so far as to encompass and include extra-urban roads. In such cases those roads frequently seem to remain entangled within the conurbation so as to work as local traffic distributors, mainly operating between the single urban nuclei that have gone generating it. Here issues of urban dynamics and matters of traffic go combining and intertwining, influencing each other and causing several problems, both in urban and infrastructural field. And here, therefore, a configurational approach, aimed at connecting and integrating those aspects, can actually play its part.

Closely linked to the matter of traffic is the further issue of urban resilience, which is increasingly regarded as a key property of urban systems and has been variously declined in order to indicate and reproduce different features. A relational notion of resilience, to be called 'network resilience' will be here taken into account, assumed as the capability of an urban system, thanks to its own spatial features, to adsorb accidental events and transformations without significantly changing its inner geography and global behaviour (Cutini, 2013); and, when it comes to vehicular traffic, it is clear which kind of events or transformations are here mainly

concerned: car accidents, road disruptions, traffic jams, traffic regulations. What in particular makes network resilience strongly related to traffic issues is that fundamentally it is appraised as a result of the diffused richness in alternative paths from any origin to any destination; while, on the other hand, resilience clearly affects traffic, as related to the vulnerability of the road network to any turbulence, as well as its flexibility and capacity to adapt to different functional assets.

With reference to the network resilience, three main indices have been so far introduced and tested (Cutini, 2013): the mean connectivity value of the grid (suitable for roughly reproducing the density and variety of paths connecting each line to all the others of the axial map), the frequency value (suitable for reproducing the degree to which the shortest paths are diffused all over the grid) and the synergy coefficient (reproducing the strength of the correlation between the distribution of integration values at different scales). In this paper a further parameter will be introduced and discussed with reference to the case study of Florence, aimed at appraising the degree of polarization of the movement flows distribution, to be regarded as clue of vulnerability of the system.

3 METHODOLOGY

As hinted above, a configurational approach was here selected as a tool for the analysis of conurbations. What suggested this choice is its assumption of the urban grid as the primary element in the distribution of movement and hence in determining the patterns of human behaviour (Hillier, Hanson, 1984): mainly movement, which is oriented and led by the visual perception of the spatial layout, and through movement, also the location of activities, land value and so on. At the root of the configurational approach is the assumption that an urban grid contains, due to the spatial relations between its elements, an intrinsic vocation for attracting movement flows (Hillier, 1996); which is liable to drive movement-seeking activities towards the most crowded spaces and to address the movement-avoiding ones towards the most segregated and deserted. Several operational techniques – encompassed under the denomination of space syntax - have been so far developed, differing from one another in respect of the way of reducing the grid into a system, and hence on the single spatial element composing it: the line in axial analysis (Hillier, Hanson, 1984), the vertex in visibility graph analysis (Turner et al., 2001), the segment in segment analysis (Turner, 2005), the road-centre line in road-centre line analysis (Turner, 2007), the mark point in Ma.P.P.A. (Cutini et al, 2004). Despite these differences, still all those techniques share the same conceptual basis sketched above; and all provide each element of the grid (either line, vertex, segment, road-centre line or mark point) with a set of parameters suitable for reproducing different urban aspects. Among those parameters, integration and choice value are acknowledged suitable for describing the changes in the inner geography of the settlement. Integration is the normalised value of the mean depth of an element with respect to all the other elements of the grid (Hillier, Hanson, 1984), and should describe its accessibility, that is how easy it is to get to from all other elements; concretely, in fact, it was proved suitable for narrowly reproducing the actual density of the located activities, and hence the distribution of attractiveness, or the vocation of a place to work as an appealing location (Cutini, 2005). Choice, defined as the frequency of a spatial element on the shortest paths connecting all pairs of other elements, is suitable for measuring how likely an element is to be passed through: in fact, several studies attest a strong correlation of choice with the distribution of movement flows (Hillier et al., 1993; Penn et al., 1998; Hillier, Iida, 2005). In other words, while integration reproduces the to-movement potential of a spatial element as a destination, choice measures the through-movement potential of an element as a piece of route (Hillier, 2012).

With reference to the network resilience, three main indices have been so far introduced and tested (Cutini, 2013). A first parameter is the mean connectivity value of the grid, which measures the density and variety of paths connecting each element to all the others. High values of connectivity are likely to guarantee a dense

presence of alternative paths and hence the capability of the urban system to absorb a material grid transformation without significantly modifying its relational state (Cutini, Rabino, 2012). A further index takes into account the distribution of shortest paths: being resilient the systems that are provided with a widespread presence of shortest paths all over the grid and, on the contrary, vulnerable those that are characterized by their dense concentration through a small number of spatial elements. On such basis, an indicator of resilience was introduced (Cutini, 2013) as the ratio of the highest choice value and the maximum frequency a spatial element could present, what would occur if it were located on all the shortest paths between any couple of the other elements. In a system of n elements, this index, called frequency index, is expressed as follows:

$$v = choice_{max} / (n^2/2 - 3/2 n + 1)$$

The frequency value obviously varies from 0 to 1, increasing as the resilience of the system decreases. In the extreme case, should a line be located on all the shortest paths connecting all the couples of lines ($v = 1$), the system would result vulnerable to its highest degree, in that each of its paths will share (and depend on) that single line.

A further parameter, called 'synergy coefficient', reproduces the strength of the correlation between the distribution of integration values at different scales (local versus global). Since integration was proved suitable for reproducing the distribution of urban centrality at different values of radius, a strong correspondence of global and local integration can be assumed as a clue of steadiness of the system. Those three parameters can hence be used as tangible indicators of the network resilience of the whole system and to reproduce its trend over time.

The configurational technique named axial analysis was applied to the case study of Florence and to the Versilian conurbation; in both cases the actual grid consistency at different dates was analysed in order to obtain the respective configurational state and hence its diachronic trend during the making of the conurbation.

4 THE CASE STUDY

As presented above, this research is applied to the case study of the Florentine conurbation, which has gone growing on the northern side of the historic core of Florence since the middle of the 20th century. This paper aims at using space syntax in order to reconstruct the diachronic genesis of the configuration of this whole system, from the date preceding the modern growth of Florence, up to the present point in time. Given the strong relationship that correlates the configurational indices with traffic flows, the analysis of the grid configuration at different dates (before and after the north-western growth) will allow appraising the actual role of the motorway A1 within the urban grid, since its first encompassment within the whole area of the conurbation and up to the present date. The present configurational state will then be cross-referenced with the available vehicular traffic data, in order to evaluate the actual degree of inclusion of the motorway within the urban system of Florence and its likely influence in the distribution of local traffic flows. On this regard, those data can be preliminarily presented, in order to describe the general matter of the motorway traffic in the area of Florence.

The motorway A1, opened in 1964 and thereafter subject to upsizing works, was actually reached by the sprawling Florence in the first '70s and then swallowed within the conurbation at the end of the century. In the Florentine area, the motorway is provided with 5 gates for entrance and exit (namely, from south to north, Firenze Sud, Firenze Impruneta, Firenze Scandicci, Firenze Nord and Calenzano); in addition, the settlement hosts two other motorway gates, that is Prato Est and Firenze Ovest, on motorway A11. The traffic data of the motorway A1 (light vehicles) in 2014 around the gates of Florence is here represented in figure 2, which allows to easily notice the sharp rise of average traffic volume as soon as the motorway enter the Florentine area.

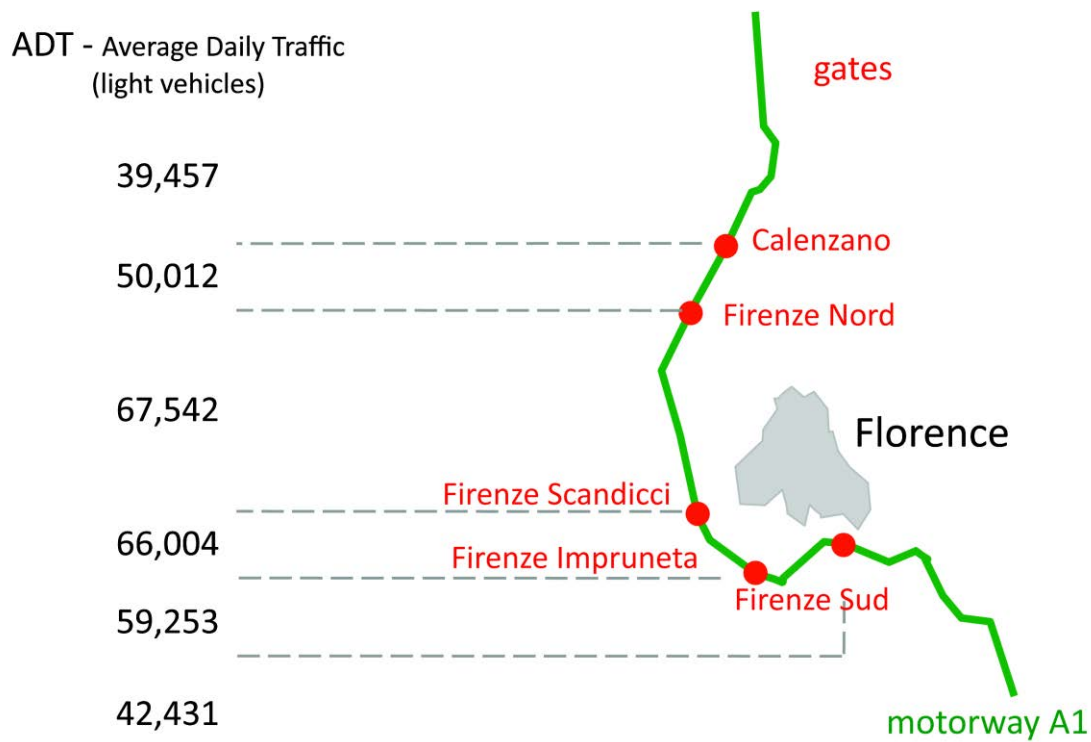


Fig. 2 Traffic data (light vehicles) of motorway A1 in 2014

It hence appears clear that traffic on motorway A1 is strongly increased by local traffic, that is car movements with both origin and destination within the Florence urban area. In other words, the difference between the average values within the Florence area (50,000/67,500 light vehicles) and the values outside (around 40,000 light vehicles) can be clearly considered just as urban traffic. If we then focus on the Florence area, and observe only the vehicles that in 2014 passed through the local gates of the motorway A1, their traffic data, provided by Autostrade per l'Italia S.p.a., operator of the motorway, are here shown in tables 1 and 2.

destination origin	Calenzano	Firenze Nord	Firenze Scandicci	Firenze Impruneta	Firenze Sud	Firenze Ovest	Prato Est	Total
Calenzano	-	252,756	839,648	426,949	513,567	188,070	32,946	2,253,935
Firenze Nord	428,050	-	136,699	391,774	342,737	19,051	46,453	1,364,764
Firenze Scandicci	925,831	82,256	-	798,686	1,463,240	225,205	864,720	4,359,938
Firenze Impruneta	406,377	59,541	671,864	-	1,387,202	475,406	361,514	3,361,904
Firenze Sud	474,631	52,495	1,458,769	1,452,646	-	372,237	435,636	4,246,414
Firenze Ovest	76	46	127	167	149	-	3,312,974	3,313,539
Prato Est	32,202	30,388	836,452	373,474	486,617	3,211,232	-	4,970,365
Total	2,267,167	477,481	3,943,559	3,443,696	4,193,512	4,491,201	5,054,243	23,870,859

Tab. 1 Vehicular flows in the Florence area in 2014 (source: Autostrade per l'Italia S.p.a.)

Destination Origin	Whole Florence area	Total	Percentage Florence area
Calenzano	2,253,935	3,556,668	63.4 %
Firenze Nord	1,364,764	2,800,640	48.7 %
Firenze Scandicci	4,359,938	7,149,299	61.0 %
Firenze Impruneta	3,361,904	4,922,532	68.3 %
Firenze Sud	4,246,414	6,950,527	61.1 %
Firenze Ovest	3,313,539	6,677,345	49.6 %
Prato Est	4,970,365	7,075,529	70.2 %
total	23,870,859	39,132,540	61.0 %

Tab. 2 Vehicular flows in the Florence area in 2014 – total data

The data reported in the last table are specially clear and highly impressive: over 60 per cent of the total vehicular movements locally entering the motorway actually has a local destination, confined inside the Florentine area, values that go as high as 70 per cent in some of the gates: a significant amount of the motorway traffic in the area of Florence is hence actually local – that is urban – traffic, going on top of the heavy vehicular traffic running down the peninsula and making the Autostrada del Sole a very crowded motorway, with high percentage of troubles, traffic jams and car accidents. Conversely, a large amount of vehicular traffic to and from locations within the Florentine conurbation does actually use the motorway, preferring it to the urban grid, despite the toll payment its use involves. As a matter of fact, the seven motorway gates appear mainly working as urban network nodes, rather than extra-urban movement terminals. The question is whether this traffic assignment is to be acknowledged as influenced by the structure of the settlement; or, in other words, if it is possible to find any clue that the grid configuration itself is the primary element addressing the route choice towards the use of the motorway. In order to answer this questions, a configurational analysis of the settlement was carried out, beginning from a diachronic analysis, aimed at reconstructing the genesis over time of the grid configuration, and then focusing on the present state of the system.

As for the diachronic analysis of the settlement, nine significant dates have been selected, suitable for identifying as many epoch-making moments in the modern growth of Florence. The first one is 1825, date of the Lorraine cadastral registry, reliably reproducing the layout of the city in 1:1,250 scale just before the beginning of modern urban growth. Apart from few punctual transformations, such state appears fundamentally unchanged with respect to the golden era of the Renaissance. The second date is 1858, just the year before the annexation to the Kingdom of Italy. The third date is 1867, representing the 6 years when Florence was the capital of Italy, and, above all, reproduces the transformation works carried out for such role; among them, in particular, are to be mentioned the demolition of the ancient townwalls, their substitution with a ring boulevard and the realization of the first extra-moenia residential developments. The fourth and fifth date are 1910 and 1938, witness dates of the progressive consolidation of the radial growth out of the inner core. The sixth date is 1955, reproducing the saturation of the flatland towards south and east, as well as the beginning of the unidirectional growth towards north-west, which appears developed at the following date, 1970; the conclusion of this growth is attested by the cartography at the eighth and ninth dates, respectively 1990 and 2015, with the progressive merging of the north-western urbanization with the surrounding settlements and the making of the present conurbation, swallowing and including the layout of the motorway. The grid corresponding to each of the dates above was analyzed by axial analysis.

The diachronic trend in the distribution of integration value in Florence is here summarized in figure 4. As the system has gone greatly increasing over the years (as can be seen in figure 3), it was here preferred to use here different scales of representation, in order to maintain a full view on the whole system and clearly describe the distribution of values and their trend over time.

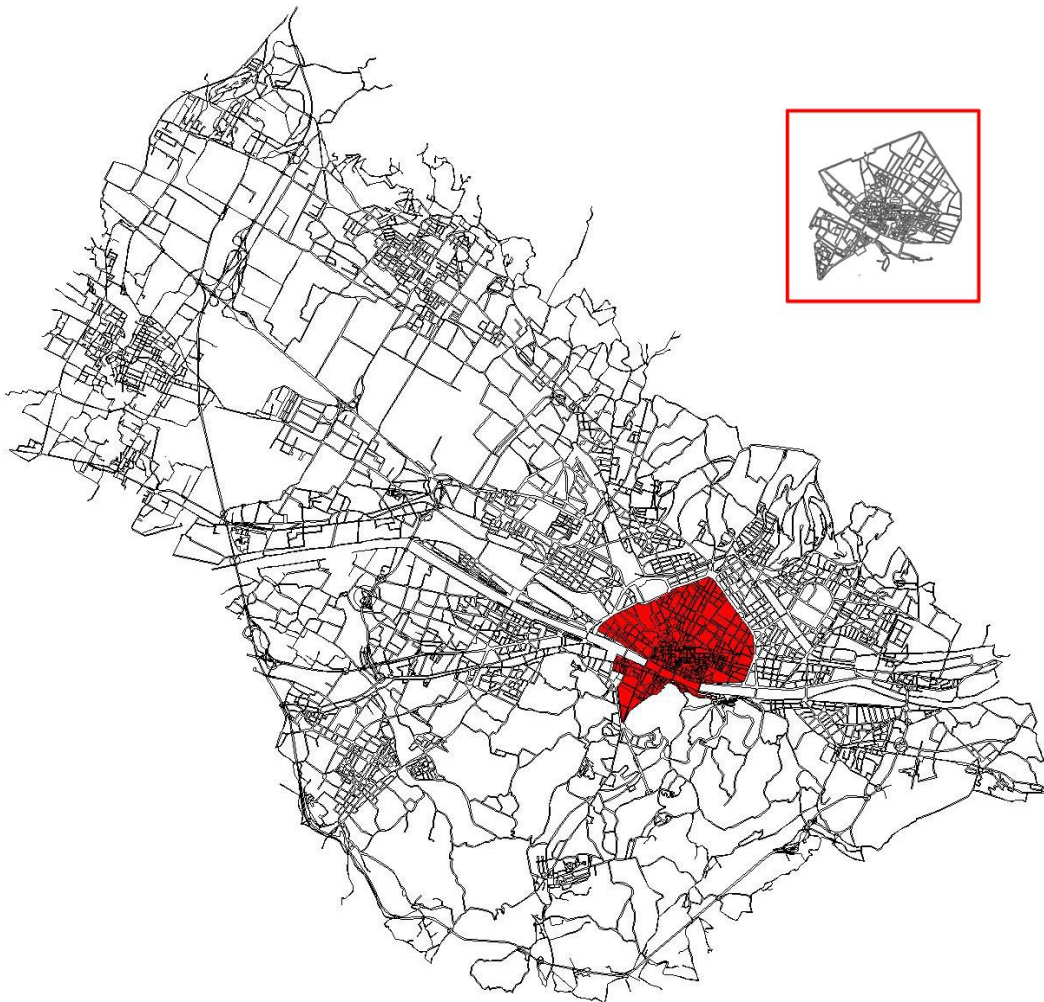


Fig. 3 The grid of Florence at the present date and (above and highlighted in the box) at 1825

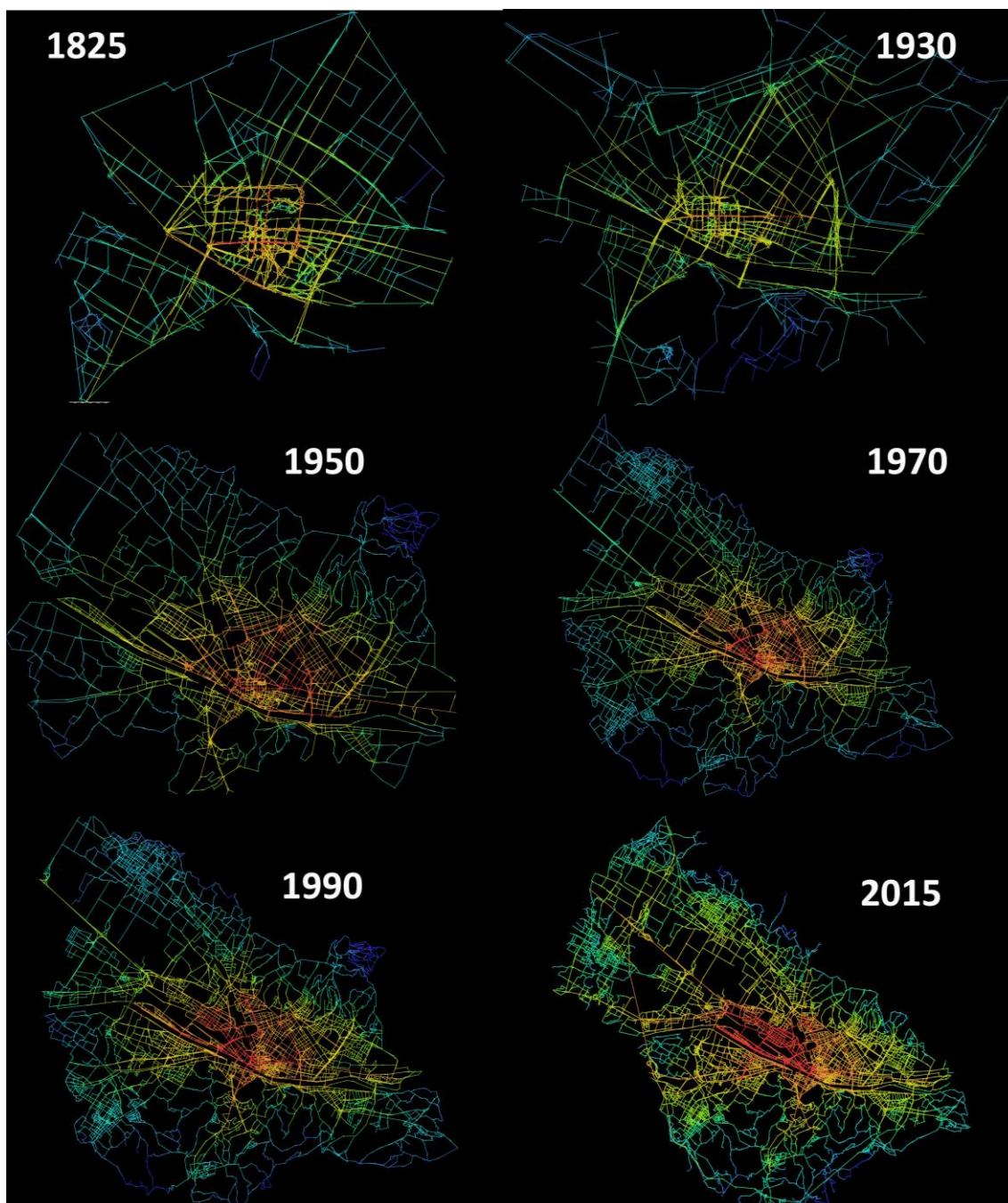


Fig. 4 Distribution of global integration in Florence 1825-2015

Some considerations easily arise from the observation of those results. First, a progressive shift of centrality, from the geometric centre of the inner core towards the external radial developments, is clearly shown in figure 5: while in the first three maps of the 19th century the strongest integrators appear to steadily persist coinciding with the *cardo* and *decumanus* of the original Roman layout of the city, in the very heart of Florence, since the early twentieth century the outer ring appears gaining more and more attractiveness. The making of the conurbation, in the last decades of the century, appears to involve the clear orientation of the integration core towards north, up to the last state, at 2015, showing it steadily anchored between the ancient townwalls and the recent north-western developments.

The images in figure 5 represent the correlation of local integration versus the global one, whose coefficient was mentioned above as 'synergy value', accounting for the extent to which local centralities depend on the

whole pattern of centrality. This index can be assumed as an indicator of the degree to which the different scales of the settlement are actually correlated, so as to concur in synergy to the global working of the city, which is commonly acknowledged a vital property in urban areas: in case of a strong correlation, local integrators are also prominent integrators at a global scale, thus creating a stronger and perceivable interface between the whole settlement and its single parts. The diachronic trend of synergy coefficient, since 1825 up to the present time shows a clear weakening of the correlation in the second half of the twentieth century (from $R^2 = 0.92$ to $R^2 = 0.55$), as a result of the sprawl of Florence and the growing of the conurbation.

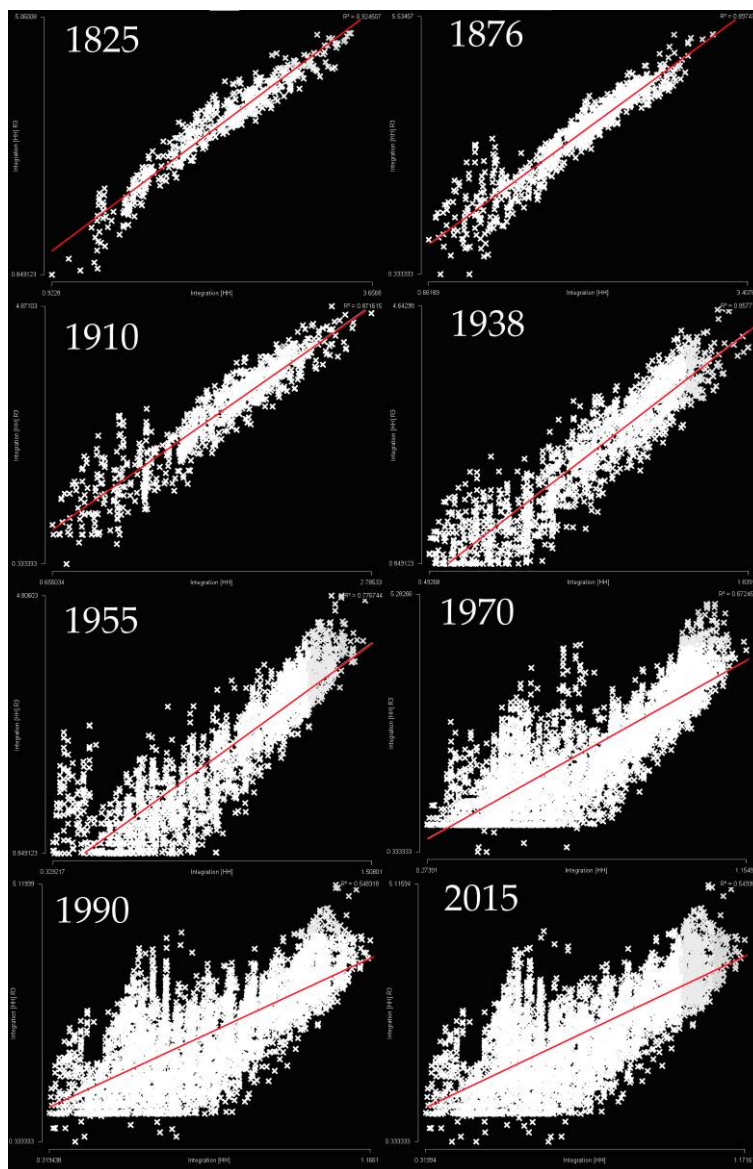


Fig. 5 Correlation local ($R = 3$) vs. global integration in Florence 1825-2015

The figure 6 summarizes the diachronic trend of the three resilience parameters in the period 1825-2015, highlighting the recent increase in the spatial vulnerability of the system. In fact, the decrease in the mean connectivity value stands for the decrease in redundancy of connections, what is commonly acknowledged as a fundamental element of urban resilience (Salingaros, 2005), as well as a precious source of urban life (Dupuy, 1991). Moreover, the decrease in synergy value stands for the weakening of the spatial relationship between the whole settlement and the local centres, which are scattered around and drift away, detached from the

global spatial structure. Furthermore, the sharp rise of the frequency value stands for the strong polarization of the network structure around a limited number of road axes. Just like the tree-like pattern described by Christopher Alexander, a tree whose major trunk is here the motorway, distributing movement flows to the neighbourhoods scattered around: 'Whenever we have a tree structure, it means that within this structure no piece of any unit is ever connected to other units, except through the medium of that unit as a whole' (Alexander, 1965; p. 50).

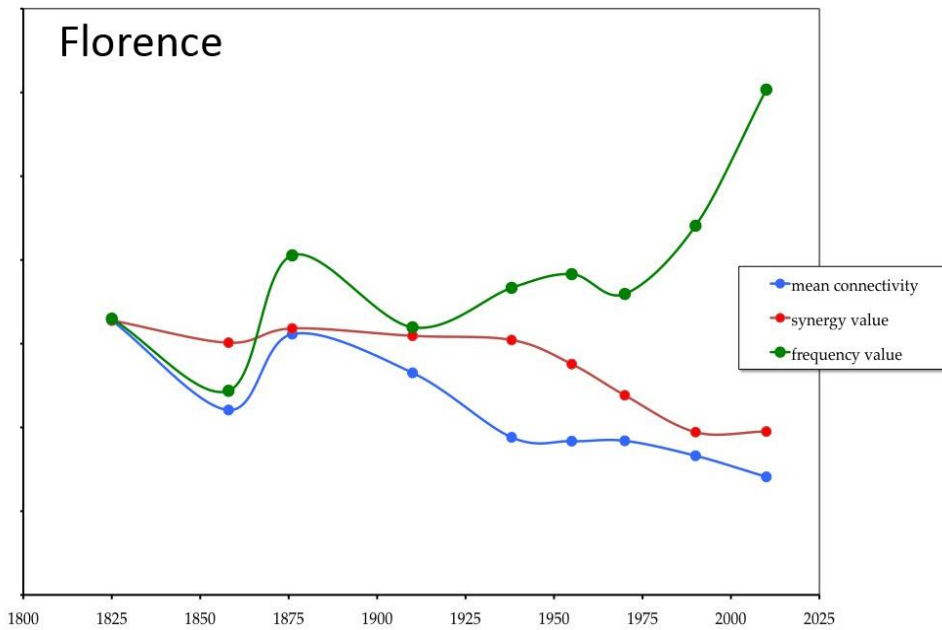


Fig. 6 The trend of resilience parameters in the grid of Florence in the period 1825-2015

All those phenomena appear attested in the grid configuration corresponding to the first '70s, and can be easily referred to the making of the conurbation and the embedding of the motorway within its grid: at present, the whole settlement actually appears highly depending on a handful of distributor roads, and above all on the motorway itself, provided with the highest values of choice: should any perturbation affect this road (as it is likely to occur, due to possible car accidents or traffic jams, unfortunately so frequent in this crowded section of road), the whole urban system would be at risk of globally collapsing.

A qualified literature on the issue (Penn et al., 1998; Hillier, Iida, 2005; Iida, Hillier, 2005; Turner, 2005) suggested to use angular segment analysis, according to different values of metric radius, in order to determine likely patterns of movement. Such analysis was therefore applied to the present grid of Florence, with radius varying from 400 m up the highest value of 15,000 metres in order to encompass the whole conurbation. Obviously the lowest values of radius are expected to provide the likely pattern of pedestrian movement, while the highest are suitable for reproducing the distribution of vehicular traffic.

The results of these analyses, for what concerns the distribution of choice values, are summarized in figure 7 and reveal that the distribution of pedestrian movement (R= 400/800 metres) mainly involves the streets of the inner core, making to clearly emerge the orthogonal grid of the ancient Roman city; on the other side, the vehicular traffic flows (R= 15,000 metres) are particularly intense outside the historic centre, towards the northern edge of the conurbation.

A further, appropriate refinement in the representation of vehicular movement pattern would then result from the clearing of the limited traffic zone out of the urban grid. As a matter of fact the streets of this zone, which at present approximately covers the area encircled within the ancient townwalls, do not actually concur to the

road network of the settlement. As a result of the cancellation of those streets, the distribution of choice values, with a radius of 15,000 metres, appears as shown in figure 8.

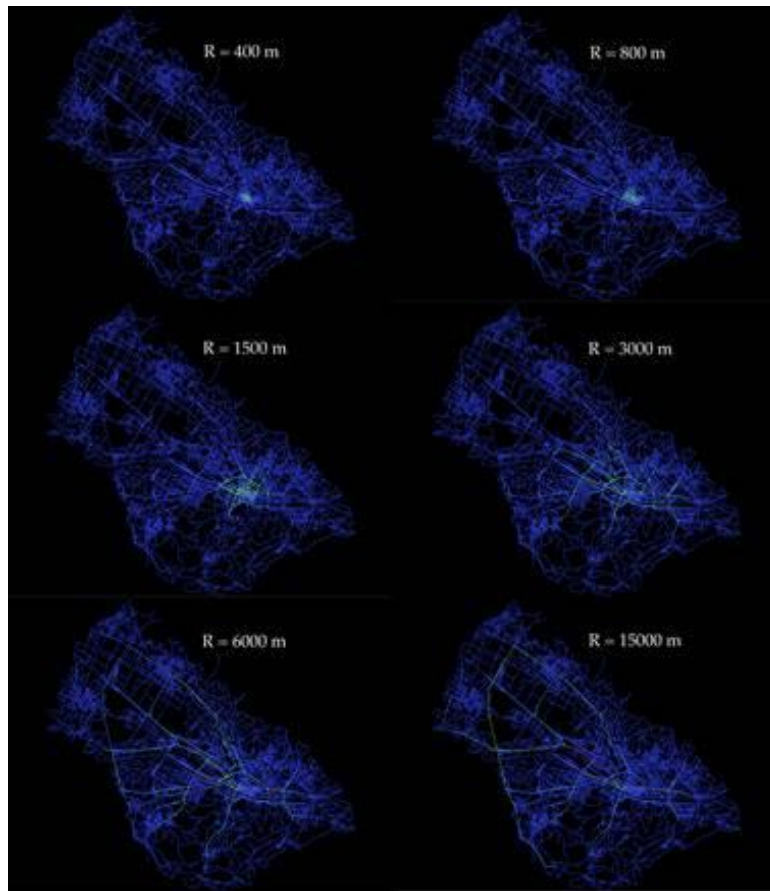


Fig. 7 Distribution of choice value in Florence for different values of metric radius



Fig. 8 Distribution of choice value in Florence (R= 15,000 m), net of the limited traffic zone

The figure above highlights two major traffic distributors, as provided with the highest choice values: the road segments composing the ring route surrounding the historic centre – the so-called 'viali', which in 1865 substituted the pre-existing townwalls; and the Florentine section of the motorway A1, appearing an outer ring on the western side of the conurbation. This result appears to exactly correspond to the actual phenomena of traffic congestion in the area of Florence, as it is perceived in the common sense as well as objectively measurable by direct survey. But it also appears to clearly materialize the traditional classification of traffic engineers in 'roads to be built as traffic conduits' (here in green and red) and 'roads to be built for the needs of the local communities to give access to their homes' (here in blue) (Tripp, 1950; p. 297) that was mentioned above. Two aspects are worth highlighting. First, the motorway appears to divert a significant amount of traffic from the streets of the urban fabric, thus depriving them from the precious by-product of origin-destination movements (Hillier, 1996b). Moreover, on the traffic side of the matter, it has to be noted that, while the few large scale movement arteries mostly run on the edge of the settlement, the short range movements, suitable for pedestrian movement, are exclusively encompassed within its inner core and hence are practically non-existent all over the wide conurbation. The hierarchical sequence traffic distributors / local traffic roads / pedestrian paths traditionally established by the manuals of traffic engineering for the efficient distribution of urban movement here appears broken and incomplete in most of the settlement, mainly due to the absence of a much finer scale structure outside the historic centre, suitable for receiving and distributing local traffic: a serious deficiency, since cities, as Hillier wrote, quoting John Peponis, 'in a sense, are interfaces between scales of movement' (Hillier, 1996b; p. 56).

This evidence induces to deeply investigate on the hierarchy of configurational values, observing the change of the frequency distribution of choice values in 2015 and in 1930, before the merging of the conurbation (fig. 9). It can be seen that over 95% of values is today under the 5th percentile, while in 1935 such percentage was around 83%. The choice values appear hence to follow a Paretian distribution: few lines (2% in 1930, 0.2% in 2015) take the overwhelming majority of the shortest paths between any couple of the others, and the slope of the function gets steeper with the progressive making of the conurbation.

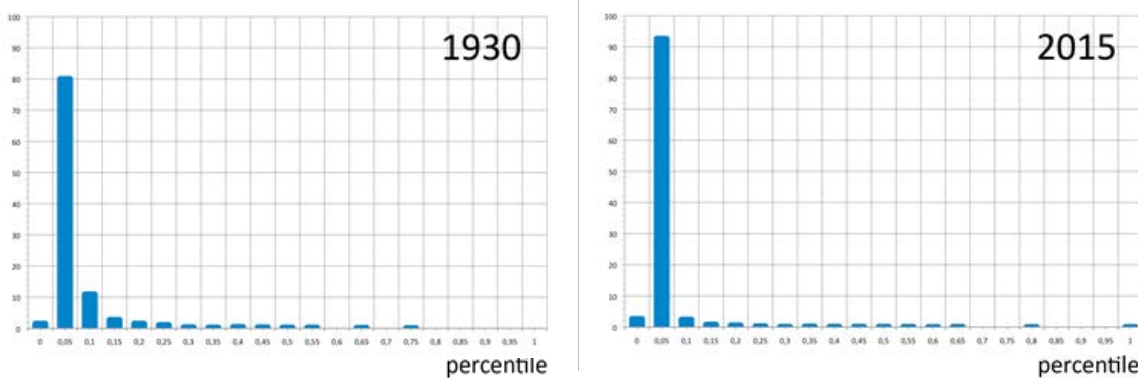


Fig. 9 Frequency distribution of choice values in the axial map of Florence at 2015 and 1935

The decrease of choice values appears so steep as to suggest representing their distribution by means of log-log rank-choice diagrams, having on x-axis the logarithm of rank (ordered by decreasing values of choice) (fig. 10). Those diagrams appear to narrowly correspond to a typical Zipf's function

$$\beta \log R_i + \log Ch_i = \log Ch_1 = \text{constant}$$

up to a cut-off threshold, after which such correspondence sharply weakens and choice values rapidly drop.

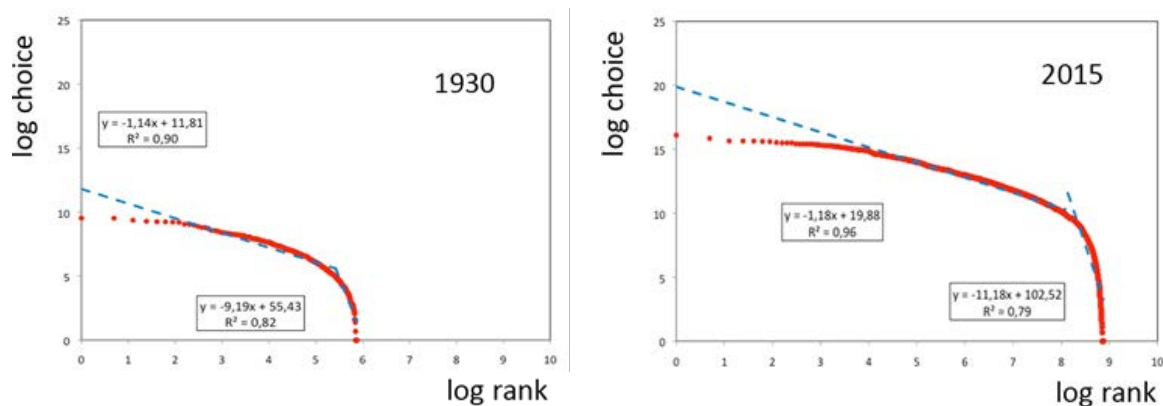


Fig. 10 Log-log rank-choice values in the axial map of Florence at 2015 and 1935

The distribution represented in figures 9 and 10 certifies that the merging of the conurbation has determined a strong polarization of the movement flows along a very limited number of spatial elements, hosting the vast majority of traffic. Conversely, an increasing number of lines (over 95% in 2015) appear excluded by the through movement all over the grid. Comparing such findings with the actual distribution of choice values represented in fig.8, we may easily observe that the very heart of this phenomenon of polarization is the motorway, while the suburban fabric appears almost entirely segregated from the major traffic flows.

5 CONCLUSIONS

The results sketched above allow certain conclusions to be drawn on the effect of the making of the Florentine conurbation. First, the diachronic analysis of its configurational state confirms the actual progressive shifting of centrality from the original inner core towards the north-western development area. Besides, the resilience of the whole system appears weakening as a result of the recent growing of the conurbation and to the strong polarization of the network structure around a limited number of road axes; among them, the motorway A1 in particular, lapping the urbanized area on its western side, appears to polarize most of the whole traffic within the conurbation. Moreover, a large amount of internal movement bypasses the urban grid of the conurbation, moving from an urban origin to an urban destination through the motorway, even at the cost of the toll payment: the vast majority of the accesses to the motorway through the gates of the Florentine area actually corresponds to local (that is internal) movement. Furthermore, the motorway A1 appears supplementing the urban streets, thus improperly concurring in supporting the working of the system; what obviously involves a local worsening of its traffic condition, heavy in itself because of the heavy traffic running down the Italian peninsula. Yet, apart from this effect on traffic, the local role of the motorway also diverts a significant amount of vehicular traffic flows from the streets of the urban grid, involving the loss of the fertilisation benefit the irrigation of through movement provides. And each of these aspects appears worth highlighting, as they clearly affect both the inner geography of the settlement and merely traffic issues, linking them and making evident the mutual influence of one on the others.

More in general, leaving aside the case of Florence, two aspects deserve a special focus.

The proposed method can be applied to the general issue of motorways in metropolitan areas, in order to evaluate the relationship between the motorway and the urban road network and the actual entanglement of inter-urban roads within the system of the conurbation: a widespread phenomenon, commonly resulting from the growth of the urban settlements and their sprawl into the surrounding areas.

Even more in general, the configurational approach, suitable for appraising the urban grid as the interface between the physical city and the phenomena that occur along its paths, once again proves its usefulness in linking spatial issues and traffic questions, so as to bridge the traditional gap between urban design, focused

on the morphologic features of blocks and buildings, and transport analysis, strictly concerned with the distribution of movement flows on the streets network.

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IMAGE SOURCES

Fig. 1: Google Earth

Fig. 2: Autostrade per l'Italia S.p.a

Fig. 3, 4, 5, 6, 7, 8, 9, 10: elaborated by the author

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THE WATER SENSITIVE FUTURE OF LAHIJAN. PUBLIC SPACES AS INTEGRATED COMPONENTS OF STORMWATER MANAGEMENT INFRASTRUCTURE

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ABSTRACT

The emergence of the modern urban water system in Iran, albeit facilitated access to clean water and accelerated discharge of waste- and stormwater, it left some negative imprints on country's urban and natural environment. Among which larger stress on natural water cycles and pollution of water resources are of great importance. More importantly, such impacts are occurring when cities are going through a changing climate, and are facing higher risks of water shortages and flooded urban surfaces in warm and wet seasons, respectively. The present research is built upon a case study conducted in Lahijan, a small city in northern Iran. Bridging between traditional urban design principles and water management practices, the study aims to find ways to connect place making with urban water infrastructure design in order to reintegrate water into the design of public spaces to create visually pleasant, environmentally sustainable and yet resilient contemporary urban forms. The analysis of the water-state of the traditional city reveals that stormwater has been an integrated into the design of Lahijan's public spaces for centuries, and that the blue and green surfaces were the key components in constructing the porous landscape of Lahijan. As an endeavour to build new techniques upon the old traditions, the paper concludes that after a long period of absence of water in urban settings, water must be reintegrated in the design of public spaces. Accordingly, urban spaces of the future water sensitive Lahijan through various storage, conveyance, infiltration, and evaporation capacities shape the distributed on-site stormwater management infrastructure of the city which can adapt to the impacts of a changing environment while addressing the problems of water scarcity, floods, and pollution.

KEYWORDS:

Urban water infrastructure, Public space, Stormwater, Lahijan, Iran

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水敏型城市 LAHIJAN 的未来。

公共空间作为 LAHIJAN 雨水管理基础设施的综合组成部分

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摘要

虽然伊朗现代城市供水系统的兴起促进了清洁水的获取，同时加速了废水及雨水的排放，但还是给这个国家的城市 and 自然环境带来了负面影响。自然水循环面临的较大压力以及水资源污染是其中的两大问题。更重要的是，当城市面临气候变化，在温暖潮湿的季节面临更大的水资源不足以及洪水淹没城市地表的危险时，也会产生这些影响。目前正在针对伊朗北部的小城市 Lahijan 进行一项案例研究。为了缩小传统城市设计原则与水资源管理实践之间的差距，这项研究旨在设法将公共场所建设与城市供水基础设施设计相融合，从而将水资源利用重新纳入公共空间设计，从而打造出外观优美、环境可持续发展并且满足未来需求的当代城市形态。对传统城市供水状态的分析表明，数百年来，雨水排放和收集系统已融入到了 Lahijan 公共空间设计之中，对于多孔城市 Lahijan，打造蓝天白云、绿树成荫的环境是关键。为了打破旧传统，引进新技术，本文得出的结论是，对于长期缺水的城市环境，必须将水资源利用重新纳入公共空间设计之中。因此，未来的水敏型城市 Lahijan 要通过存储、输送、渗透、蒸发来重塑城市的雨水管理基础设施，以便应对不断变化的环境影响，同时解决水资源短缺、洪水和污染问题。

关键词：

城市供水基础设施；公共空间；多孔城市；雨水；Lahijan；伊朗

1 INTRODUCTION

The emergence of the modern urban water system in Iran, albeit facilitated access to clean water and accelerated fast discharge of waste- and stormwater to the sewers, it left some negative imprints on Iran's urban and natural environment. Among which urban sprawl and horizontal expansion of cities, larger stress on country's natural water cycles, pollution of water resources and depletion of green spaces are of great importance. Such impacts are even more critical in a time when cities are experiencing more frequent extreme weather events including destructive floods and draughts of a changing climate. Consequently, many Iranian cities are facing higher levels of air temperature and risks of water shortage in warm seasons as well as increased risks of urban flooding and pollution of water bodies in wet seasons.

Studying the traditional knowledge and learning from locally practiced techniques can help us to pave the path in finding new ways to face the growing water challenges of the country and to move towards the sustainability of water resources. The strong connection of traditional methods to the regional geography and their adaptation to the local climate are the keys to durability of them. However, after the modernization process, many of such local methods lost their value and effectiveness, and gradually became forgotten. One may argue that traditional practices are not able to solve all water-related issues of the current time; however, combining the traditional knowledge and the recent technological capacities can offer a good mix of "old" and "new" practices and techniques to assist the communities to achieve the sustainable management of their water resources. In Mays' words, "Many present day water problems could be solved using the traditional methods developed and used for hundreds of years. ... This has blinded many people of the forgotten sustainable ways of the ancients. So that in reality highly advanced methods are not required to solve many water problems, particularly in many of the poor and developing parts of the world." (2010, pp.217, 218) Such strategy might become even more fruitful in a country like Iran, where the rapid pace of urban expansion requires further development of urban water infrastructure; while some of the traditional techniques of water management are still in use and there is a tendency to preserve them.

The present research is built upon a case study conducted in Lahijan, a small Iranian city. Lahijan, situated in the Caspian coastal plain in the north of Iran, is one of the oldest cities of the country. With the area of 1013 hectares and population of some 94000 people, it is the third most populous urban settlement of the northern province of Guilan, and was the capital city of the province in the past. Employing desk research and fieldwork, the paper studies the past and the present status of the city and its urban water infrastructure development. Bridging between the urban design principles and traditional water management practices, the research aims to identify the sustainable urban water management techniques of the past, which were fitted into the local context while meeting the water demands of the communities. Following the principles of traditional water management techniques, the study seeks to connect place-making with urban water infrastructure planning in order to reintroduce water into design of public spaces, and turn them into an integrated component of stormwater management infrastructure. Such integration would be the key factor to create visually pleasant, environmentally sustainable and yet resilient contemporary urban forms.

In recent urban planning and design literature there is a convergence of research and case applications addressing sustainable water management systems through place-making projects (Wong & Ashley, 2006; Heaney, 2007; Ahern, 2007; Novotny, 2009; Wong & Brown, 2009; Sipes 2010; Novotny *et al.*, 2010; Hoyer *et al.*, 2011). In contrast to the conventional fragmented system, under an "Integrated" water management system, the urban water infrastructure design has a strong bond with urban design and place-making processes of cities. Integrated water management techniques are known under different names in various parts of the world: Low Impact Development (LID) and Green Infrastructure (GI) in the USA, Sustainable Urban Drainage Systems (SUDS) in the UK, Best Management Practices (BMPs) in Europe, and Water Sensitive

Urban Design (WSUD) in Australia. All of such techniques, however, aim to minimize the hydrological impacts of urban development specifically targeting stormwater.

Contrary to the current stormwater management practices, which are concentrated on reducing peak flow rates to prevent flooding, through mimicking natural hydrologic processes, various integrated water management techniques create functional green spaces to control and manage stormwater as close to the source as possible. Low-impact development (LID) techniques aim to maintain, repair or replicate the predevelopment hydrological functions of urban areas (including storage, infiltration, and groundwater recharge) to control runoff and the transport of pollutants. "In a retreat from decades of large, centralized hard-pipe solutions that treat stormwater as a burden and ship it off-site as quickly as possible, LID is a paradigm shift that keeps stormwater on-site for longer periods and manages it as a valuable resource." (Sarte, 2010, p.104)

Similar to LID, Sustainable urban Drainage Systems (SuDS) seek to shift the paradigm towards surface water and introduce it as a valuable resource. "SuDS aims to slow down and reduce the quantity of surface water runoff from a developed area to manage downstream flood risk, and reducing the risk of pollution; through harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment to be enjoyed by everyone." (Woods Ballard *et al.*, p.19) Accordingly, the SuDS Design Philosophy aims to deliver such multiple benefits, manage surface water runoff through mimicking natural hydrological processes, enhance biodiversity, beauty, and the natural aesthetic of buildings, places and landscapes, deliver resilience, and make developments more sustainable.

Green infrastructure design is yet another technique which employs "an interconnected network of natural areas and other open spaces to conserve natural ecosystem values and functions, to sustain clean air and water, and to provide a wide array of benefits to people and wildlife (Benedict and McMahon 2006). Ahern (2007, p. 267) defines green infrastructure as "spatially and functionally integrated systems and networks of protected landscapes supported with protected, artificial and hybrid infrastructures of built landscapes that provide multiple, complementary ecosystem and landscape functions to a broad public, in support of sustainability". In his definition, Ahern emphasizes the idea of infrastructure as a networked system that follows a multi-scale approach with recognition of pattern:process relationships and an emphasis on physical and functional connectivity. Among others, the concept of connectivity directly applies to water flow as the most important flow in any landscape, particularly in human-dominated and urban environments. Disruption of hydrologic connectivity is a major concern when planning for sustainability.

Comparable to the previous techniques, Wong and Ashley introduce Water Sensitive Urban Design (WSUD) as an interdisciplinary concept, which is based on the integration of the two key fields of 'Integrated urban water cycle planning and management' (IUWCM) and 'urban design'. They argue, "WSUD brings 'sensitivity to water' into urban design, as it aims to ensure that water is given due prominence within the urban design process through the integration of urban design with the various disciplines of engineering and environmental sciences associated with the provision of water services including the protection of aquatic environments in urban areas. Community values and aspirations of urban places necessarily govern urban design decisions and therefore water management practices (Wong & Ashley 2006). Wong & Brown characterize a Water Sensitive City by "three pillars, which must be seamlessly integrated into the urban environment". The three pillars of water sensitive cities indicate: (1) Cities as water supply catchments; (2) Cities providing ecosystem services; and (3) Cities Comprising Water Sensitive Communities (Wong & Brown 2009, p.676).

Hoyer *et al.* (2011) also highlight the multidisciplinary of Water Sensitive Urban Design in which the objectives of the urban water management system is combined with the ones of a responsive urban design and a functioning urban landscape. Although WSUD embraces all different aspects of urban water management

including water supply, sewage treatment, flood management, protection of water bodies such as rivers and creeks, and providing social amenities and improving the livability of the urban environment, stormwater management seems to be a key element.

Unlike the conventional approach in which stormwater is mainly considered a problem, under all various integrated water management techniques, stormwater is not only recognized as a resource but also a great asset to provide the amenity of the city. Echols highlights the failure of engineered stormwater facilities in considering its otherwise ecological, social or aesthetic qualities of the built infrastructure, he states, "sustainable stormwater management can be used to create places that serve both the demands of urban drainage and urban planning. From the urban drainage point of view, people want to have a system that is reliable, simple to construct and easy to maintain, while also considering its costs. Alongside, from the view of urban planning, sustainable stormwater systems should be beautiful, meaningful, and educational (Echols, 2000, p.1).

2 LAHIJAN'S DEVELOPMENT THROUGHOUT THE HISTORY

Similar to the majority of Iranian cities, Lahijan went through rapid urban expansion and population growth within the last decades. Despite its rapid expansion of the 20th century, the current urban form of Lahijan can be traced back in Safavid era. *Safavid city* (1502-1736) of Lahijan experienced a golden age when its agriculture- and commerce-based economy was flourishing. The region owes the richness of its flora and fauna, and the variety of its agricultural resources to its humid subtropical climate and the density of its hydrographic system. Rabino (1916, p.115) says, "Perhaps nowhere else in the world are there so many rivers, streams and torrents as in the Caspian provinces". As a result of a significant amount of precipitation, the region is gifted by innumerable watercourses, permanent streams or seasonal flows which are the primary sources of water to feed the lagoons or the ponds. Hence, the running waters of streams and watercourses and the still water of lagoons and ponds are significant components of Lahijan's traditional urban form. Apart from their original function as a source of water for various domestic and agricultural activities, such water structures were contributing to the quality of urban spaces in different ways. They were improving the aesthetic qualities and visual attractiveness of the urban environment and offering leisure and recreational spaces to people in warmer seasons. The residential neighborhoods, the polo field, which was built by the direct order of Shah Abbas the great, and the pond were the main components of Lahijan's urban landscape in Safavid dynasty. The three components were surrounded by cultivated lands in the north and the south; while the river and the hills were drawing the western and eastern edges of Lahijan, respectively (Figure 1). Qajar city (1758-1925) of Lahijan witnessed the further development of city's residential districts. Lahijan found its seven oldest neighborhoods in this period. Each of which enjoys a specific character and socio-economic status. They, however, share the same physical and functional pattern in which the housing areas surround a functional center. The functional centers contain the public facilities of each neighborhood, and they are connected through key passages of the city to shape the main urban structure of Lahijan.

The diversity of available water resources in the region, which could offer the citizens alternative sources of water for domestic and agricultural purposes, is among the main driving forces of urban development during Qajar monarchs. Since the level of groundwater in the area is very high, digging wells and bringing groundwater up to the surface has always been a common habit of the residents to supply their domestic water demands. In Bromberger (1989, p.16) words, "such easy access to water gives exclusive and original features to the settlements in northern Iran: in central part of Iran activities such as fetching water, watering the livestock and doing the washing, mean daily visits to communal facilities of the neighborhood, village or the city; on the contrary, the easy access to source of water in private sphere of the household have turned

drawing water and bathing into private affairs: the well is virtually a constant component of the house located in the courtyard.”

In addition to the surface- and ground water resources, rainwater was yet another important source to fulfill the water demands of the community. Roof water collection and farm ponds were the main rainwater harvesting techniques which were used by people for a long time. Despite the fact that Guilan province has an annual average precipitation of about 1000 mm, it is not concurrent with cultivation season, and therefore, use of farm ponds sounds to be an intelligent technique to harvest the water in rainy seasons and use it later in the cultivation period (Madani, 2014). Since evaporation rate is never a concern in northern Iran, the uncovered open cisterns (locally called *Istakhr*) became the popular rainwater harvesting technique among the local communities. Historical investigations reveal that almost all the cities and villages in Guilan province had one or more ponds to meet their agricultural demand for water. Ghoddousi refers to farm ponds as “structures which are constructed by small earthen walls on flat or hilly land to collect and store rainwater, surface runoff and flood flows” (1999, p.292). In Banihabib’s words, “the rain and stormwater running from the upper or neighboring catchments is collected and directed into these small reservoirs.” (1999, p.337)

Lahijan has probably seen its most significant changes in Pahlavi period. *Pahlavi city* (1925-1979) of Lahijan is characterized by the emergence of new streets and residential districts, as well as modern urban water infrastructure. The streets of Pahlavi city were not only functioning as physical connections to facilitate the mobility but also providing places of socializing and leisure activities. New residential districts are other components, which were added to the former structure of Lahijan in this period. The development of new residential areas along with modern transportation networks resulted in an increase in hard and impervious surfaces of the city. In the absence of an efficient drainage system, less porosity and perviousness of urban surfaces caused higher risks of flooding in Lahijan (Figure 2).

H.L.Rabino, a British consul serving in Rasht, the capital city of Guilan province, visited Lahijan in 1906; he describes the city in his book, “Lahijan has seven neighborhoods, 2260 houses and a population of some 11000 people...” (Rabino 1916) Since then Lahijan has seen a significant population growth. Just in the last 55 years, the city’s population grew almost fivefold and passed 94000 residents. To accommodate such rapidly growing population, the *Post-Revolution City* (1979-2016) has seen massive expansion (Figure 5). Many agricultural fields inside the city have been reclaimed to provide room for further densification projects and expanding transportation networks. Following the decreased surface of green spaces and cultivated lands inside the city and introduction of modern water infrastructure, Lahijan Pond lost its primary function as a source of water for agricultural purposes. Besides, the growing network of streets of the city cut the natural connections between the streams and seasonal flows and the pond. Covering the floor and walls of the pond by concrete was yet another step in the transformation of the pond. Neither a cistern to harvest the rainwater for future agricultural activities, nor a sponge to hold the excess urban runoff to avoid flooding, the natural pond was transformed into an artificial lake and lost its original character. Such changes, albeit facilitated the maintenance of such large body of water inside the city and ensured sanitary concerns, damaged its natural aquatic life. The artificial lake, however, has become a great recreational space with beautiful scenery inside the city, is one single entity disconnected from surrounding natural environment (Figure 3). Currently, the pond is not a source of water anymore- as it was in the past; rather it is a large artificial component in the city which receives its water from other underground water resources. Instead, to reduce the risk of urban flooding, the city started to further expand its drainage system to convey urban runoff as fast as possible out of the city.

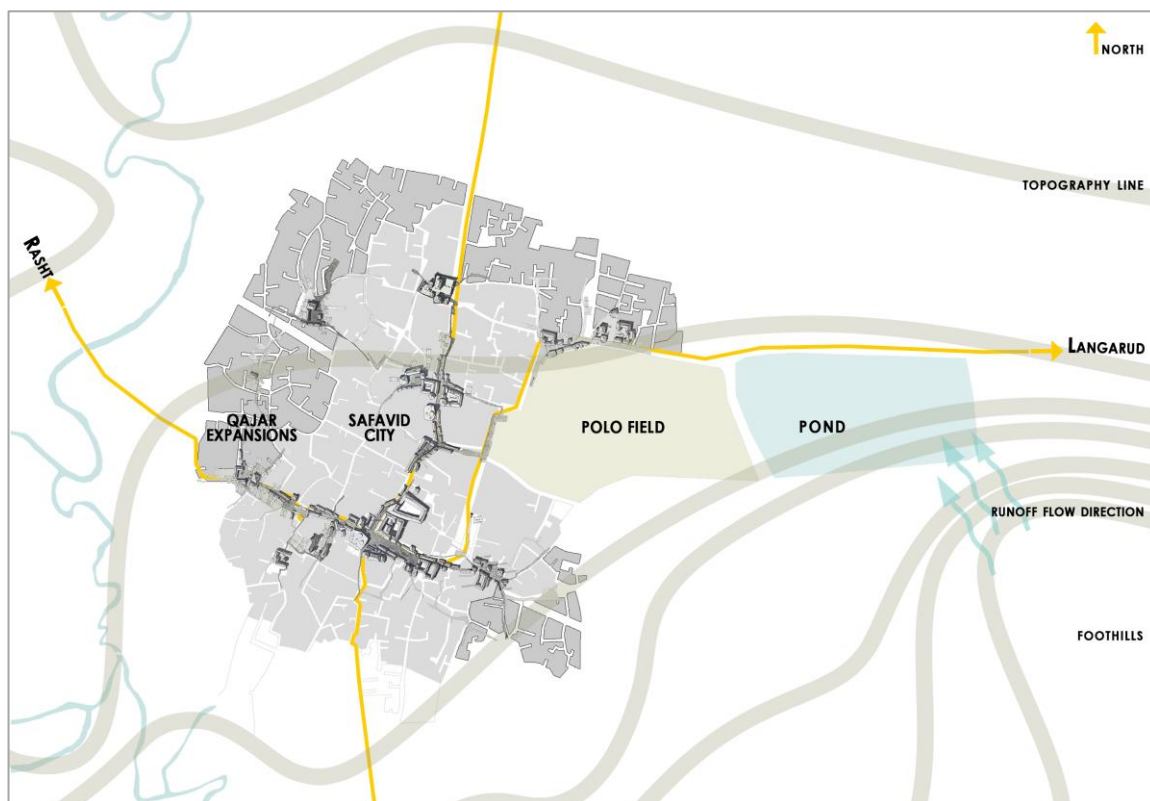


Fig. 1 The urban structure of Qajar city of Lahijan: residential neighbourhoods, the polo field, and the farm pond

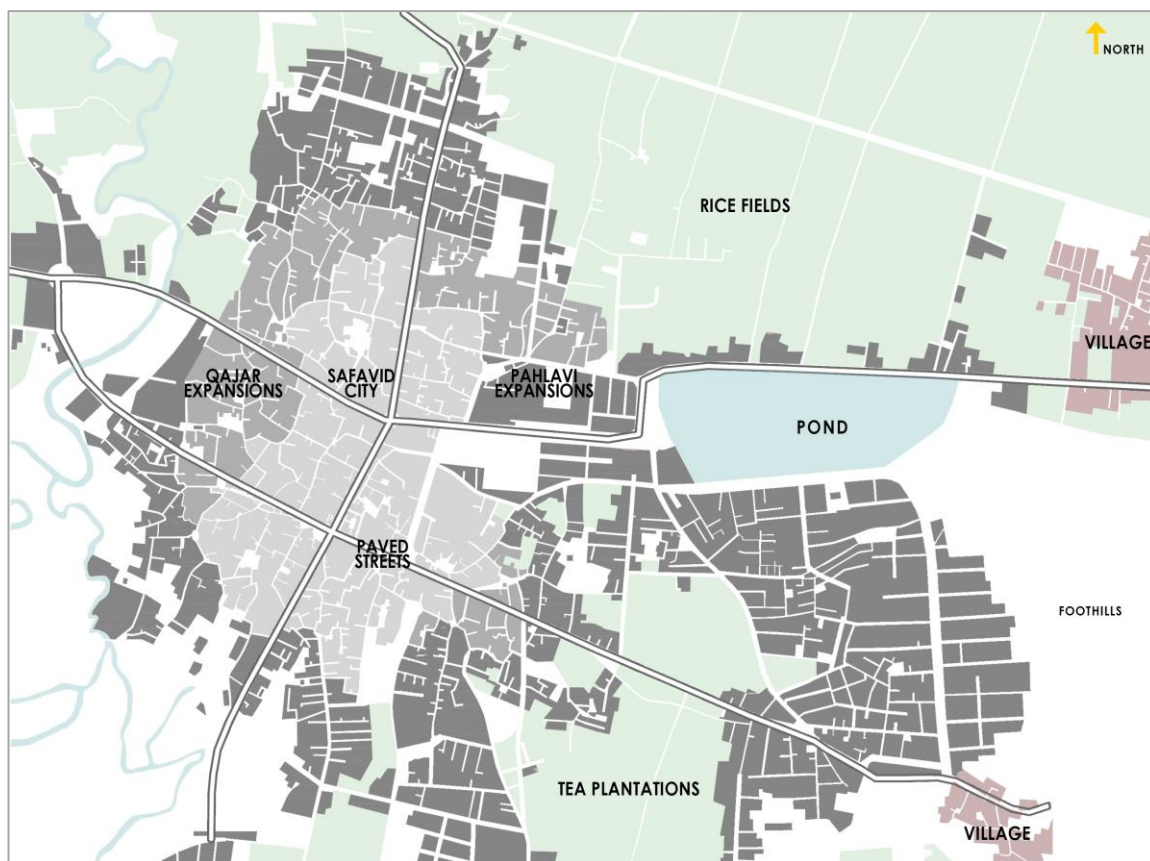


Fig. 2 Pahlavi city; the expanding area of built up spaces and paved streets



Fig. 3 The natural pond in 1970s (left) and its transition to an artificial lake in 2000s (right)

3 ANALYSIS SUMMARY

3.1 CENTRALIZING A DE-CENTRALITY: STORMWATER NOT A SOURCE OF WATER ANYMORE

By the beginning of the 20th century, the city experienced a faster pace of urbanization. Due to the rapid growth of the population, which was followed by fast urban sprawl, the traditional techniques were not able to respond to the increasing demand of the community. The emergence of modern urban water systems in the second half of the twentieth century was yet another reason to accelerate the paradigm shift from a traditional distributed system to the centralized network of underground water pipes. Although the underground urban water networks provided easy access to clean water, and solved the sanitation and maintenance problems of the former infrastructure, it caused less popularity of traditional water management practices. One can mention the example of farm ponds in the region; While harvested rainwater by farm ponds was meeting the water demands of the agricultural activities for centuries, the emergence of modern irrigation systems and lack of proper maintenance caused gradual deterioration and later disappearance of many farm ponds in Guilan. Therefore, unlike traditional systems, which were relying on the locally available sources of water to respond the demands, the current urban water network employs available technologies to bring water from farther distances, and lack the climatic and geographical considerations of the previous system. In contrast with the network of decentralized local practices scattered all over the territory, the present urban water infrastructure is a central system of underground water pipes, which delivers water to each and every household. The new technology-oriented urban water infrastructure paid the slightest attention to the local environment where this new system is implemented. In other words, “this quick-and-fix approach to use of new technologies to solve complex development problems of developing economies dismisses the achievements of the past and underestimates and minimizes the many difficulties some of the new technologies have brought in their work.” (Borri & Grassini, 2014, p.112)

The current water supply of Lahijan is partially afforded through 13 deep wellbores located in outskirts of the city as well as the treated water from Water Treatment Plant of Sangar Dam Lake, located some 89 kilometers away. Despite availability of urban water supply, many families still use their private wells as extra free of charge sources of water in case of urban water cut or shortage of water in warm seasons. Long distance water transfer from Sangar Water Treatment Plant as well as uncontrolled abstraction of groundwater from wells affects the hydrological cycles and local ecosystems. More importantly, this is happening in a time when the cities have less and less infiltration capacity to recharge the region’s groundwater resources (Figure 4).

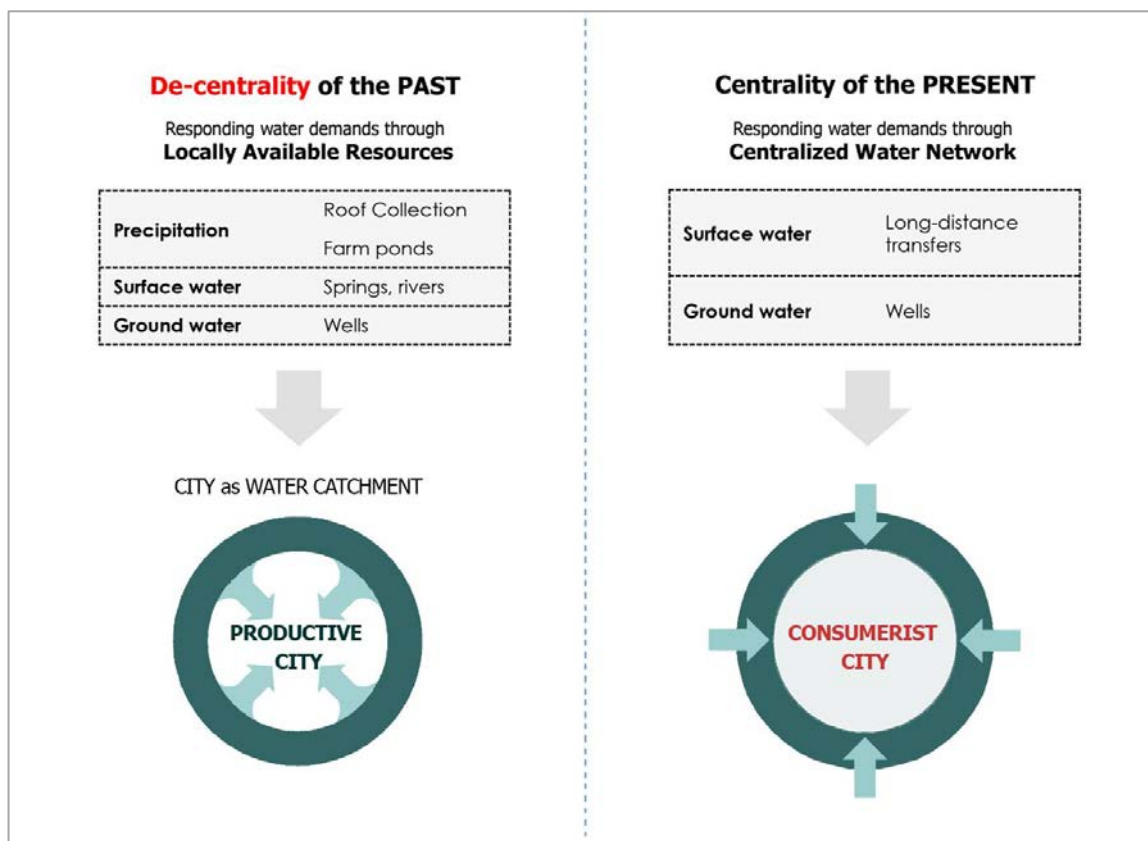


Fig. 4 Water resources in traditional and modern urban water supply system



Fig. 5 Limited number of Green patches in contrast with the expansive impervious areas of post-revolution city represents the limited on-site stormwater management capacities



Fig. 6 Flooded urban streets of Lahijan, October 2013

3.2 MORE WASTEWATER DISCHARGE: STORMWATER EQUALS WASTEWATER

Lahijan enjoys an average amount of 1228 mm of rainfall and 136 rainy days per year. Hence, it has a considerable amount of stormwater to manage. In wet seasons, the city has to manage greater amount of stormwater than wastewater that the residents produce. Currently, the drainage system of the city is a mix of combined (185 km) and separated (61 km) sewers, and thus the larger amount of stormwater and urban runoff is mixed with waste and conveyed through one conduit. Furthermore, the existing wastewater treatment plant of the city does not have the capacity to treat all the loads of wastewater. The construction of Lahijan water treatment facility, which started in 1994, is not yet finished and is projected to be completely done by 2026. The ultimate capacity of the treatment facility will be about 36000 cubic meters per day, while currently, the treatment facility is capable of receiving and treating some 26000 cubic meters of wastewater per day. If the wastewater is not treated, the pollution is just conveyed elsewhere. Discharging effluent water without receiving any treatment impose several challenges to the city and its surrounding natural environment including pollution of nearby water and soil resources. Apart from the pollution of water and soil resources, the treatment facilities consume a lot of energy, and thus, contribute to higher carbon emission and air pollution. On one hand combining stormwater and wastewater in one conduit under the current urban water infrastructure eliminates the possibility of harvesting and treating rainwater and reintroducing it to the system as a new source of water. On the other hand, the traditional stormwater management techniques are not capable to manage all the loads of rain and runoff in the city. There is, however, a lesson to learn from such traditional practices to change the conventional approach towards stormwater as waste and recall the true capacities of rain and stormwater as valuable resources in the urban water management system of the city.

3.3. LIMITED POSSIBILITIES OF ON-SITE STORMWATER MANAGEMENT: STORMWATER NOT AN ASSET BUT A MENACE

As mentioned previously, Lahijan like the rest of Caspian plain enjoys much higher amount of annual precipitation than other parts of the country. Due to such availability, rainwater should be considered a great

asset and source of water for the city. However, lack of proper stormwater management system has turned urban runoff and stormwater into one of the main challenges of the municipality, particularly in wet seasons. Despite lack of proper drainage network, the traditional city was offering various opportunities for distributed on-site stormwater management. Before the onset of rapid urban expansion and densification of Lahijan in Pahlavi and post-revolution period, the urban open spaces including green spaces of orchards and cultivated lands as well as courtyards and gardens of private properties were offering various storage, infiltration, and evaporation capacities to the city. Such capacities were significantly decreasing the risk of urban flooding in cases of intense precipitation. Among the trends, which strongly affected such nature-oriented mechanisms of stormwater management in recent century, is the growing use of automobiles in the cities. Dominance of automobiles in the last 50 years not only affected the urban form of Lahijan, but also negatively influenced air and water quality. Following the new car-dependent lifestyle, the urban form of Lahijan changed to create room for connecting roads and parking spaces. The results were increased imperviousness of city surfaces and lower infiltration capacities, and thus, increased surface runoff and more frequent flash floods (Figure 5). As a consequence of less on-site stormwater management possibilities inside the city, the main goal of stormwater management set to be fast conveyance of urban runoff and stormwater out of sight to the nearby water bodies. Employing the available technologies, the municipality began to develop a drainage network. Time and again, such fast conveyance system of stormwater is neither environmentally sustainable nor resilient to the extreme weather events. The channels have not only a limited capacity to contain all the loads of stormwater but also limited entering points to let the stormwater inflow to the channels. In events like heavy precipitation the entering points cannot manage the intensity of rain and the channels cannot receive the total amount of rainfall and thus, the stormwater will overflow on the streets and other public spaces of the city. Frequency of flooded streets in recent years reveals that the current stormwater management infrastructure does not have enough capacity to manage the urban runoff and that the system is only functional under normal weather conditions. Furthermore, the urban open spaces of the city cannot assist the stormwater management process of the city in emergencies. The failure of the current infrastructure is even more critical in a time when all the cities around the globe are going to experience more frequent extreme weather events of a changing climate including destructive floods (Figure 6)

3.4 SWALLOWED GREENERY IN FAVOR OF A GRAY CITY

Over the centuries, Lahijan was known as a green city with rich and beautiful landscape. Due to the availability of fertile soil and rainfall, city's economy was mainly centered on agriculture, and vast areas of rice and tea cultivations were among the main components to shape the inner and outer landscape of the city. In recent decades, however, Lahijan is losing its original character as a green city; agricultural fields have been swallowed to provide space for new developments, and single-family houses are being replaced by multi-story buildings to accommodate the growing population. Urban forests are destroyed while a few urban parks and sport pitches are added. Consequently, the green character of Lahijan is weakened and a strong division between the natural and built environment is happened. Less greenery in the city means decreased area of permeable and soft surfaces and higher risks of erosion and flash floods due to the increasing area of impervious and hard surfaces. The figures from Municipality of Lahijan reveal that just in the last 40 years, some 250 hectares of cultivated fields and other green open spaces are replaced by various impervious surfaces including roads and streets, paved paths and rooftops.

In addition to lower degrees of perviousness and less on-site stormwater management capacities, the expanding dark and hard surfaces of Asphalt and concrete exacerbate the Urban Heat Islands effects inside the city. On the contrary, neighborhood parks and other large green spaces, which enjoy much cooler environment than other parts of the city in warm seasons, are becoming very rare. Based on the available

data from Iran's national Meteorological Organization (1956-2014), both average minimum and maximum air temperature in Lahijan has increased, a trend which is expected to continue in the future. The higher levels of air temperature in warm seasons increase the energy demands to condition the indoor spaces, which cause further temperature rise in urban areas.

4 DISCUSSION: ENGAGING TRADITIONAL PRACTICES TO THE NEW URBAN WATER MANAGEMENT PARADIGM

In parallel with demographic shifts, Iranian culture is also changing, becoming more consumerist and wasteful and less environmentally friendly. Despite the fact that Iran has limited sources of water, it is exhaustively exploiting and extensively polluting them, imposing so much pressure on its natural water cycles. Due to the limited availability of fresh water and to move towards sustainability of such rare resources, there is a certain need to rethink of our available water and our consumption patterns.

Following the concept of the water sensitive city which emphasizes the unseen potential of cities as 'water supply catchments (Wong & Brown 2009), the future sustainable urban water management must provide access to a diversity of water sources through centralized and decentralized infrastructure. Such diversity reduces the stress on surface and underground water resources, and introduces new sources of water including rain and stormwater to the urban water systems. The revival of traditional water harvesting systems of the region can play an important role in proposing new strategies which benefit from traditional knowledge and solutions as well as advanced technologies of the current time. As explained earlier, distributed water systems and the practices of rainwater harvesting and building cisterns and storage tanks to collect and store the water are not alien concepts in Iran, and particularly in Guilan region. On the contrary, while such practices were common in the past, they are currently almost forgotten and not in use anymore. Recently, however, there is a growing awareness about the importance of stormwater as a valuable source of water and asset for the city. Rather than larger withdrawal and long distance transfer of fresh surface water or extraction of groundwater, stormwater can be stored, treated and reused for various potable and non-potable purposes. For example, stored rainwater can be used for toilet flush or fire sprinklers when treated. Moreover, rainfall and urban runoff are the main sources to recharge depleted groundwater aquifers. Reintroducing rainwater as an alternative source of water of the city decreases the stress on surface and ground water resource and thus, contributes to the sustainability of fresh water resources. Furthermore, collecting rainwater and reusing it for non-potable purposes, rather than mixing it with wastewater and discharging it to the sewers, reduces the loads of waste entering the wastewater management infrastructure and the pressure on Lahijan's water treatment facility.

The current stormwater management infrastructure of the city is a set of surface channels and underground conduits with limited capacity in conveyance of stormwater out of the city. In addition to inefficiency of the existing infrastructure, the current design of the urban spaces is not of any assistance. Among others, the rapidly expansion of hard surfaces is a very important factor to further uncover the weak performance of the current drainage system of Lahijan. An overview of the present status of the city reveals the limited number of green open spaces (soft surfaces) in Lahijan and their uneven distribution within the city. This makes some parts of the urban fabric very vulnerable, so that if the underground wastewater infrastructure fails to manage the urban runoff in case of heavy rains, the urban environment is not resilient enough to adapt to the situation to receive and manage the excessive water temporarily. Hence, the limited capacity of the current drainage of Lahijan along with low on-site stormwater management capacities of the urban spaces calls for a changing paradigm in design of public spaces including urban squares and streets to reduce the impacts of unpredictable weather events.

According to Novotny *et al.* (2010), “the conventional approach which is based on fast conveyance systems should change to storage-oriented, slow-release systems characterized by storage in ponds, on flat roofs, in underground cisterns, ponds, lakes, etc.; infiltration into shallow aquifers; soft treatment (rain garden, bio-filters, earth filters, wetlands, ponds); slow conveyance in grassed swales (rain gardens) and natural or nature mimicking surface channels. Fast conveyance has no social benefit except getting rid of water as quickly as possible.” (p.186) The shift from strictly engineered systems of urban sewers to nature-oriented network of water sensitive urban spaces (Wong & Ashley, 2006) will not only reduce the environmental impact of the urban water system but also provide social amenities and contribute to the higher quality of urban environment and life of the communities.

Borrowed from Ahern’s classification of landscape elements in designing the green infrastructure of cities (2007), Lahijan’s urban surfaces must change to increase their various storage, infiltration, and evaporation capacities. Such capacities will improve the distributed onsite stormwater management possibilities in Lahijan and turn the city into a functioning urban landscape in which each and every component plays a role to sustain the system. Publicly owned green spaces and water bodies such as parks, sport fields, gardens, cemeteries, campuses, vacant lands, wetlands and lakes are examples of urban land use and surfaces that can shape the water sensitive patches of any given urban landscape. In addition to patches, water sensitive corridors would also play critical roles as the main connectors to form and define the backbone of a nature-oriented stormwater management infrastructure of the city. Long strips of publicly owned land within the city including canals, streams, drainage ways and green streets are examples of such corridors to shape the green network of urban landscape.

Rehabilitating and modifying Lahijan’s pond and reintegrating it to the stormwater management infrastructure can be yet another step to build new concepts based on old traditions to achieve the sustainability of urban water management system. In other words, under the new water sensitive urban paradigm, instead of large distance transfers of stormwater, on-site and local harvesting and treatment will form a distributed urban water system, in which the pond plays a crucial role. Moreover, such surface stormwater management system provides recreational amenities to the community and contributes to the aesthetic qualities of the city.

In addition to increasing on-site stormwater management capacity of different urban spaces, creating a distributed yet well-connected network of such water sensitive surfaces within the city is important. Such a network of urban surfaces, however, is not a natural network, mimics the characteristics of a natural landscape. Thus, connectivity is considered as one of the most significant characteristics of a well-functioning landscape. The urban landscape of Lahijan today is suffering from low connectivity. The landscape elements are either disappeared and replaced by urban elements or fragmented and highly separated from each other. Despite the fact that the concept of connectivity is highly related to water flows and a fragmented hydrological system is not capable of well-functioning, water systems seem to be among the most affected ones; in which they are largely disconnected after the development of grey (civil) infrastructure of the city. The significance of connectivity is important in achieving the resiliency of the system, so that if part of the system fails to function, the rest of it goes on and prevents the collapse of the whole system (Figure 7).

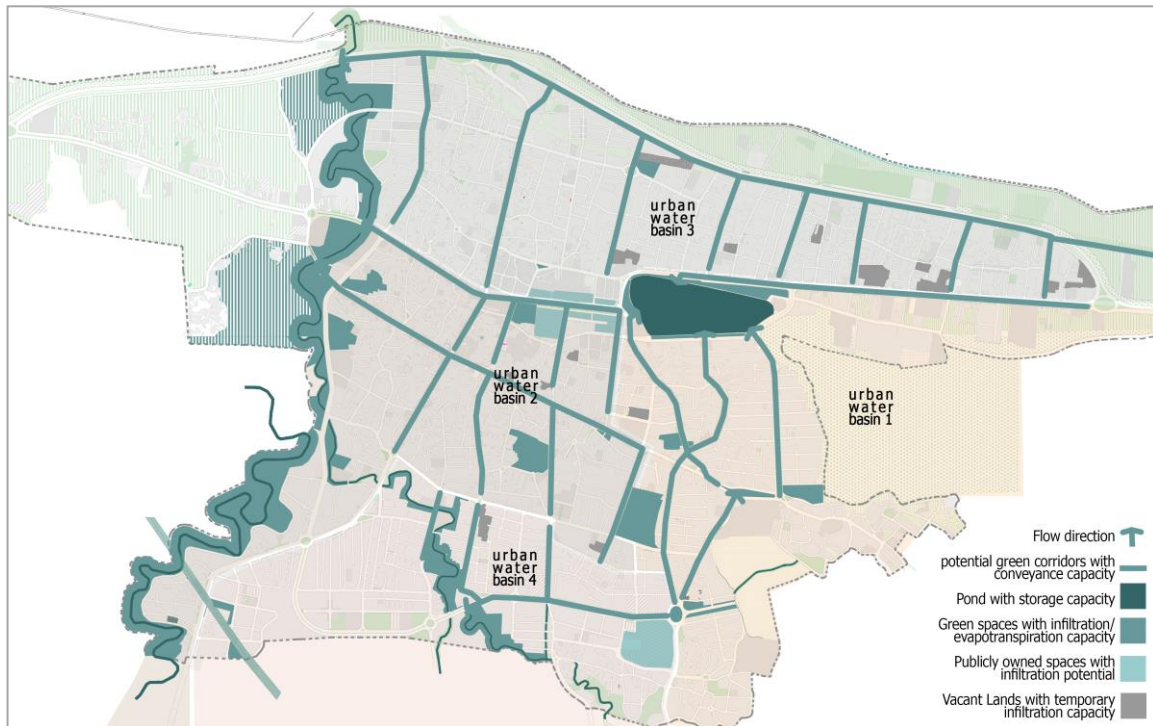


Fig. 7 A scheme of the network of water sensitive public spaces of Lahijan

Due to the small size of the city, the enhancement of the grid of green spaces offers all urban residents walking distances to one or more of such green spaces. Besides their functions, the green spaces will improve the quality of the urban environment and will contribute to the revitalization and regeneration of the green character of Lahijan.

Among the other benefits of increasing on-site stormwater management practices through water sensitive urban surfaces is its effect in moderating the temperature extremes and cooling down the urban spaces. Such capacity is highly appreciated in present time when the city is affected by Urban Heat Island (UHI) phenomenon and the urban areas are experiencing warmer temperature than the surrounding rural environments. Water evaporation absorbs a considerable amount of heat energy. Evaporation of water --direct evaporation from surrounding bodies of water or evapotranspiration from vegetation and surrounding soils, raises the moisture content of surrounding air, lowers the air temperature, and therefore cools down nearby surfaces. Hence, availability of water in urban spaces is the first requirement to apply passive evaporative cooling strategies. As discussed earlier, water can be provided through presence of ponds, pools, fountains as well as vegetation in urban spaces. Brophy *et al.* argues, "the presence of a body of water will help to moderate temperature extremes due to its high thermal storage capacity. ...The temperature of hard landscaping materials can be lowered when water is sprinkled, run over or through them. This is especially beneficial in built-up areas with large surfaces of heat retaining materials, exposed to high solar radiation." (2000, p.13) accordingly, encouraging on-site stormwater management practices inside the city through improving various conveyance, storage, evaporation and infiltration capacities of urban runoff assures the stronger and longer presence of water in public paces of the city, and mitigates the negative impacts of UHI effects inside Lahijan.

5 CONCLUDING REMARKS

The current stormwater management system of Lahijan is neither sustainable to accommodate the future water demands of the city, nor resilient to adapt to the conditions of a changing environment. To overcome such challenges, the stormwater management system of Lahijan must change to become an integrated part of the urban design of the city. After the long period of absence of water in urban settings, water must become a key component in design of the public spaces, which its real values are celebrated and its many benefits are revealed.

To achieve the sustainability of our fresh water resources and to reduce the stress on surface and underground waters, stormwater would be considered an asset and resource of the city rather than a menace. The analysis of the urban water state of the traditional city reveals that stormwater has been an integrated part of the design of Lahijan's public spaces for centuries, and that the urban spaces through various storage, conveyance, infiltration, and evaporation capacities were shaping the key elements in constructing the landscape of the porous city of Lahijan. Accordingly, urban spaces of the future water sensitive city would become an integrated part of a distributed on-site stormwater management to adapt to the impacts of a changing environment. Connecting stormwater water management with place-making will provide higher living standards for the citizens, and it will also address the problems of water scarcity, flooding and pollution. Water sensitive urban surfaces provide the possibilities to collect rainwater and reintroduce it as a source of non-potable water to urban water system; to hold excess amount of water in case of heavy rain and discharge it slowly; to increase the groundwater recharge potentials and decrease the discharged wastewater to public sewers, and so forth. Thus, water sensitive public spaces help communities to achieve the sustainability of their local water resources and the resiliency of their urban environment.

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IMAGE SOURCES

Cover Figure: Lahijan Pond from Ramin Shoraka

Fig. 1, 2, 4, 5, 7: figures from the author

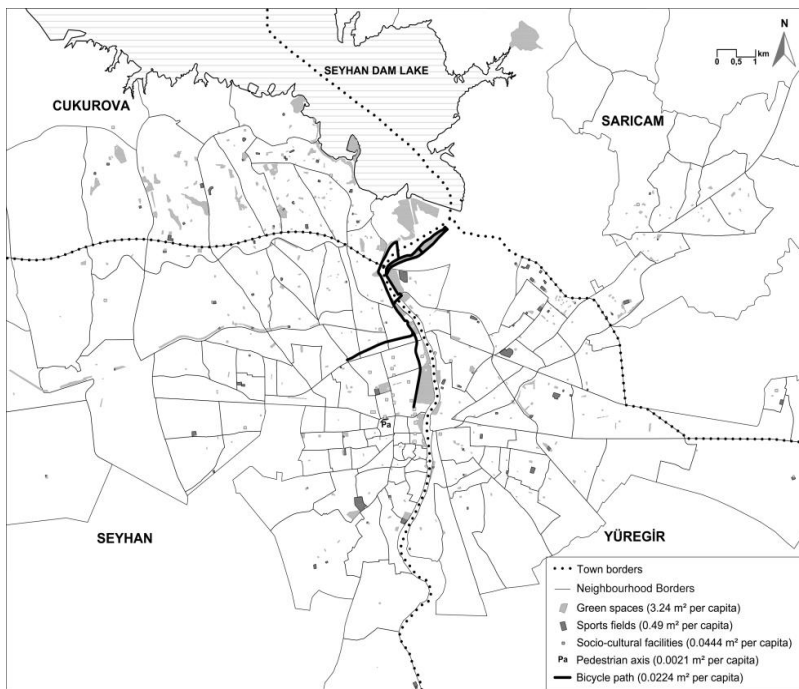
Fig. 3, 5: figures from Lahijan Municipality archive

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THE EFFECTIVENESS OF URBAN GREEN SPACES AND SOCIO-CULTURAL FACILITIES

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ABSTRACT

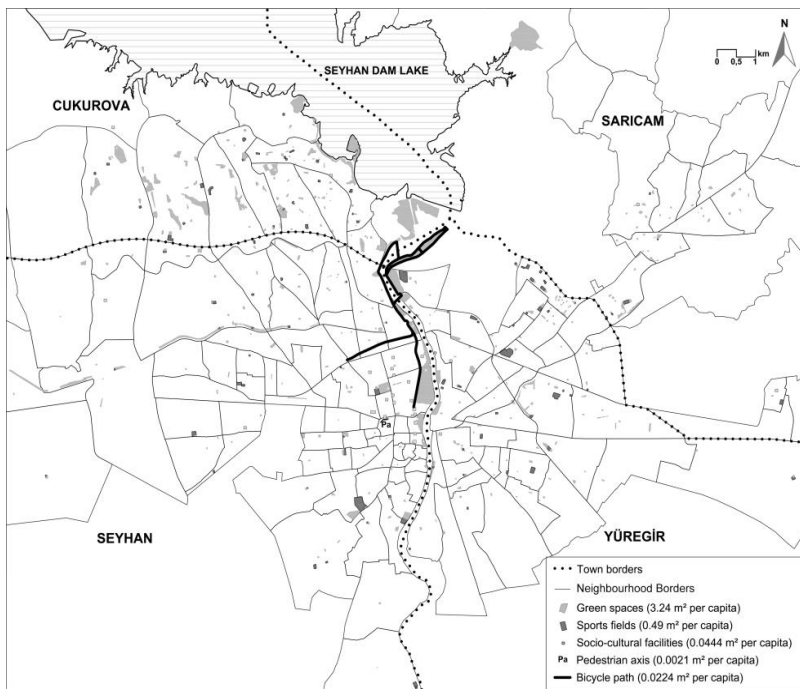
This paper aims to develop a theoretical approach for mapping and determining the effectiveness of green spaces and socio-cultural facilities as providers of urban ecosystem services and urban services in the case of Adana, Turkey. Firstly, green spaces and socio-cultural facilities per capita have been determined and indexed for the neighbourhoods in the city. Then, a distance-based method for estimating the effectiveness of these facilities was used. The distances between the various neighbourhoods and between a given facility and the farthest threshold have been measured and these values have been used to determine the facility effectiveness change value for each neighbourhood. Then, effective values have been calculated and indexed by incorporating the green space and socio-cultural facility values and the effectiveness change values for the neighbourhoods. Finally, point-based effective green spaces and socio-cultural facilities index values have been converted to continuous surface values in a GIS (geographic information system) environment in order to utilize as a base map for urban physical planning purposes. According to the outcomes of this study, the distribution of green spaces and socio-cultural facilities of the neighbourhoods are imbalanced and index values of these facilities range in between 45 and 84 out of 100.

KEYWORDS:

Effectiveness Change Value; GIS; Index Map; Index Value; Socio-Cultural Facilities; Urban Green Spaces

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城市绿色空间与社会文化设施的效益

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摘要

本文旨在建立一种理论方法，帮助土耳其阿达纳的城市生态系统服务和城市服务提供商设计并确定绿色空间与社会文化设施的效益。首先，为城市社区确定了人均绿色空间和社会文化设施并进行了指数化处理。然后，采用基于距离的方法对这些设施的效益进行了评估。对不同社区之间的距离和给定设施之间的距离以及最远的阈值进行了测量，这些测量值已被用来确定各个社区的设施效益变化值。然后，通过合并绿色空间和社会文化设施的价值以及社区的效益变化值计算出了有效值，并进行了指数化处理。最后，基于分数的有效绿色空间和社会文化设施的指数值被转换为GIS（地理信息系统）环境中连续的表面值，以使用作城市实体规划的基图。根据本研究的结果，社区的绿色空间和社会文化设施的分布并不平衡，这些设施的指数值范围介于45和84之间（满分100）。

关键词：

效益变化值；GIS；指数图；指数值；社会文化设施；城市绿色空间。

1 INTRODUCTION

Quality of urban life is quantified by the physical, social and economic characteristics of the urban environment and its inhabitants. Social and economic characteristics are excluded from this research, which focuses on green spaces and socio-cultural facilities although physical characteristics do include components of urban systems.

Urban systems are traditionally able to deliver services for the fulfilment of human needs via the provision of urban services, which are defined as public services and facilities that are historically and typically provided in cities. Urban services are provided by society, generally without the direct use of ecosystems, and include basic provisions such as sanitary sewer systems, Storm drainage systems, domestic water systems, fire and police protection services, public transit services, road construction services, sidewalks, street and road lighting systems, parks and recreational facilities, schools, social and cultural facilities, public health and environmental protection, and so on (Antognelli & Vizzari, 2016). These areas, particularly urban green spaces as providers of urban ecosystem services (e.g., air purification, groundwater recharge, erosion prevention, crop or biomass production), are of great importance for urban aesthetics, culture and recreation as well as, for harmonizing green areas, urban structure and urban ecosystems (Baycan-Levent & Nijkamp 2009; Gomez et al. 2011; Haq 2011; Coolen & Meesters, 2012). The diversity and richness of these areas and spaces contribute to the physical and mental health of urban inhabitants. Additionally, it improves social networks, solidarity, spatial identity and urban culture by enabling various social activities of urban inhabitants (Cohen 1996; Gangloff 1995; Kotler et al. 1997; Bolund & Hunhammar 1999; Madanipour 1999; Willis et al. 2001; Jim 2004; Kabisch & Haase 2013).

The presence of green spaces and socio-cultural facilities in a city can be expressed either qualitatively (e.g., high, medium, low or sufficient, medium sufficient, insufficient) or quantitatively (e.g., total and per capita amount). However, urban life has many components (income and education, housing type and quality, urban green space etc.) and the description of these components with a single criterion is an important constraint. Therefore, creating a common single unit is essential in order to compare and combine all these components and to obtain a life quality value. The index value, as a measurement unit, defines a system both as a whole and by pieces and is an important tool to solve this constraint. The Human Development Index (HDI), Index of Sustainable Economic Welfare (ISEW), Recreation Opportunity Index (ROI), Perceived Quality Index (PQI), Green Index, and Open Space Index (OSI) are some of the indices that define social, economic or physical life quality of the public.

Another question is to decide which values to index for the studied characteristics. Green spaces and socio-cultural facilities are defined by the area (m²) per capita. For example, per capita standards in Turkey are as follows: total 2.5 m² for libraries, museums, theatres and concert halls, cinemas and exhibition places; total 2 m² for pedestrian and bicycle path widths total 20 m² for picnic areas, arboretums, woodland; 20 m² for urban parks; 10 m² for community parks; 8 m² for neighbourhood parks; 6 m² for playgrounds; 8 m² for sports fields; and 0.075 m² for swimming pools (Gurbuz 2012).

This figure is inadequate in evaluating the effectiveness of these areas, the spatial distribution of which may be unbalanced. Some parts of the city may have facilities with high levels of opportunities and diversity, whereas other parts may have poor levels of the same. In such a case, the inhabitants living in areas with poor facilities will tend to use facilities at adjacent neighbourhoods, in which case the use of such facilities will be overloaded by the other users from outside of the neighbourhood. As a result of this over-use, the effectiveness of these facilities will be diminished. The distances of facilities to people's homes should be incorporated with indices calculated on per capita values to create employable indices within urban plans. Integrated index values calculated for each neighbourhood will define the effective supply of green spaces and socio-cultural facilities in a city (English & Cordell 1993; Marcouiller et al. 2009).

Integrated index values indicate urban areas and effective facility levels of the neighbourhoods included in the study. These indices need to be mapped in order to be integrated into the planning process properly. Thus the effectiveness of the facilities in each part of the city will be determined easily through this map. The most important function of these maps are their ability to facilitate a decision support system for the planning and application process of green spaces and socio-cultural facilities which are well balanced with the needs of urban areas.

This study aims to test the application of a theoretical approach for mapping and determination of the effective supply of green spaces and socio-cultural facilities in the example of Adana City, the 5th largest city in Turkey. In the first phase of the study, 16 facility types have been indexed and the average per capita has been calculated for city and neighbourhood scales. These values have been combined with effectiveness change values as a result of the calculated distances to homes and re-indexed to determine the effective supply of the 16 facilities (urban park, community park, neighbourhood park, playground, sports field, swimming pool, picnic area, arboretum, woodland, pedestrian axis, bicycle path, library, museum, theatre and concert hall, cinema, exhibition place). In the second phase, index values have been interpolated within a GIS environment to create contours. As a result of this work a baseline map was created for urban planning.

It can be concluded that the distribution of green spaces and socio-cultural facilities are unbalanced, which diminishes the effectiveness of facilities in the neighbourhoods studied.

2 MATERIALS AND METHODS

2.1 STUDY AREA

Adana, as the 5th largest city in Turkey, is also the centre of the Çukurova Metropolitan area. Agriculture and agricultural industry is developed within the region as it is largely covered with the most fertile soils in the country. This development creates a large employment capacity which results in migration from the countryside to the city. Thus, the population increased from 500,000 to 1,700,000 in between 1980 and 2015. Housing needs of this population were prioritized in the urban development plans of 1990-2010. However, green spaces, recreational and socio-cultural facilities were not developed sufficiently and green area per capita decreased inversely with the population increase. On the other hand, the ecological potential of the city offers great opportunities for the establishment of these facilities. When compared with the other parts of the country, the cities inhabitants spend longer periods doing outdoor activities due to the location of the city in the Mediterranean region, which is characterised by mild and rainy winters and hot summers. The city has a mostly flat topography. Seyhan River, which crosses the city, and Seyhan Dam Lake, located in the northern area of the city, offer great potential for recreational activities. The utilization of all of this potential in the development of green spaces and socio-cultural facilities will increase the quality of urban life in many ways (Berberoğlu et al. 2000; Altunkasa & Uslu 2004; Uslu et al. 2012; Adana Urban Council, 2015).

A new law in Turkey was introduced in 2008 to share the authorization and responsibilities of the municipalities with town administrations. As a result of this, urban development plans are approved by representatives of town municipalities together with the city council, thus authorization and responsibilities are shared amongst municipalities. In this respect, Adana city has been divided into four towns, namely Çukurova, Sarıçam, Seyhan and Yüreğir by the borders of the Seyhan River and the main irrigation channel. These towns include 146 neighbourhoods (Çukurova: 14; Sarıçam: 19; Seyhan: 74; Yüreğir: 39). The populations in 2014 were 330,000, 110,000, 840,000 and 420,000, respectively, for Çukurova, Sarıçam, Seyhan and Yüreğir (Uslu et al. 2012; Adana Urban Council 2015).

2.2 METHODS

Socio-cultural facilities are well developed in Seyhan, which covers the old city centre and surrounding urban development area, and in Çukurova which is a new urban development area. Rural and agricultural life style is still dominant in Sarçam and Yüreğir where the population consists of immigrants from other parts of Turkey.

The study is implemented in four stages:

I Calculating green spaces and socio-cultural facilities index (*GSSF*)

In this phase, 16 facilities within the four towns and 146 neighbourhoods have been converted to area per capita by using city and town municipality inventory reports, aerial photos and ground truth. Herein, different populations have been used for each facility according to its service characteristics: city population for urban parks, arboretums and museums; town population for community parks, picnic areas, woodlands, libraries, theatres and concert halls, cinemas, exhibition places, pedestrian and bicycle paths; and neighbourhood population for other facilities have been used to calculate area per capita. The highest possible value is assumed to be 100 for each facility and other values have been calculated relative to this value. Thus, unweighted index values (*UIV*) for each facility have been derived from the neighbourhoods of the four towns. The priority level of each facility is a crucial question. Gold (1980), English & Cordell (1993), Dunnett et al. (2002) and Gilliland et al. (2006) emphasized that considering all planning units equally may cause misleading results. Thus, the *UIVs* for each facility have been weighted. Gold (1980) points out that a planning process without the contribution of decision makers, planners and users will not progress well. Having considered this fact, weights ranging between 1 and 10 have been assigned by 20 decision makers, 20 planners and 600 randomly selected users. Planners consist of city planners, architects and landscape architects employed in Çukurova University, each having a PhD degree. The total number of these staff was 20 during the implementation period of this research. Decision makers are composed of four members from each metropolitan municipality and four town administrations. This composition enabled a good balance between the two groups. The user survey was implemented using 600 people based on the sampling size recommended by Arkin and Colton (minimum 400 users for settlements with a population of over 100,000) (Pulido 1972). One hundred and fifty randomly selected users over 18 years of age from each town area (total 600 users) have been interviewed face to face, 46 of whom were discharged due to inconsistencies and protests in their answers.

It has been observed that weight values vary between 1-3, 1-5, -3-3, 1-6, 1-10, 1-100 in the literature. Gold (1980) and Giles-Corti et al. (2005) emphasise that the range of weight values may be small if the elements under evaluation are similar in terms of concept, whereas the range of weights should be large for elements with large number and diversity in order to increase discrimination. This research maintains weight values of between 1 and 10 for the 16 different facilities.

Another constraint is that the three actors in the planning progress have different aims and objectives. Gold (1980) points out that political pressures may affect the behaviour of decision makers. They are expected to make investments in the short term, using small budgets to maximum benefit as they have limited time. However, planners aim to reach maximum benefit for the public through a more systematic approach. On the other hand, users seek maximum benefit with minimum willingness to pay. As a result of these differences, the three actors should have different weights for the planning process. The average weight values of planners, users and decision makers have been multiplied by coefficients of 3, 2 and 1, respectively, as suggested by Gold (1980). Weighted scores (*WS_i*) of each facility have been calculated by averaging the weighted values. Weighted index values (*WIV*) for each facility have been calculated by multiplying the *WS_i* with the *UIV*. Values for the green spaces and socio-cultural facilities (*GSSA*) for each neighbourhood have been calculated by

averaging weighted index values and scaled between 0 and 100. Consequently, a green spaces and socio-cultural facilities index (*GSSFI*) of the 16 facilities for the 146 neighbourhoods has been derived.

II Calculating effectiveness change (*EC*) values

calculating effectiveness change (*EC*) values: English & Cordell (1993), English et al. (1993), Coles & Caserio (2003), Giles-Corti et al. (2005), Stahle (2010) and Peschardt et al. (2012) point out that the effectiveness of facilities is assumed to change linearly with distance. This change in effectiveness describes the relationship between two different spatial distances (D_{xy} and TD_i) with the following definitions:

D_{xy} = the linear distance between the centres of any two neighbourhoods x and y ,

TD_i = the longest linear distance between facility i and the threshold regardless of the boundaries of neighbourhoods.

D_{xy} and TD_i values were derived using digital aerial photos of the city within a GIS environment. Measured TD_i values for each of the 16 facilities have been weighted through multiplying by the WS_i and a weighted average of the obtained values have been used to form the integrated threshold distance (*ITD*) values.

EC_{xy} value for green spaces and socio-cultural facilities of any two interacting neighbourhoods (x and y) have been calculated using a modified version of the method of English and Cordell (1993) described below:

$$EC_{xy} = 1 - (D_{xy}/ITD) \text{ if } D_{xy} < ITD$$

$$EC_{xy} = 0 \text{ if } D_{xy} > ITD$$

III Calculating effective green spaces and socio-cultural facilities index (*EGSSFI*) values

The *EGSSFI_x* value for any neighbourhood x depends on the *GSSFI_y* value of neighbourhood y and the relation between the EC_{xy} values of two neighbourhoods and this relationship is described as (English & Cordell 1993; English et al. 1993):

$$EGSSFI_x = \frac{\sum_{y=1}^n (GSSFI_y * EC_{xy})}{\sum_{y=1}^n EC_{xy}}$$

$n = 146$ neighbourhoods.

For any neighbourhood, the most important determinants of the *EGSSFI* value are green spaces and socio-cultural facilities available in that neighbourhood. Proximity to a neighbourhood with good opportunities may greatly augment the effective supply. Similarly, proximity to other neighbourhoods with large population concentrations and few opportunities will reduce the effective green spaces and socio-cultural facilities when these competing populations are taken into account. Small neighbourhoods have larger adjustments due to surrounding ones because of the greater effectiveness changes associated with the surrounding neighbourhoods (English & Cordell 1993; Van Herzele & Wiedemann 2003; Germann-Chiari & Seeland 2004; Schipperijn et al. 2010; Stahle 2010; Yildiz et al. 2011; Kabisch & Haase 2014).

A flowchart summarizing all of the steps described above, as well as each of the acronyms, is provided in Figure 1.

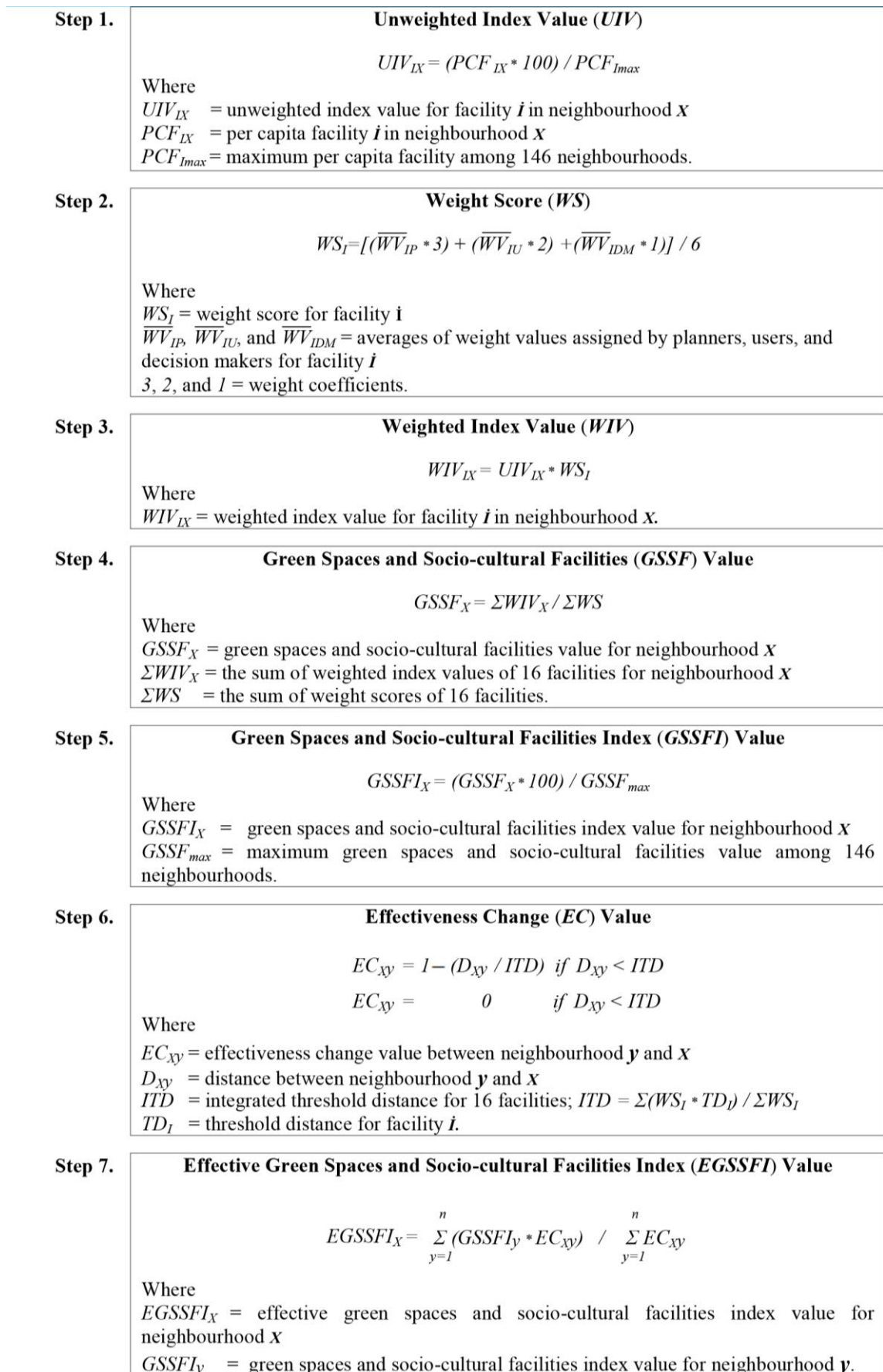


Fig. 1 Flowchart for calculating EGSSFI values.

IV Mapping *EGSSFI* values

mapping *EGSSFI* values: The *EGSSFI* values of the 146 neighbourhoods describe the effectiveness of green spaces and socio-cultural facilities, however, these values are not spatial. In other words, the *EGSSFI* value of a neighbourhood represents the whole neighbourhood. However, the *EGSSFI* values may vary with distance over the area. In such a situation, determining *EGSSFI* values over the city regardless of neighbourhood boundaries would be a more appropriate approach. Converting *EGSSFI* values to contours on a map will enable planners to evaluate the spatial distribution of this index. This approach is implemented in a GIS environment by interpolating point values of *EGSSFI* onto contours. To that end, digital aerial photographs are used as raw data, with a requirement for georeferencing with ground coordinates. This process has been performed by resampling the photographs into a Universal Transverse Mercator (UTM) projection system using ERDAS Imagine 9.1 software. Following the geometric registration, the central pixels of each neighbourhood have been determined and *EGSSFI* values have been assigned. In the final stage, these values have been interpolated using inverse distance weighting (*IDW*) to produce the effective green spaces and socio-cultural facilities index map. The distribution of *EGSSFI* values occurred in a large range (45-85), thus creation of contours for each value might cause difficulties in interpretation, which decreases the practical use in the physical planning process. For this reason, *EGSSFI* values were grouped into 8 classes (45.0-50.0; 50.1-55.0; 55.1-60.0; 60.1-65.0; 65.1-70.0; 70.1-75.0; 75.1-80.0; 80.1-85.0) and these classes were integrated into the map. *EGSSFI* values can be considered to be an important tool in the making of development plans for a particular location in terms of the levels of green spaces and socio-cultural facilities across the city.

3 RESULTS

The spatial distribution of green spaces and socio-cultural facilities which have been derived from Adana metropolitan and town municipalities' inventory reports, development plans and digital air photographs is shown in Figure 2.

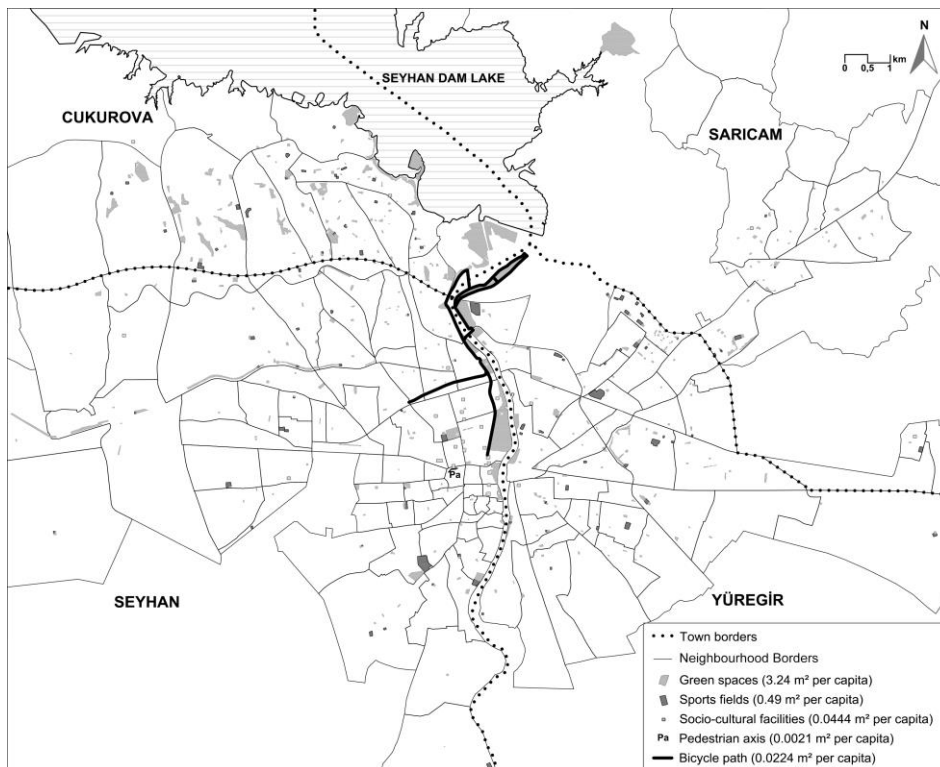


Fig. 2 The spatial distribution of green spaces and socio-cultural facilities.

The amount of green space and socio-cultural facility area per capita for the four towns is given in Table 1. Additionally, the WS_i , TD_i and ITD values which were used to calculate the $GSSF$ and EC , are also shown in Table 1.

Facilities	Per capita green space and socio-cultural facility (m2)										Weight score (WS_i)	TD_i (m)
	Çukurova		Sarıçam		Seyhan		Yüreğir		Average value for city			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)				
Urban park	0.25		0.25		0.25		0.25		0.025	8.942	13124	
Community park	0.29		0		0		0		0.06	8.770	13825	
Neighbourhood park	1.44	33.76	1.45	3.45	0.80	54.40	0.69	13.01	0.93	8.785	5080	
Playground	2.19	23.64	0.30	2.92	0.88	13.67	1.42	7.92	1.22	8.912	5162	
Sports field	0.35	13.35	0.52	3.88	0.26	3.70	0.71	7.45	0.42	8.758	6291	
Swimming pool	0.01	0.41	0.03	0.17	0.01	0.16	0.01	0.14	0.01	7.960	5576	
Picnic area	3.04		0		0		0.06		0.58	8.202	10347	
Arboretum	0.22		0.22		0.22		0.22		0.22	7.889	16829	
Woodland	0.68		0		0.16		0		0.21	7.177	12175	
Pedestrian axis	0		0		0.0032		0		0.0021	8.396	13778	
Bicycle path	0		0		0.0301		0.0308		0.0224	7.907	11601	
Library	0.0012		0.0026		0.0014		0.0015		0.0015	7.509	8069	
Museum	0.0021		0.0021		0.0021		0.0021		0.0021	7.460	12457	
Theatre and concert hall	0.0124		0		0.0282		0		0.0162	8.545	11824	
Cinema hall	0.0064		0		0.0212		0.0062		0.0132	8.449	12720	
Exhibition place	0.0512		0		0.0021		0		0.0114	7.353	12639	

(1) Average value for town, (2) The highest value measured between neighbourhoods in each town.

Tab. 1 Distribution of green space and socio-cultural facility area per capita in the towns of Adana City, weight values of 16 facilities (WS_i) and threshold distances (TD_i).

Table 2 includes the lowest and highest $EGSSFI$ values in the 146 neighbourhoods within the four towns together with UIV , $GSSF$, $GSSFI$ and ΣEC values. $EGSSFI$ values of other neighbourhoods ranged between the highest and lowest values.

	Unweighted Index Values (UIV)														$GSSF$	$GSSFI$	ΣEC	$EGSSFI$		
	Up	Cp	Np	Pg	Sf	Sp	Pia	Arb	Wdl	Pa	Bp	Lib	Mus	Tch					Ch	Ep
Çukurova																				
1	100	100	7.5	16.5	0.2	0	100	100	100	0	0	46.2	100	44.3	28.6	100	51.6	80.9	64.3	67.7
13	100	100	0	0	100	100	100	100	100	0	0	46.2	100	44.3	28.6	100	62.7	98.3	1.8	84.3
Sarıçam																				
19	100	0	0	0	0	0	100	0	0	0	0	100	100	0	0	0	24.3	38.1	13.3	70.3
21	100	0	0	0.00	0	0	100	0	0	0	0	100	100	0	0	0	24.3	38.1	16.8	45.0
Seyhan																				
62	100	0	0	1.6	0	0	100	2.1	100	100	53.8	100	100	100	100	3.9	47.5	74.4	16.8	45.1
99	100	0	85.6	0	0	0	100	2.1	100	100	53.8	100	100	100	100	3.9	53.1	83.2	27.4	76.9
Yüreğir																				
119	100	0	0.8	10.0	41.1	0	1.9	100	0	0	100	57.7	100	0	28.6	0	33.3	52.2	72.2	65.5
146	100	0	0	32.3	0	0	1.9	100	0	0	100	57.7	100	0	28.6	0	32.0	50.2	28.8	48.6

Tab. 2 The lowest and highest $EGSSFI$ values and UIV , $GSSF$, $GSSFI$ and ΣEC values of 16 facilities within the 146 neighbourhoods of the four towns.

Analytical example of calculating GSSF and EGSSFI values for neighbourhood number 146:

$$GSSF = (100 * 8.942 + 0 * 8.770 + 0 * 8.785 + 32.3 * 8.912 + 0 * 8.758 + 0 * 7.960 + 1.9 * 8.202 + 100 * 7.889 + 0 * 7.177 + 0 * 8.396 + 100 * 7.907 + 57.7 * 7.509 + 100 * 7.460 + 0 * 8.545 + 28.6 * 8.449 + 0 * 7.353) / 131.014 = 32$$

$$EGSSFI_{146} = (GSSFI_{146} * EC_{146} + GSSFI_1 * EC_{146,1} + GSSFI_2 * EC_{146,2} + GSSFI_3 * EC_{146,3} + \dots + GSSFI_{143} * EC_{146,143} + GSSFI_{144} * EC_{146,144} + GSSFI_{145} * EC_{146,145}) / \sum EC_{146}$$

An effective green spaces and socio-cultural facilities index (EGSSFI) map is shown in Figure 3.

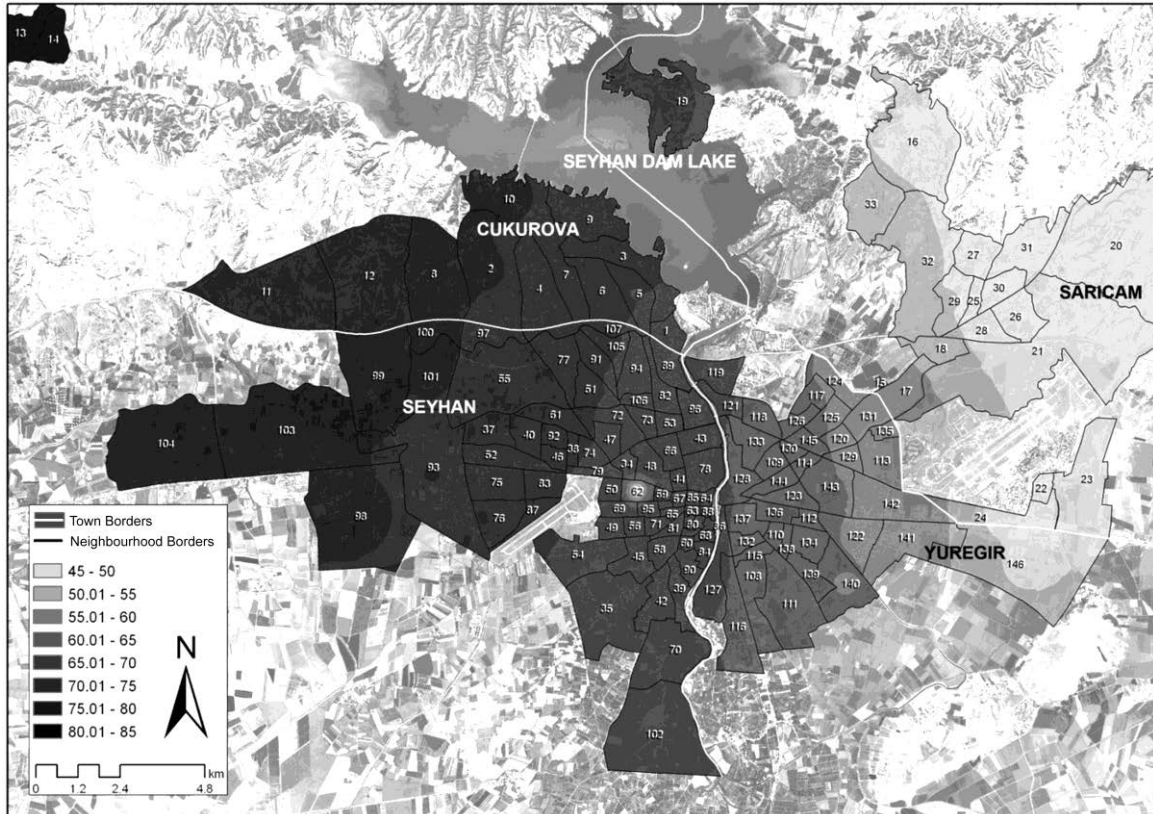


Fig. 3 Effective green spaces and socio-cultural facilities Index (EGSSFI) map.

The interpretation of Tables 1 and 2 and Figures 2 and 3 can be summarised as follows:

- the green spaces and socio-cultural facilities of Adana are below the standards introduced in Turkey. The amount of green space and socio-cultural facilities per capita suggested by national urban planning law and the ratio of the current amount to the suggested amount are given in parentheses as follows: 2.50 m² for libraries, museums, theatres and concert halls, cinemas, exhibition places (0.2%-2.9%); 2 m² for pedestrian and bicycle paths (0%-1.7%); 20 m² for picnic areas, arboretums, woodland (1.1%-19.7%); 20 m² for urban parks (1.3%); 10 m² for community parks (0%-2.9%); 8 m² for neighborhood parks (8.6%-18.1%); 6 m² for playgrounds (5%-36.5%); 8 m² for sports fields (3.3%-8.9%); and 0.075 m² for swimming pools (13.3%-40%);
- the spatial distribution of green spaces and socio-cultural facilities in the neighbourhoods are unbalanced. Çukurova and Seyhan have more facilities than the others. Seyhan includes more cultural places and historic parks than any other place in the city as it is located centrally and forms the current shape of the city, particularly from the 14th to 20th century. Çukurova is located next to the Dam Lake of Seyhan on an undulating terrain, this environmental structure, including valleys and the coast of the lake, enables

- an increase in the number of parks and woodlands. Development of green spaces and socio-cultural facilities is poor in Sarıçam and Yüreğir, where the rural life style is still the norm. Priority has been given to residential development in these towns, particularly in the neighbourhoods away from the city centre;
- the effectiveness of facilities in a given neighbourhood varies according to the distance to other neighbourhoods having better or poorer facilities due to the unbalanced distribution of green spaces and socio-cultural facilities amongst the neighbourhoods. For example, the *GSSFI* value of neighbourhood number 9 decreases from 100 to 73, whereas the *GSSFI* value of neighbourhood number 19 increases from 38.1 to 70.3. It can clearly be seen that people in poorly facilitated neighbourhoods tend to use the higher level of facilities in adjacent neighbourhoods depending on their distance. As a result of this, the effectiveness of the facilities decreases in the neighbourhoods with a high level of facility due to the increasing population, whereas poorly facilitated neighbourhoods have an increase due to the population tending towards use of facilities in the other neighbourhoods;
 - the spatial distribution of green spaces and socio-cultural facilities can be clearly seen on the maps (Figure 2). Index values decrease from west to east. Urban growth in the west and northwest part of the city took place during the planning revisions in the 1990s. House construction started in the same period, which created opportunities for the growth of green spaces and socio-cultural facilities. There was not such an opportunity on the eastern side due to a long period of unplanned and illegal urban development. Urban transformation projects for the eastern part were introduced in the early 2000s. These projects are expected to speed up the planned development and, consequently, green spaces and socio-cultural facilities shall reach an acceptable level.

4 DISCUSSION

Quantity of green spaces and socio-cultural facilities within a city can be determined with two criteria: quantity per capita and accessibility. Service diversity within a facility is the third criterion which defines quality and quantity together. Service diversity may vary according to social, cultural and economic characteristics, tendencies and demands of the users. It is difficult to set the norms or standards for service diversity as the necessity and sufficiency levels are subjective. Size of the area per capita and accessibility (or distance to homes) can be calculated mathematically and objectively (Gold 1980; Santerre 1985; Phillips 1996; Georgi & Dimitriou 2010; Haq 2011; Higgs et al. 2012; Peschardt et al. 2012). In this respect, the green spaces and socio-cultural facility level of Adana was derived using two criteria, including size of the area per capita and distance to homes.

Coles & Caserio (2003) indicated that the most intensively used open and green spaces are a maximum of 500 m walking distance in their research which was conducted in 15 European cities to determine the effects of accessibility and facility diversity of urban green spaces on usage. Insufficiency of these areas in terms of facility diversity particularly affects the level of short-term usage (maximum 2 hours). For long-term usage, it has been observed that users preferred green spaces to be closer and with highly diverse facilities, however, they should be further than 500 m away. Findings of Giles-Corti et al. (2005) in Perth in Australia showed that accessibility to the green spaces is closely related to the level of usage whereas area and attractiveness have less of an effect. Threshold distance may reach up to 5-6 km for daily use facilities such as neighbourhood parks, playgrounds and sports fields in Adana as a result of insufficiency and uneven distribution of green spaces and socio-cultural facilities. It can be concluded that most of the users are either unable to use these facilities or usage efficiency is poor due to intensive usage of many visitors who come from far away.

The effectiveness method used in this research was proposed by English & Cordell (1993). Similar to this study, there is a clear trend that effectiveness of the facilities decreases in the neighbourhoods with a high

level of facilities due to population pressure from outside, whereas poorly facilitated neighbourhoods have an increase due to lower population use.

English & Cordell (1993) use weights in the range of 1-3 to calculate a weighted opportunity set index (*WOSI*) which is identical to the *GSSFI*. The Adana study is based on stakeholder participation in the planning process. In the first stage, planning experts, decision makers and NGOs determine weights ranging between 1 and 10 for the 16 facilities covered. Average weights of the coefficients assigned by planners, NGOs and decision makers were multiplied by weights of 3, 2 and 1, respectively. Differences in the objectives of stakeholders may result in a large divergence in the values for the 16 facilities so these coefficients have a balancing effect on the values calculated for 16 facilities. These values can be attributed to an adjustment factor to reflect the views of the different stakeholders to the green spaces and socio-cultural facilities.

There are studies mapping some social, economic and physical components of urban life quality in the form of unweighted values or indices. Schyns & Boelhouwer (2002) map the unemployment rate in Amsterdam for example. Point data are interpolated and converted to surface data in the same way as for Adana City. Gilliland et al. (2006) map the playground facilities and demands in the neighbourhoods of London (Canada). Playground facilities and demands are categorised into 5 levels from low to high within the maps and a single value is assigned to whole neighbourhood areas. Li & Weng (2007), map the environmental and economic characteristics of urban life quality in Indianapolis (USA) by converting these characteristics to indices. Present facilities are not associated with distance to homes due to the nature of this study.

These studies show that converting the green spaces and socio-cultural facilities to indices and mapping in the form of contours for the expression of spatial distribution is uncommon in the literature. For that reason, the Adana case study is unique in its mapping approach, which has the potential to bridge the gap in the literature. The effective green spaces and socio-cultural facilities index (*EGSSFI*) map can be used by local administrations as a baseline map in the planning process.

5 CONCLUSION

In the light of the above discussion, solutions which may contribute to an increase of green spaces and socio-cultural facilities to a sufficient level are as follows:

- restricted or limited use of public green spaces (forest, woodland, agricultural land etc.) within the cities should be implemented and use not allowed for other purposes by law. Thus, the unity of green spaces will be protected and this will ensure the existence of reserved areas for new green spaces. The effectiveness of the green spaces will increase in the case of continuity of the green spaces with playgrounds and new parks will be achieved;
- Seyhan Dam Lake at the north and Seyhan River divide the city on a north-south axis. Irrigation channels which border the four towns provide great potential to develop continuous open and green spaces and socio-cultural facilities. These areas should be kept away from urbanisation and reserved to increase green spaces and socio-cultural facilities;
- public and private rural-agricultural lands have been zoned for construction in Sarıçam and Yüreğir towns due to migration from outside of Adana. As a result of this, the land value has increased dramatically. Land owners tended to construct multi-storey buildings to increase their profits. The number of houses within these two towns is approximately 117,000 according to Adana Urban Council (2015) data, this number is very close to the projection for 2020, which is 136,000. Thus, there will be a more than adequate number of houses available as the number of houses grows with this trend;

- In this respect, more land will be needed to meet this demand. The lands allocated for open green spaces will decrease or become fragmented. Thus, the size, accessibility and effectiveness of open and green spaces will diminish. To prevent such a circumstance, some preventive measures can be taken:
 - first of all, improvement of green spaces and socio-cultural facilities should be made, considering the per capita need for green space within urban development plans, and including accessibility and facility diversity. Preventive decisions should be taken to protect these areas. However, the opportunity cost which will result from conversion of built-up areas to open and green spaces is the major problem for the land owners of the expropriation areas. This problem can be solved either by giving an equal amount of land from urban development areas to land owners or by clearing;
 - less profitable rural lands increase their value following the introduction of urban development plans, as a result, land owners and constructors make profits by constructing vertical structures which increases the number of homes per unit area. The parcel sizes in these areas should be enlarged and more space should be allocated for green spaces within these parcels to convert this speculative profit to public benefit. In this way, public open and green spaces can be managed and enhanced without the need for costly actions.

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IMAGE SOURCES

Fig. 1, 2, 3: author's elaboration

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PLANNING ASSIGNMENTS OF THE ITALIAN METROPOLITAN CITIES.

EARLY TRENDS

GIUSEPPE MAZZEO

ABSTRACT

The last stage of the process of establishment of the Italian Metropolitan Cities, which took place in 2014, follows of a few decades the start of this institutional reform. In 1990, in fact, the Act 142 (Local Autonomies Reform) had planned metropolitan areas as the administrative organization more suitable to provide these territories of structures for the management and the strategic development alike the best international models.

The paper proposes to analyse the first activities taken by the Italian Metropolitan Cities in the sector of territorial government, three years after the enactment in 2014 of Act nr. 56.

Focal point of the analysis is the jurisdiction in the formation of two plans (the Strategic Plan and the Metropolitan Territorial Plan) and the following relationships among them, in the logical assumption that between them a necessary and strict consistency there should be.

In the first part, the paper analyses some factors characterizing the metropolitan areas and the functions that the law assigns to the new institution in the territorial government sector. The second part outlines the updated situation with regard to the formation of the sectoral tools (Strategic Plan, Territorial Plan and homogeneous zones). The third part analyses the progresses in three Metropolitan Cities taken as sample (Milan, Genoa and Bologna) and, in general, to those of Southern Italy. In the last part, the paper exposes some considerations regarding the issues raised in the article, particularly about the innovativeness of the tools and the timeline for the implementation of the act.

KEYWORDS:

Metropolitan city, Strategic planning, Territorial planning

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意大利广域市的规划任务。 早期趋势

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摘要

在经历数十年的体制改革后，意大利广域市在 2014 年进入了最后的设立阶段。事实上，早在 1990 年颁布第 142 号法令（地区自治改革）时，意大利便已打算设立广域市，将其作为行政机构顺理成章地实施国际一流的管理和战略发展计划。本文提议在 2014 年第 56 号法令颁布三年后，对意大利广域市各属地政府部门开展的首批活动进行分析。分析重点包括形成两项规划（战略规划和广域市规划）的管辖区以及两项规划之间应该存在必要和严格的统一关系的合理假设。

本文的第一部分分析了广域市具备的一些特征，以及法律为区域政府部门的新机构分配的职能。第二部分概述了有关区域形成的最新情况（战略规划、国土规划和相似区域）。第三部分抽样分析了三座大都市（米兰、热那亚和博洛尼亚）的进展情况，并在大体上与一些意大利南部城市进行了对比。在最后一部分，本文针对所提出的一些问题指明了要注意的事项，特别是在工具创新以及行动实施的时间表方面。

关键词：
广域市；战略规划；国土规划

1 INTRODUCTION

The last stage of the process of establishment of the Italian Metropolitan Cities, which took place in 2014, follows of a few decades the start of this institutional reform. In 1990, in fact, the Act 142 (Local Autonomies Reform) had planned metropolitan areas as the administrative organization more suitable to provide these territories of structures for the management and the strategic development alike the best international models. The paper proposes to analyse the first activities taken by the Italian Metropolitan Cities in the sector of territorial government, three years after the enactment in 2014 of Act nr. 56.

Focal point of the analysis is the jurisdiction in the formation of two plans (the Strategic Plan and the Metropolitan Territorial Plan) and the following relationships among them, in the logical assumption that between them a necessary and strict consistency there should be. Other interesting elements are the connections of the new institution with the previous institutional subject (the Province), especially with regard to the experience of the Provincial Territorial Plans (PTCP) and their use as metropolitan planning tool.

The deepening of this relationship is interesting, given the existence of a continuity of the administrative processes. Nevertheless, it is clear the need that the new metropolitan authority is a promoter of a strong innovation in the planning tools, enough to mark a substantial advance over the experience of the Provinces. In the first part, the paper analyses some factors characterizing the metropolitan areas and the functions that the law assigns to the new institution in the territorial government sector. The second part outlines the updated situation with regard to the formation of the sectoral tools (Strategic Plan, Territorial Plan and homogeneous zones). The third part analyses the progresses in three Metropolitan Cities taken as sample (Milan, Genoa and Bologna) and, in general, to those of Southern Italy. In the last part, the paper exposes some considerations regarding the issues raised in the article, particularly about the innovativeness of the tools and the timeline for the implementation of the act.

2 GOVERNANCE OF METROPOLITAN AREAS

Urban systems are increasingly at the centre of global development processes (Sassen, 2001; EEA, 2014).

Cities are constantly developing in all continents; they are the place where the majority of the Earth's inhabitants lives, with a growing tendency that the forecasts believe certain (UN, 2015; Mazzeo, 2016). For this reason, «cities in the (Weberian) sense of integrated socio-economic entities no longer exist. The urban phenomenon is better described by the notion of metropolitan areas that is multi-centred urban regions which develop mainly along functional networks, cutting across institutionally defined territorial boundaries» (Kubler & Heinelt, 2002, 2).

In Europe, in particular, the urbanization's phenomena have a specific importance, both in terms of population (about 80% of the total is an urban population), and in economic terms. Urban areas, in fact, concentrate a large share of the national budget's transfers and of local investments (Spadaro, 2015; Ciapetti, 2014). Within this continental space (but the same argument can also be made for the urban situations of other continents) metropolitan areas present more specificity in terms of concentration of assets, innovation and produced wealth (BBSR, 2011).

The metropolitan systems are typically an interdisciplinary topic in which several research's areas are involved with a wide variety of approaches. Generally, if the physical size and the number of inhabitants are the main factors linked to a city assuming the name of "metropolis", the definition of "metropolitan area" is associated with the functional relationships created at the local level, the level of infrastructure and the size of activities' system, especially the highly specialized (Salet et alia, 2003).

For this reason, metropolitan areas are territorial systems affected by particular attention at international level,

up to reach to the constitution of ad hoc administrative structures, provided with operational capabilities both managerial and strategic.

Within these processes, special attention is paid to the relational aspects that occur in the game role between administrative subjects. For Hamilton et alia (2004), also if metropolitan administration is the key of the reasoning, its probability of success depends on the vertical relations established by central and local level (just think to financial flows from the centre) and on the horizontal relations between the municipalities belonging to a metropolitan region.

3 THE NEW ITALIAN REGULATORY FRAMEWORK

The reform process of the Italian administrative system, started in 2014 but dropped into a state of uncertainty following the outcome of the constitutional referendum of December 2016, based their fundamental motivations in the thematic of the simplification. The achievement of this aim seemed to be necessary both to increase the efficiency of the State's structures than to reduce its overall weight on the economic and productive system. Acts such as deleting of the provinces or transformation of the Senate into unelected parliament were intended for this purpose.

The formation of Metropolitan Cities falls within this process.

The normative sources on which this administrative body is founded are the Constitution and the Act nr. 56 of April 7, 2014, named "Arrangements on metropolitan cities, provinces, unions and mergers of municipalities". The first describes the Metropolitan City as an intermediate institution and assigns to it generic statutory, regulative, administrative and financial authorities (article 114 and followings). The second, by paragraph 2 to 50, defines the structure of the new institution and assigns to it either specific functions than functions transferred from the provinces, as part of the reorganization process foreseen by paragraphs 85 to 97 of the same act, as well as in accordance with Article 117 of the Constitution.

The new institution represents a governance's answer to complex urban areas (Mazzeo, 2015a). The territorial extension, one of the main obstacles encountered by previous reform's acts on the local autonomies enacted since 1990, it is imposed as coincident with that of the deleted provinces.

New Metropolitan Cities replace provinces in the management of their territory, and also in the coordination of the activities of the inner Municipalities.

One consideration is that the law does not give any indication of the modes in which the relationships between Metropolitan Cities and inner Municipalities must be realized, nor on the action's freedom of the Metropolitan City respect to Municipalities.

This situation puts the Municipalities in a strong position founded on the continuity of the management of their functions. This is irrational in a complex reality that needs strength in the strategic activities rather than in basic ones. Among the potential consequences is to underline the weakening of the action's capacity and of image of the new authority, due to potential conflicts that cannot be excluded given the current legislation.

In this regard it is to remember that political scientists identify two different positions. The first underlines the need of a strong administrative subject because «the existence of a large number of independent public jurisdictions within a metropolitan area [is] the main obstacle for efficient and equitable urban service delivery» (Kubler & Heinelt, 2002, 3); the latter highlights the aspects of democracy and participation associated with the presence of more administrative entities between which no one seems to have enough force to impose its position. Two positions have to do, ultimately, with a further version of the democratic dilemma between system's efficiency and citizen's participation.

With regard to the aspects connected with planning, Act nr. 56, paragraph 44, foresees two different tools. The first is the Strategic Plan of the Metropolitan City (PST), setting guidelines for the performance of their functions, also with regard to the implementation of delegated or assigned functions by the Regions on the

basis of specific acts that must regulate the passage of functions of their competence to the Metropolitan cities. The PST has a life of three years and may include an annual review.

The second is the General Territorial Plan (PTG), a plan that specifically deals with:

- communication facilities;
- service networks;
- infrastructures under the jurisdiction of the metropolitan community;
- constraints and aims to activity and function's practice of the Municipalities included in the metropolitan territory.

Territorial plans of the Provinces (PTCP) put beside that functions, as well as the protection and enhancement of the environment, which descends from the provincial functions.

Territorial planning of metropolitan areas can be considered as a coordination tool connecting territorial assignments that are part of the Metropolitan Cities with the needs of the communities that belong to. In fact, we should not forget that Metropolitan Cities does not delete the inner Municipalities, nor their competencies, which remain untouched. For this reason we can conjecture that general planning could «to refer to the possibility of prescriptive and mandatory predictions selecting relevant large-scale projects and action, thus leaving to the "traditional" urban tools regulatory tasks for the municipal and local level» (Gastaldi & Zarino, 2015).

In this regulative framework the Metropolitan Territorial Plan will have to perform strategic, coordination and prescriptive tasks in relation to a number of areas and themes, looking for forms of sharing and collaboration with the Municipalities.

Act nr. 56 foresees other key functions that, for their inherent characteristics, can fit into a planning process of metropolitan dimension. We refer, in particular to:

- mobility and road system;
- compatibility and consistency of the urban planning of the Municipalities located in the metropolitan area;
- promotion and coordination of economic and social development with the support to economic and research innovative activities that are consistent with the vocations of the Metropolitan City, as outlined in the Strategic Plan of its territory;
- sponsorship and coordination of computerization and digitization's environments in metropolitan areas.

Another area not directly owned by PTG's competence which, for its specific characteristics, can be involved is the organization of coordinated systems of management of public services presenting a general interest and a metropolitan dimension (Mazzeo, 2015b).

The act does not precisely define the contents and the aims of the General Territorial Plan of the Metropolitan City. It requires, however, that the Regions adapt their legislation with the provisions of the Act nr. 56.

Despite this requirement, the Regions are not working with enthusiasm to promote the process of strengthening of the Metropolitan Cities, despite the fact that some of them have approved acts for adaptation and reorganization of functions to be delivered to the Metropolitan Cities¹. In this way the competencies, resources, and organizational structures necessary to complex settlement's systems cannot be completed, as it is not possible to outline the final overview of the planning competencies and the relationship between metropolitan planning and regional planning.

Finally, national law assigns an important role to the homogeneous zones, a kind of association of Municipalities representing an intermediate level between the municipalities and the Metropolitan City. Just consider that the Assembly of the Mayors of the homogenous zones expresses mandatory opinion in the procedure for approval of the Territorial Plan.

¹ For example, Piedmont Region has issued a regional act in 2015 (nr. 23), later amended several times.

4 SOME CHARACTERISTICS OF THE METROPOLITAN CITIES

Act nr. 56 of 2015 represents a point of arrival of twenty years of attempts made to resolve a long-standing question as that of the government of metropolitan regions in Italy. The urgency of a strong innovation comes from the need to provide of innovative management structures this specific area of territorial government, so that they are able to act effectively both on internal front (territorial redevelopment and higher quality of services) that on outside front (national and international competition between metropolitan areas).

Moreover Metropolitan Cities are not a limited territorial sample both for territorial area, population, and total added value at current price. Table 1 presents the data as regards three basic indicators. It points out that they occupy an area equal to 16.54% of the national territory hosting 36.37% of the population and producing 41.17% of national income.

METROPOLITAN CITY	TERRITORIAL AREA (Sq Km, 2014)	POPULATION (Nr., 2014)	TOTAL ADDED VALUE AT CURRENT PRICES (Million Euros, 2014)
Milan	1,575.65	3,196,825	150,723.72
Turin	6,827.01	2,291,719	62,304.50
Venice	2,472.91	858,198	23,342.27
Genoa	1,833.79	862,175	25,578.78
Bologna	3,702.32	1,004,323	34,275.72
Florence	3,513.69	1,012,180	31,906.04
Rome	5,363.28	4,342,046	137,724.55
Neaples	1,178.93	3,118,149	50,230.73
Bari	3,862.88	1,266,379	21,670.74
Reggio Calabria	3,210.37	557,993	6,946.39
Cagliari	4,570.41	561,925	10,945.65
Palermo	5,009.28	1,276,525	19,222.49
Catania	3,573.68	1,116,917	16,553.93
Messina	3,266.12	645,296	9,619.03
<i>Overall MC</i>	<i>49,960.32</i>	<i>22,110,650</i>	<i>601,044.54</i>
Italy	302,072.84	60,795,612	1,459,881.00
<i>% MC respect Italy</i>	<i>16.54</i>	<i>36.37</i>	<i>41.17</i>

Tab.1 Territorial area, population and total added value of the Metropolitan Cities. Data are relates to 2014. Source: Italian Government, <http://dati.italiainitalia.it/pendata.aspx>

These basic data highlight the weight of these systems and their relevance in economic terms (Papa et alia, 2014). This importance is confirmed even if more specific data are used. Table 2 presents the export data per type of productive sectors grouped according to Pavitt's classification (1984). These data confirms what was stated above, in particular for "science-based" and for "specialized productions" sectors, that is for the most innovative sectors of the productive system.

To prejudice of this data, institutions created to manage Metropolitan Cities seem to be enough indifferent to the territorial potential present and therefore do not appear to be conscious of the need to put in place direct and strong actions in areas greatly affected by the national and international competition.

METROPOLITAN CITY	TRADITIONAL SECTORS	SPECIALIZED SECTORS	SCALE-INTENSIVE SECTORS	SCIENCE-BASED SECTORS
Milan	10,440,037	10,676,028	11,000,884	5,257,130
Turin	2,620,024	5,479,944	10,526,294	1,974,077
Venice	1,883,551	911,960	1,058,570	299,576
Genoa	730,155	1,936,813	1,539,638	179,157
Bologna	2,578,114	5,980,258	2,961,741	512,413
Florence	5,850,881	2,419,011	899,148	839,878
Rome	1,271,881	838,964	3,508,948	2,109,265
Neaples	1,816,279	591,953	674,083	1,939,278
Bari	1,446,475	520,009	763,165	1,210,552
Reggio Calabria	61,127	6,574	64,918	628
Cagliari	123,797	59,074	4,050,770	28,159
Palermo	127,932	89,093	41,600	15,459
Catania	41,600	59,931	103,028	599,774
Messina	188,636	74,782	863,553	5,306
<i>Overall MC</i>	<i>29,180,489</i>	<i>29,644,394</i>	<i>38,056,340</i>	<i>14,970,652</i>
Italy	129,853,352	96,171,688	133,549,888	38,421,460
<i>% MC respect Italy</i>	<i>22.47</i>	<i>30.82</i>	<i>28.50</i>	<i>38.96</i>

Tab.2 Export in the sectors defined by Pavitt Classification. Data in Euro x 1000. Year 2014. Source: Italian Government, <http://dati.italiainformazioni.it/opendata.aspx>

METROPOLITAN CITY	TERRITORIAL AREA (ha)	CONSUMED SOIL (ha)	NOT CONSUMED SOIL (ha)	CONSUMED SOIL (%)	NOT CONSUMED SOIL (%)
Milan	157,565	50,043.71	107,626.50	31.74	68.26
Turin	682,700	67,405.66	615,526.97	9.87	90.13
Venice	247,291	35,819.80	211,196.12	14.50	85.50
Genoa	183,379	15,516.84	167,974.18	8.46	91.54
Bologna	370,232	33,221.68	336,980.46	8.97	91.03
Florence	351,358	28,954.73	322,402.95	8.24	91.76
Rome	536,328	70,803.98	464,764.56	13.22	86.78
Naples	117,893	39,618.17	77,745.13	33.76	66.24
Bari	386,288	37,185.72	345,329.79	9.72	90.28
Reggio Calabria	321,037	18,125.24	300,161.95	5.69	94.31
Cagliari	457,041	18,809.84	438,541.08	4.11	95.89
Palermo	500,928	28,249.87	466,358.73	5.71	94.29
Catania	357,368	27,941.96	327,373.38	7.86	92.14
Messina	326,612	19,938.77	303,953.13	6.16	93.84
<i>Overall MC</i>	<i>4,996,020</i>	<i>491,635.97</i>	<i>4,485,934.93</i>	<i>9.84</i>	<i>89.79</i>
Italy	302,072,840	2,287,799.22	27,788,915.00	7.61	92.39
<i>% MC respect Italy</i>	<i>16.54</i>	<i>21.49</i>	<i>16.14</i>	<i>=</i>	<i>=</i>

Tab.3 Soil consumption in the Metropolitan cities. Territorial area by ISTAT (<http://dati.istat.it/>). Other data by ISPRA (2016)

This happens despite their territories have the tools to increase their performance. One consequence of this is found in the development's and competition's activities that the most active subjects provide on their own because they do not yet recognize to the Metropolitan Cities no willingness to become an active player in the construction of strategic development views.

Economical elements are not the unique interpretation's key of the Metropolitan Cities territories. An aspect that can assume critical meanings is linked to the way by which in the recent past have been made the processes of urban expansion. Using the words of Sbeti (2016, 28) we can affirm that in the last years «the process of metropolisation of Italian settlement systems has been extended by assuming different forms, often post-urban, with a significant worsening of the problems related to quality of life, to the development process, and to the social integration». Without to forget environmental aspects.

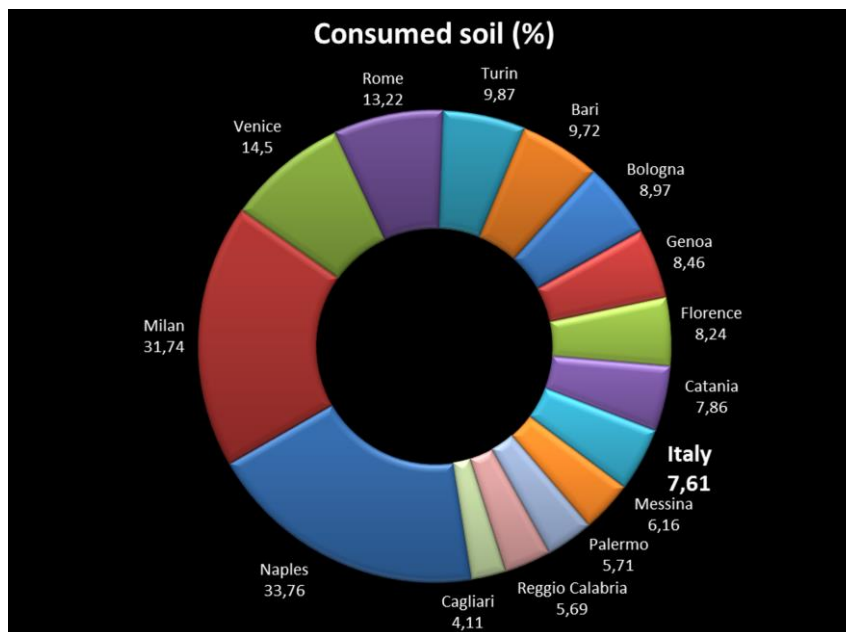


Fig. 1 Percentage of soil consumption for the Metropolitan Cities compared with national datum. See Consumed soil (%) in Table 3 Data by ISPRA (2016)

Among the indicators showing this phenomenon we use the soil consumption occurring in metropolitan areas. Table 3 highlights that in Metropolitan Cities the consumed soil is 9.84% of entire territorial area, whereas this datum is 7.61% at national level. Furthermore, respect a territory equal to 16.54% of national one, the consumed soil is 21.49% of the whole.

This testifies that the territory of the Metropolitan Cities presents a concentration of soil consumption's phenomenon, due, most probably, to the pressure carried out on these areas by the settlement's systems and by the production's systems.

5 STATE OF THE ART IN METROPOLITAN PLANNING

The analysis of the activities that Metropolitan Cities are carrying out makes it possible to outline a precise overview of the state of implementation of the legislation that has led to the establishment of these new institutions.

This analysis is important not so much in relation to the formation of the bureaucratic structure of the institutions, as for their capability to equip with the operational and planning tools that the law provides them. This phase is very sensitive and, at the same time, very important. It should have been carried out with a

good speed so as to put the Metropolitan Cities under the conditions to become fully operational and, above all, to work having a large action's capacity.

For the aims of the present paper, the 14 Metropolitan Cities that shape the national metropolitan system (including those belonging to the Special Statute Regions of Sardinia and Sicily), have been analyzed in relation to the state of formation of the three tools inherent in the planning sector, namely the strategic planning, the territorial planning and, more specific element, the establishment of homogeneous zones in which the Metropolitan City can be divided.

The picture that comes out is summarized in the Table 4.

METROPOLITAN CITY	STRATEGICAL METROPOLITAN PLAN	TERRITORIAL METROPOLITAN PLAN	HOMOGENEOUS ZONES
Milan	Under way	Under way	Yes
Turin	Under way	Formally under way	Yes
Venice	Under way	PTCP	No
Genoa	Under way	Under way	Yes
Bologna	Under way	PTCP	Yes (1)
Florence	Under way	PTCP	No
Rome	No	PTCP	No
Neaples	No	PTCP (2)	No
Bari	No (3)	PTCP	No
Reggio Calabria	Under way	PTCP	No
Cagliari	No (4)	PTC	No
Palermo	No (5)	PTCP	No
Catania	No (6)	PTCPct	No
Messina	No	PTP	No

Tab.4 State of the art for the three tools belonging to the planning function of Italian Metropolitan Cities. Update: 08/03/2017

Notes: (1) The homogenous zones are the associative forms of the Municipalities as the territorial plan of Province of Bologna (PTCP). (2) PTCP of the Province of Naples is not yet in force. (3) In 2010 a strategic plan called "Piano Metropoli Terra di Bari" was published. (4) In 2012 a strategic plan called "Piano Strategico Intercomunale dell'Area Vasta di Cagliari" was published. (5) On the institutional site there is a page dedicated to the strategic planning. (6) In PTCPct is present a "Propositional Framework with Strategic Value".

Starting from this overall picture we analyse below some of the Metropolitan Cities – namely Milan, Genoa and Bologna; they are in a more advanced phase in the drafting process of the territorial governance tools required by law.

Indeed, while the general situation is not positive, some local situations can be considered more advanced and go in the direction of the enhancement of the new administrative structure and deepening of the potentialities existing in it.

A brief analysis is also performed on the state of planning in Metropolitan Cities of Southern Italy.

6 METROPOLITAN CITY OF MILAN

6.1 STRATEGIC METROPOLITAN PLAN

On May 12, 2016, the Metropolitan City of Milan has definitively approved the Strategic Plan. With this tool it wants to become a strong player in the process of sustainable revitalization of the local economy and wants to cooperate in the resolution of the needs of Municipalities, citizens and enterprises.

The Strategic Plan is the result of a path lasted about a year, which has seen a continuous interaction with Municipalities, organized for homogeneous areas, with the economic and social organizations of the territory, gathered in the "Metropolitan Table for Development", and with many other actors.

The construction of the Strategic Plan is based on two different and related visions: a short-term vision interpreting the current situation and outlining actions in the near period, and a long-term vision, forecasting a "fully operational" Metropolitan City. These two visions are condensed in the slogan "Milan. Real metropolis, possible metropolis".

Particularly interesting is the opening of the Strategic Plan to a long-term vision, which exceeds that of the short period required by law. In this regard a number of areas to develop in the future metropolitan policies are identified. In this regard a number of areas to develop in the future metropolitan policies are identified. Reference is to the characteristics of the metropolis of the future in relation to the knowledge needed to maintain an international dimension and to act in the process of competition; to the development of spatial planning processes for the metropolitan area of North West of Italy; to the policies for a free mobility; to the green and metropolitan parks; to the environmental sustainability of the metropolitan area after the signing of COP21; to the development of large network services (Nobili, 2016).

The Strategic Plan has represented the first important opportunity to realize the change outlined by the act of reform of the local autonomies, ie the transition from the former Province to Metropolitan City.

It is significant that Milan has been the first Italian Metropolitan City to develop its strategic plan, confirming as one of the most dynamic Italian realities among metropolitan systems and one of the main places for incubation of political and institutional changes at the national level.

6.2 TERRITORIAL PLAN

The Metropolitan City of Milan is oriented towards an adaptation of the existing Territorial Coordination Plan. The new plan will be structured so as to include information in key areas for the organization of the territory. It will centralize its attention particularly:

- on infrastructure networks. They are under the responsibility of the Metropolitan City and are a characterizing element of the PTCP. The new plan will strengthen the connections of the networks with the territory and settlements, focusing on interchanges and logistics;
- on the localization of excellence and metropolitan rank functions. The settled functions considered of excellence should be identified and strengthened. For this purpose, the plan will have to think in terms of service areas, of accessibility conditions, of effects and impacts of large area. Characterizing element of this forecast will be the establishment of effective embodiments, which use the territorial equalization;
- on the organization of general interest public services in metropolitan areas. The Provincial Territorial Plan (PTCP) had already addressed this issue in relation to the presence of poles of attraction and to their utilization for increasing the compactness of the settlements. The new plan will add new informations about services' forecasts meeting a supra-local dimension demand, as well as to satisfy certain accessibility requirements in relation to the hierarchical characteristics of public transport nodes. In this area lies also the possibility of forming supra-municipal services plans, coordinated with the policies of the Metropolitan City;
- on the territorial equalization. The aim is to make more effective the activation and implementation of territorial policies related to some types of interventions through the use of a balanced system of costs and benefits allocation between the different municipal administrations involved by large area scale urban and/or infrastructural transformations. On the other hand, the plan will have to confirm the urban equalization, instrument of municipal plan competence, regulated by Regional Act nr. 12 of 2005;

- on the relations with the other general and sectoral tools of territorial planning. The plan must be consistent with the Regional Territorial Plan and the sectoral planning tools of regional level. A peculiar situation applies in the case of the South Milan Regional Agricultural Park, which includes 61 Municipalities out of 134 of the Metropolitan City. Since the Province of Milan is management authority, inevitably problems will arise; they will be resolved within the metropolitan planning;
- on the relationship between metropolitan and municipal planning. Metropolitan plan will work for systematizing the forecasts on the whole metropolitan territory. Their functions will be of three types. The first is of address, through the provision of “visions” and criteria that the municipalities and other entities must respect, and that should be consistent with the three-year Strategic Plan of the metropolitan territory. The second function will be of coordination, and it will be carried out using contents and functions performed by the PTCP in force, a way to achieve a greater simplification and rationalization. The third, finally, will be of programmatic/prescriptive order, ie there will be some themes of metropolitan significance that will be directly regulated by the Strategical Plan, always in a perspective of joint planning.

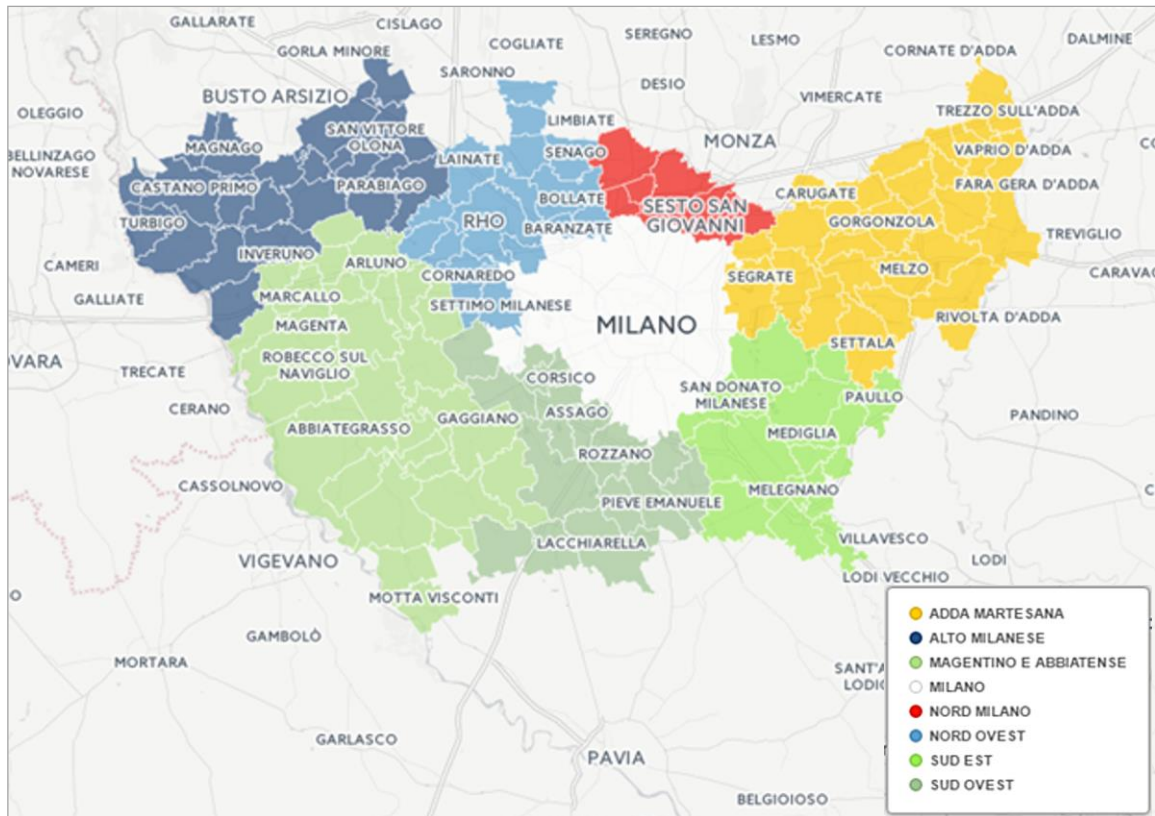


Fig. 2 Metropolitan City of Milan. Homogeneous areas

6.3 HOMOGENEOUS AREAS

The Metropolitan City of Milan foresees the creation of seven homogeneous areas (over Milan, which is area to himself), characterized by strong affinity with regard to geographical, demographic, historical, economic and institutional characteristics. Each zone is built to articulate at best the activities on the territory and to make possible a greater integration of provided services. The homogenous zones are:

- Adda Martesana (28 Municipalities, 336,284 inhabitants, 264.95 sq Km);
- Alto Milanese (22 Municipalities; 258,743 inhabitants; 215.23 sq Km);

- Magentino e Abbiatense (29 Municipalities; 213,745 inhabitants; 360.44 sq Km);
- Nord Milano (7 Municipalities; 315,494 inhabitants; 57.88 sq Km);
- Nord Ovest (16 Municipalities; 315,749 inhabitants; 135.82 sq Km);
- Sud Est (15 Municipalities; 173,267 inhabitants; 179.72 sq Km);
- Sud Ovest (16 Municipalities; 238,729 inhabitants; 179.94 sq Km).

7 METROPOLITAN CITY OF GENOA

7.1 STRATEGIC METROPOLITAN PLAN

Intention of the Strategic Plan of the Metropolitan City of Genoa is to realize a renewed relationship with the territory. To achieve this goal the topics that it wants to tackle are the new functions of the Metropolitan City, the renewed attention to the traditional functions of the previous Province (in particular schools and roads, to assign new characters and new meanings), the age-old issue of hydrogeological risks to deal with a specific attention to the resilience of the territory, and, finally, the promotion of the environment.

Specifically, it wants to give operational skills related to coordinated management systems of metropolitan public interest, in particular water cycle, public transport, and waste cycle. With regard to this last function the Metropolitan City of Genoa has already adopted the metropolitan plan of wastes; in a strategic vision of circular economy it aims to exceed 65% of separate collection and recycling by 2020.

One of the new institution's responsibilities is the economic development. The strategic plan of Genoa wants to face this task in an innovative and sustainable way, giving strong support to the creation of new activities in leading production sectors. For this purpose it foresees the realization of incubators, the development of activities dedicated to the most innovative companies and to those offering greater youth and female employment, and new types of tax breaks able to attract companies and resources. In this way, the plan aims to enhance the excellence of the territory (by means of territorial marketing), to promote sustainable tourism, to clear up the advantages of soft and green mobility.

Most relevant aims from the point of view of territorial impact are the rebalancing of the relationships between coast and hinterland, the support for the activities of the Genoa's Harbour, and the construction of specific infrastructure such as the railway corridor Genoa - Rotterdam.

The increase of the territorial resilience aims to effectively respond to the risks of hydrogeological instability. This means to increase the environmental protection with specific actions such as the networking of parks, the creation of the Pelagos Cetacean Sanctuary, the release of the Internet portal #fuorigenova, with news, informations on environment, services of the territory, the project E.L.EN.A. (European Local Energy Assistance), aiming to increase the energy efficiency and the development of renewable sources.

Within the Strategic Plan there are also details related to new projects in the field of the metropolitan governance, particularly with regard to the involvement of local communities in the implementation of metropolitan functions and services. This applies, in particular, for the participation of Genoa to the development of the network of European metropolitan cities committed to implementing the Europe 2020 strategy of the European Community.

7.2 TERRITORIAL PLAN

At the time of the formation of the Metropolitan City the Province of Genoa was equipped with the Territorial Coordination Plan and had begun the procedures for its review. The new plan project, identified by the acronym "PTCP20", has become the basis for the construction of the General Territorial Plan of the Metropolitan City (Pasetti, 2016). On April 22, 2015, with a resolution of Metropolitan Council, were

identified ten "guidelines" for its formation. The path of the new plan foresees the organization of territorial meetings for their deepening. The guidelines are the following:

- Genoa metropolitan area can be regarded as a door for Europe. The plan should aim at strengthening the role of the Metropolitan City of Genoa in the network of Italian Metropolitan Cities and of greater European cities;
- the plan should be seen as a uniform and commonly shared "territorial project", reinforcing the sense of belonging to the metropolitan community through the use of simple and consistent rules;
- homogenous territorial areas are tools for representing individual or associated municipalities; they realize the necessary coordination between Municipalities and Metropolitan City;
- the plan identifies a number of "strategic systems", that is to say areas characterized by complex and cross-sector problems to deal with "integrated projects". Complex systems are a priority in the process of relaunching and positioning of the metropolitan area;
- soil is a valuable and irreproducible resource to enhance and transmit to future generations. Consequently, the plan must act primarily on the existing city, reinforcing it by means of urban regeneration actions;
- territorial safety and hydrogeological instability prevention are preconditions for the plan decisions. Specific guidelines for urban planning must promote the integration of the morphological, natural, and hydrogeological elements with the man-made elements distributed on territory;
- the economy of the future must be sustainable and must be present on territory with widespread productive activities; the logic should be the public-private partnership, involving institutions, entrepreneurs, universities and third sector;
- the building and strengthening of infrastructure networks, both physical and virtual ones, are determining factors for developing economy, relations and social cohesion of the area;
- the territorial networks (particularly the metropolitan ecological, the public service, and the cultural, historical, landscape and environmental networks) are essential facilities to improve quality of life and attractiveness of the metropolitan territory;
- the homogeneous zones are the tools to organize and to manage in an efficient way the territorial services.



Fig. 3 Metropolitan City of Genoa. Homogeneous areas

7.3 HOMOGENEOUS AREAS

The proposal of the Metropolitan Territorial Plan articulates a system of homogeneous areas already defined by previous planning tools. The areas identified are Riviera Ponente, Stura, Genoa Central Area, Scrivia, Trebbia, Paradiso, Tagullio's Riviera, Fontanabuona, Aveto-Graveglia-Sturla. As mentioned, they were in an advanced formation in the draft revision of the territorial plan of Province of Genoa (PTCP2020), plan with strong characters of metropolitan planning.

The considerations that led to the bounding of the homogeneous areas were the maximization of the territorial characteristics within the urban planning, the effectiveness of the functions and activities of large area, the coordination of local planning, the improvement of services to citizens and businesses, the co-operation in the protection and enhancement of the territory.

8 METROPOLITAN CITY OF BOLOGNA

8.1 STRATEGIC METROPOLITAN PLAN

The Metropolitan Council approved the Address lines of the Metropolitan Strategic Plan of Bologna in May 2016 (PSM2.0). They represent an evolution of the process started in 2013, when the Covenant for the Metropolitan Strategic Plan had been signed (PSM2013).

This plan represented «the first experience of strategic planning in Bologna and the first national experience of plan with a metropolitan dimension» (Conticelli *et alia*, 2016, 42).

Address lines of PSM2.0 sets out five strategic lines and seven goals within which the upcoming strategic planning instruments will operate. It also outlines the priorities of the metropolitan politics in order to organize, guide and select the projects and concrete actions that will compose the PSM2.0.

The goal is to provide a strong identity to the new local authority so that it can work to coordinate the economic development of the territory and to become an active subject in the direct confrontation with national and international partners.

Within the territory the Strategic Plan will identify priority areas and will define action's systems without fixing settled geographies. Apennines with hilly areas and great axes are two of these geographical realities of the territory with a strong outside recognisability; for this reason the plan will not be limited to the Metropolitan City area but will have a broader view extending its gaze to a vast territorial space.

Metropolitan City and Emilia-Romagna Region have defined together the action areas of the Strategic Plan, namely:

- economic and social development, business promotion and innovation policies, training, and employment services;
- territorial planning, mobility, and infrastructures;
- policies for the attractiveness;
- welfare systems;
- creation of coordinated systems of public services management and their organization in metropolitan area;
- policies of simplification, computerization, and digitization.

The confrontation with the territory has led to the formulation of five strategic lines, or working areas, representing a synthesis of the more strongly positions come out in the confrontation; their realization will lead to a more connected, more open to the world, and more attractive territory. The strategic lines are:

- quality of life of the citizens, in all their aspects;
- connection among education, research, and manufacture;

- strengthening of a speedy and sustainable mobility;
- new meaning of the urban regeneration theme;
- culture as identity and attractive element.

These lines must also be empowered to work using a number of cross factors, defined as elements that must characterize and qualify the entire metropolitan action. Reference is the attention to the genders and generations, the implementation of digital technologies and an easier and open relationships with the public institutions.

On the basis of these premises the address lines of the Metropolitan Strategic Plan identify seven following tasks:

- territorial marketing addressed to make more attractive the Metropolitan City of Bologna;
- urban and environmental regeneration for a more beautiful, sure, and healthy city;
- smart mobility for cutting traffic and pollution;
- enterprise and industry promotion in connection with school and research;
- sustain to offer and demand of culture;
- equal and fair educational system from babyhood to university;
- strengthening of the welfare system.

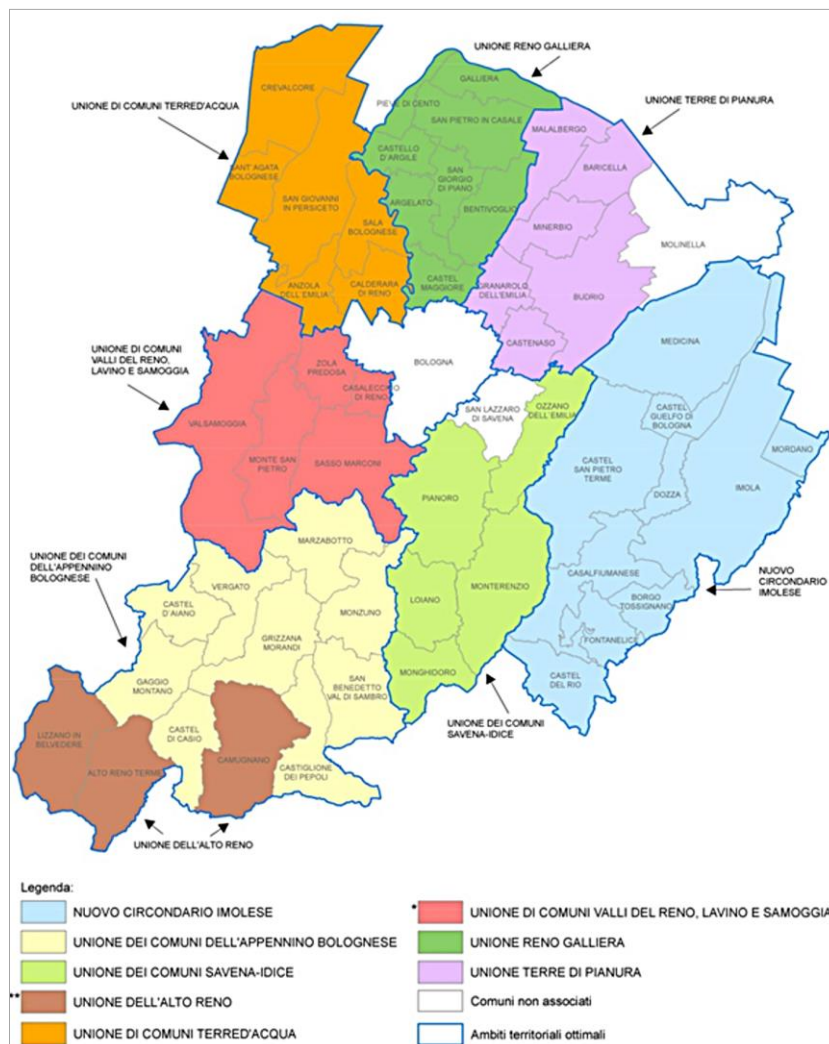


Fig. 4 Associations of Municipalities. Metropolitan City of Bologna.

8.2 HOMOGENEOUS AREAS

Metropolitan city of Bologna contains in its territory 55 Municipalities, grouped in 8 homogeneous zones.

The making of this territorial composition precedes the institution of Metropolitan cities and results from the provisions within the PTCP of Province of Bologna. Associative choices have been confirmed by the Metropolitan City of Bologna, given the fact that they had already led to specific results in terms of organization of services and management of some administrative functions. To the areas listed below must be added the city of Bologna.

- Nuovo Circondario Imolese, including the Municipalities of Borgo Tossignano, Casalfiumanese, Castel del Rio, Fontanelice, Castel Guelfo di Bologna, Castel San Pietro Terme, Dozza, Medicina, Mordano, Imola;
- Unione dei Comuni dell'Appennino Bolognese, including the Municipalities of Castel d'Aiano, Castel di Casio, Castiglione dei Pepoli, Gaggio Montano, Grizzana Morandi, Marzabotto, Monzuno, San Benedetto Val di Sambro, Vergato;
- Unione dei Comuni Savena-Idice, including the Municipalities of Loiano, Monghidoro, Montereenzio, Ozzano dell'Emilia, Pianoro;
- Unione dei Comuni Valli del Reno, Lavino e Samoggia, including the Municipalities of Valsamoggia (fusione dei Comuni di Bazzano, Castello di Serravalle, Crespellano, Monteveglio, Savigno), Monte San Pietro, Sasso Marconi, Casalecchio di Reno, Zola Predosa;
- Unione dell'Alto Reno, including the Municipalities of Alto Reno Terme (fusione dei comuni di Granaglione e Porretta Terme), Camugnano, Lizzano in Belvedere;
- Unione Reno Galliera, including the Municipalities of Argelato, Bentivoglio, Castel Maggiore, Castello d'Argile, Galliera, Pieve di Cento, San Giorgio di Piano, San Pietro in Casale;
- Unione Terre di Pianura, including the Municipalities of Baricella, Budrio, Castenaso, Granarolo dell'Emilia, Malalbergo, Minerbio;
- Unione Terre d'Acqua, including the Municipalities of Anzola dell'Emilia, Calderara di Reno, Crevalcore, Sala Bolognese, San Giovanni in Persiceto, Sant'Agata Bolognese.

9 METROPOLITAN CITIES OF SOUTHERN ITALY

Southern Italy is present in the system of Metropolitan Cities with 3 continental cities (Naples, Bari, and Reggio Calabria) and 4 insular cities (Cagliari, Palermo, Catania, and Messina). In all these cases, the activation's process of the new institutions presents significant delays.

At the present days none of these has seriously started procedures in the direction of the formation of strategic and territorial plans. We can state that in these territories there is a clear trend to use the plans bequeathed by deceased provinces, postponing the necessary adjustments to a date to be determined.

This situation is clear both as regards the formation of strategic plans that with regard to territorial plans.

Table 4 shows that only two Metropolitan Cities (Reggio Calabria and Palermo) have on the agenda the topic of the strategic planning, even if the informations available show that they are in a more than early stage and that they have not taken any steps to concretely undertake the process of formation of the plan.

As for the other cities there is no trace, on corporate websites, of strategic plans.

In the cases of Bari and Cagliari there is mention of the existence of strategic plans formed before the dissolution of the provinces. Aims and purposes of these plans are to be evaluated carefully in the light of the need for a strategic plan that wants to call itself "metropolitan". In the case of Catania the situation is still different because inside the territorial plan of the province (PTCPct) is present a "Propositional Framework with Strategic Value".

As regards the territorial planning the situation, as said, sees the presence in all cases of provincial territorial

plans. Of these only one (Naples) is still not fully in force.

In all cases, therefore, the provincial plans serve as a planning tool and, although it is evident the need for a their deep review – necessary to adapt them to the new institutional reality –, seem to be no many possibilities to start this new planning season.

Finally, no information was found in relation to the formation of homogeneous zones.

10 DISCUSSION ITEMS

International experiences in the field of metropolitan agglomerations highlight the need to treat these urban systems as specific cases, clearly differentiated from the traditional urban systems. The metropolitan areas represent specific situations from the agglomerative point of view, and their management requires specific administrative structures.

The reason lies in the fact that they represent areas of economic, cultural and social strength that must be developed and made stronger by having as theme not the daily administrative practice but innovative strategies able to compete at national and international level and to act for increasing the attractiveness of their territories both in the economic field and in the development processes based on innovation.

In the situation created since the second half of 2016, we find on the one hand the lack of advanced planning by the Metropolitan Cities, on the other a climate of latent demobilization of the institutional reforms put in place in the three years from 2012 to 2016.

The institutional restructuring process that led to the constitution of Italian Metropolitan Cities had specific potentialities in itself, recognizable in curtailing of the territorial government. They represent «a perspective in which it is possible (or must be) to develop and to practice a consistent innovation in urban and regional planning, a definition of new local development policies, and a greater administrative efficiency and simplicity (for citizens, for economic activities and for services). Thus can also enhance competitiveness, thereby contributing to necessary actions to restart Italian sustainable growth processes just starting from the metropolitan Cities» (Barbieri, 2015, 9).

But if we analyse the activities of the new institutions and the steps which they have operated (Table 4), we see that the attention has focused primarily on actions that don't seem to have the required breathing. In particular, we notice an overall delay state in the planning field.

As a first step the new local authorities seem to have concentrated their attention on the formation of the strategic plan, although in three cases there is no trace of this either. The sensation is that the construction of this type of plan seems to have become a minimum target in the programs of the new institutions, almost like a simple task to be drawn up to show that they have done something.

On the other hand, if we take into account the contents and forecasts of the documented plans we can note that the formalized instruments seem, generally, without personality and do not contain any element of innovation in the methodologies, nor particularly courageous territorial visions.

We also highlight the question of the timing related to the formation of such instruments. Because the plans are lasting three years, it was reasonable to assume quickest paths of genesis and approving of the strategic plans. If the times are those hitherto applied it could get to the paradox that the period of time necessary to build the plan is comparable, if not greater, than that of validity of the same. Without considering the fact that the law provides for an annual update that, under current conditions, would have formation times equally long, unless it does not turn into a meager document attached to some deliberation.

The right combination, in the case of strategic planning, would be the construction of a document by the innovative and disruptive contents, with rapid procedures for genesis and approval.

Even worse is the situation with regard to the territorial plan, the formation of which has been started only in two of the Metropolitan Cities. Furthermore, all Metropolitan Cities use uncritically the territorial planning

outlined by previous provincial coordination plans which, in the best case, should only be a starting point to outline completely innovative tools.

The analysis of the case studies can be referred to local areas that historically have had different attitudes to planning, ranging from situations with a sedimented tradition of planning, to realities in which the plans are poorly tolerated. It shows how Metropolitan Cities, whose management structure is derived from that of the previous provinces, are almost reluctant to abandon their territorial coordination plans, as if they had not understood that the real meaning of a metropolitan planning have a distinctly different breath than that applied in the provinces. Even in the territories where the PTCP have had an interesting story resists the binding to solid but less flexible planning drawings, however not equipped with an extended view of the processes taking place in metropolitan areas at European level, at least.

This factor also connects to another not secondary aspect, namely the existence of metropolitan functional systems that often don't overlap with the statutory territorial systems. It is sufficient to consider the realities of Milan or Naples to understand how it is necessary to rethink the relationships that will be created when the Metropolitan City presents functional relationships with areas administratively external (Mazzeo, 2009). Clearly, in some way, they must fall in the metropolitan planning processes.

This aspect is confirmed also by the lack of inter-institutional collaboration processes between Metropolitan City and regional systems, whose general objectives should be convergent. The situation inevitably impacts on the overall importance of the Italian system compared to other national systems.

Same negative situation meets in the formation of the homogeneous zones, for which only four Metropolitan Cities have provided, asking for help, in the case of Bologna, to the areas already established in the previous PTCP. The delay related to this forecast is due probably to the fact that it is not compulsory, even if the homogeneous areas are considered an attractive tool to transfer at the level of the Municipalities the policies of the Metropolitan Cities. Furthermore, the establishment of homogeneous zones, allowing to rebalance the weights between Metropolitan Cities and Municipalities, particularly if the first develops in full measure its potential and seeks to assume a relevance of national and international level.

The survey carried out allows to state that the application of the reform establishing the Metropolitan Cities cannot take off.

This situation results from the lack of an effective driving force in the implementation of the reform. The enactment of the law would have to trigger a virtuous emulative process highlighting the advantages of the new administrative shape compared to the previous administrative situation. This trigger has not occurred, making it once again clear the distance between theoretical research in urban planning (for which metropolitan cities are key tools of government of large cities), and administrative practice.

Furthermore, the reform, albeit necessary and even if arising from the need to reduce public administration costs, was perceived, wrongly or rightly, as ineffective.

A not secondary element, finally, it is to emphasize: the apparent gap between the Metropolitan Cities of the Center-North of Italy and those of the South. The first show more attention to the strategic issues that may result by the creation of Metropolitan Cities, although critical aspects do not lack even in these (De Luca, 2016). The latter continue in the unconcealed aversion to all forms of planning and confirm a persistent inaction of the ruling classes, whose only strategy seems to be the preservation of their constituencies, compared to a clear lack of long term development vision.

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Fig. 2: http://www.cittametropolitana.mi.it/portale/territorio/zone_omogenee/

Fig. 3: http://www.cittametropolitana.genova.it/sites/default/files/News/ALLEGATO%20DCM_PTGcm_Linee-guida-2015.pdf

Fig. 4: <http://www.cittametropolitana.bo.it/portale/Engine/RAServePG.php/P/255810010406/T/Il-territorio>

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SHORTCOMINGS TO SMART CITY PLANNING AND DEVELOPMENT

EXPLORING PATTERNS AND RELATIONSHIPS

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ABSTRACT

Smart city criticism concentrates on conceptual and methodological ambiguity, corporate driven utopian visions, overlooking citizen and other stakeholder potential, 'splintering urbanism', and lack of long term vision for sustainable urban development adapted to local needs. Inspired by this critical discourse, this paper aims to present smart city planning and development shortcomings on the basis of applied experience and, further, use this experience to create a new theoretical construct about shortcomings to smart city planning and development. Nine individual smart city cases (Barcelona, Stockholm, Chicago, Rio de Janeiro, PlanIT Valley, Cyberjaya, Masdar, Songdo International Business District, Konza) are explored on the basis of selected published material and in-depth case studies, highlighting the challenges and shortcomings that appeared during their development and implementation. Subsequently, the identified shortcomings are synthesized and assessed critically across contextual and strategic levels, uncovering underlying causal relationships. The findings are used to create a new theoretical construct, comprising two paths to shortcomings towards smart city planning and development.

KEYWORDS:

smart city; urban development; strategy; challenge; causes and effects

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智慧城市规划与发展的缺陷

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摘要

本文对智慧城市规划与发展的缺陷进行了探讨。具体而言，它对 11 座智慧城市的发展战略以及在规划和实施阶段所发现的缺陷展开了调查。这 11 座智慧城市分别是：巴塞罗那智慧城市 (Barcelona Smart City)、生态城市普兰尼特谷 (PlanIT Valley)、斯德哥尔摩智慧城市 (Stockholm Smart City)、网路之城赛城 (Cyberjaya)、阿布杜拉国王经济城 (King Abdullah Economic City)、马斯达尔城 (Masdar City)、斯科尔科沃 (Skolkovo)、松岛国际商务区 (Songdo International Business District)、芝加哥智慧城市 (Chicago Smart City)、里约热内卢智慧城市 (Rio de Janeiro Smart City) 和孔扎科技城 (Konza Technology City)。本文对相关调查结果进行了综述并提出了中肯的评价。具体缺陷体现在以下方面：资金和预算不足、官僚主义和组织挑战、数字服务发展和布局挑战、实体规划较差、难以吸引投资和支持新商业的发展、在用户吸引方面表现不佳以及利益相关者的阻力。接下来，本文将这些缺陷分成了两大类，并逐一分析了原因和影响。本文最后通过将过往的经验与新颖的方法相结合，提出了缓解提议。

关键词：

智慧城市；缺陷；挑战；问题；缓解

1 INTRODUCTION

Urban futures have attracted the interest of urban planners for over one century now (Papa et al., 2013); but the recent leaps in ICT and knowledge and innovation economy have created an extraordinary technology push for smart city solutions and a demand pull on the side of cities which, on one hand has made the smart city conception very popular, but on the other hand hinders the development of common understanding about what it means for a city to be 'smart' (Angelidou, 2015). Smart city plans, strategies, initiatives and solutions of all sorts and sizes are now being developed by hundreds in cities all over the world. Solutions abound; open knowledge, open government, and open source applications have enabled the development of an ecosystem of solutions, platforms and tools that cities can choose from to create their smart city agenda.

But what about shortcomings to smart city planning and development? From practical experience we know that perfectly successful strategic planning initiatives do not exist in any domain. Every project faces its own challenges, and is characterized by its own objectives and specifications.

Although critical literature towards the smart city abounds, until recently it had not dealt substantially with the practical challenging aspects of strategic planning for smart city development. Purportedly "good" practices abounded while "pitfalls" and "challenges" were downplayed - and still are, in many cases. This is largely due to the 'self-congratulatory' nature of smart cities (Hollands, 2008), which assumes that the smart city is *a priori* a successful paradigm of urban development. As many smart city projects from around the world are now entering their maturity phase, however, the volume of published in-depth smart city case study research has been growing. This valuable source of knowledge can be used to build theory from cases (Eisenhardt, 1989) with the purpose of mapping practical shortcomings in the smart city planning and development process. The results can be used in policy making towards anticipating and mitigating pitfalls in technology-led development, increasing the chance of smart city initiatives to succeed.

Starting from the previous reflections, the purpose of this paper is to present smart city planning and development shortcomings on the basis of applied experience and, further, use this experience to create a new theoretical construct about shortcomings to smart city planning and development.

The following section (2) presents the basic critical arguments towards smart cities. Section 3 explores nine individual smart city cases and the challenges that appeared during their development and implementation on the basis of selected published material and in-depth case studies. Subsequently, the identified shortcomings are synthesized and assessed critically by uncovering causal relationships among them (section 4). Section 5 presents the conclusions of this paper.

2 REVIEW OF LITERATURE ON SMART CITY PLANNING AND DEVELOPMENT SHORTCOMINGS

2.1 CRITICAL LITERATURE TOWARDS THE SMART CITY

In the course of the past decade, along with the increasing popularization of the smart city idea, a growing number of smart city scholars and practitioners engaged in addressing the smart city through a critical lens. This section aims to highlight the most important points emerging from this discourse by citing the most influential academic publications in this regard. It clusters smart city criticism across five levels: (i) conceptual and methodological ambiguity, (ii) ICT and corporate driven utopian visions (iii) overlooking citizen and other stakeholder potential, (iv) 'splintering urbanism', unequal representation, privacy and security concerns and (v) lack of long term vision for sustainable urban development adapted to local needs. These points are analytically described in the following paragraphs.

Hollands (2008), in his widely cited seminal paper, *'Will the real smart city please stand up?'*, essentially launched the smart city criticism discourse by pointing out underlying issues of conceptual and ideological ambiguity, observing the 'self-congratulatory' nature of so-called 'smart cities'. Seven years later, Hollands (2015) returned with his paper *'Critical interventions into the corporate smart city'* whereby, among others, he notes that current conceptions about smart cities bring together so many disparate theories, city systems and functions, that it is essentially impossible to embed all smart city aspects in a single ideological framework (Hollands, 2015). The contribution of smart cities to sustainable development remains vague (Salvati et al., 2013). Arguably, smart cities are shaped by diverging conceptual variations, fragmentary thoughts and conflicting ideological and conceptual roots (Fernández-Vázquez & López-Forniés, 2017; Kitchin, 2015; Meijer & Bolívar, 2016; Pierce & Andersson, 2017; Van den Bergh & Viaene, 2015). Further, the lack of documentation and established performance metrics hinders an assessment of the efficiency of 'smart' interventions that can be justified towards replication (Glasmeier & Nebiolo, 2016). Hollands (2008), Van den Bergh and Viaene (2015) and Glasmeier and Nebiolo (2016), note the use of the smart city idea as a *label* and *means of promotion* used by city administrators and politicians. Smart technologies, they observe, are put forward as marketable, off-the-shelf products, instead of serving purposes of public benefit and common good.

Furthermore, smart cities put forward business-led urban development as one of their foremost priorities (Hollands, 2008), with concepts of technology-led smart city development originating not only from the business sector (technology vendors and consultants), but also government (the European Commission, for example) and academia (computer sciences) (Fernández-Vázquez & López-Forniés, 2017). As a result, smart city initiatives and technologies are increasingly driven by business imperatives, with smart city planning and control being handed over to private organizations, creating a risk of lock-in around proprietary technologies and raising issues about the management of these systems after the departure of the corporates (Buck & While, 2015; Datta, 2015a; Glasmeier & Nebiolo, 2016; Greenfield, 2013; Kitchin, 2015; Marvin & Luque-Ayala, 2013; Pierce & Andersson, 2017). Due to their nature, corporate smart city initiatives tackle a limited range of social and environmental priorities and fail to develop the capacity of a city's people to actually learn and deeply engage in the smart city discourse (Marvin & Luque-Ayala, 2013). In addition, an efficiency and reflexivity gap between vendor led, fixed smart city solutions and solutions-driven, promptly available smart city technologies is observed (Glasmeier & Nebiolo, 2016).

Stakeholder engagement is broadly cited as a fundamental pillar of the smart city in many wordings (for example grassroots engagement, bottom-up engagement) and is associated with related the conception of 'smart communities' (Bencardino & Greco, 2014; Komninos, 2011; Mosannenzadeh & Vettorato, 2014). Cities are 'messy' places (Greenfield, 2013), and regardless of the approach, the essence is that stakeholder empowerment is an enabling ingredient of the smart city: citizens, businesses and civil servants should act as empowered data and knowledge generators and contributors, agents, implementers and assessors of smart city policy. Behavioral changes are required towards the sustainable smart city development (Salvati et al, 2013). Although integrated stakeholder segmentation efforts in a smart city context have taken place in the past (Mosannenzadeh & Vettorato, 2014), existing smart city models frequently fail to identify stakeholders and describe their roles (Harrison, 2017; Pierce & Andersson, 2017; Vanolo, 2016). This is a common situation across smart city initiatives, driven by the dominance of supply-driven smart city solutions and the aforementioned different ideological stances across academic, corporate and government literature (Angelidou, 2015; Kitchin, 2015; Marvin & Luque-Ayala, 2013). It results to a loss of the opportunity to experiment with innovative solutions, tailor smart cities to user needs, capitalize on the problem solving capacity of the populace, provide new insights and obtain buy-in from stakeholders. Some smart city critics have proposed 'smart urbanism' as an alternative conceptual fundament towards integrated and participative urban growth driven by bottom-up innovation and creativity (Kitchin, 2014; Luque-Ayala & Marvin, 2015).

Furthermore, weak stakeholder participation in the smart city and the diffusion of entrepreneurially led smart cities raise questions regarding democratic representation and citizenship (Angelidou, 2014; Datta, 2015b; Greenfield, 2013; Hollands, 2015; A. Townsend, 2013), in turn posing negative implications about public space privatization, social polarization and gentrification (Hollands, 2008; Hollands, 2015). Smart cities also raise concerns about security, privacy and panoptic surveillance on different levels (Elmaghraby & Losavio, 2014; Kitchin, 2015; van Zoonen, 2016). Failing to account for the implications of smart city technology and 'networked urbanism' on urban life and urban citizens (Kitchin, 2015), technologically mediated urban living inevitably contributes to the creation of the phenomena of 'splintering urbanism' (Graham & Marvin, 2001) and 'urban digital divides' (Crang et al., 2006), with urban infrastructures enhancing spatial inequality instead of contributing to the creation of inclusive communities. Public policy is shifting away from its principal scope, which is to serve social objectives, such as provision and accessibility to quality infrastructure, education and other amenities. It is not clear who the main beneficiary of the smart city is, and furthermore to whom the smart city services will be accessible to. Smart cities, as costly, privileged, all-encompassing places, eventually risk becoming a commodity of the elite (Glasmeier & Nebiolo, 2016).

Finally, smart cities often omit accounting for a long term vision for long term, sustainable urban development, despite the efforts undertaken so far (Papa et al., 2013) as well as its potential contribution to urban resilience (Papa et al., 2015). They suffer from the dominance of one-size-fits-all smart city narratives, which do not consider the history, culture and social, economic, political and other features of cities (Kitchin, 2015). Solutions often focus only on one city system (Glasmeier & Nebiolo, 2016). Zubizarreta et al. (2015), after an analysis of more than 60 smart city applications in 33 cities, actually confirmed that smart city applications are in most cases designed as isolated tools, without contributing to the development of a broader ecosystem and failing to position themselves within a vision that promotes integrated and sustainable development. As a result, many smart city initiatives do not consider how urban systems and development areas (e.g. energy and urban living) can work together in order to achieve efficiencies.

Arguably, the criticism points mentioned above are inherently interrelated – for example, conceptual ambiguity is partly driven by the diffusion of corporate driven smart city visions, and weak stakeholder engagement posits 'splintering' pressure on the urban fabric.

Furthermore, in parallel to this ideological and theoretical criticism towards the smart city, the smart city criticism discourse is becoming stronger of the basis of evidence-supported arguments.

2.2 PREVIOUS EFFORTS TO IDENTIFY AND EXPLORE SMART CITY CHALLENGES

As many smart city initiatives from all over the world are now entering their maturity phase, we are beginning to have an increasing amount of evidence-based information about their priorities, characteristics and results. As a result, there has been a growing volume of scientific literature focusing on specific, in-depth case studies about smart city strategies, describing –among others- smart city strategy shortcomings¹. In parallel, a limited number of efforts to analyze smart city cases comparatively has also been undertaken, as described in the followings.

More particularly, Pierce and Andersson (2017), in a research conducted across 10 mid-sized European cities², identified and grouped smart city development and implementation challenges in two domains: technical and non-technical. The technical domain includes challenges with regards to interoperability and privacy, while the non-technical domain includes challenges related to collaboration, financing, governance and awareness

¹ Although background work was undertaken in this area for the purpose of selecting the case studies and sourcing material for this research, it is out of the purpose of this paper to list all the available literature with this respect.

² Aarhus (Denmark), Bristol (UK), Dublin (Ireland), Eindhoven (Netherlands), Helsingborg (Sweden), Lund (Sweden), Malmö (Sweden), Rotterdam (Netherlands), Santander (Spain)

raising. They found that the most pressing challenges lie with cross-departmental and outward collaboration and coordination of recourses, closely followed by the challenge of securing the necessary financial recourses. Fernández-Vázquez and López-Forniés (2017), in analyzing and comparing smart city initiatives while focusing on the role of citizens in the smart city, examined 200 scholarly papers to identify the characteristics of ICT based smart cities versus the characteristics of citizen based smart cities³. Among others, as weaknesses in ICT based smart cities they identify i. poor citizen participation, ii. fuzzy goals and iii. private benefits. In citizen driven smart cities they identify i. lack of funds, ii. poor communication power and iii. need for new tools/methods.

Ojo et al. (2014) studied comparatively ten smart city programmes⁴, creating a framework for smart city initiative design addressed to policy makers, practitioners and smart city stakeholders. Their findings deal, among others, with the challenges (technical, management, governance) encountered by policy makers into implementing the initiatives. These are related with attracting and sustaining stakeholder interest from the civil and private sector, including marginal communities and financing difficulties.

Neirotti et al. (2014), analyzing comparatively 70 smart city programmes around the world⁵ on the basis of secondary sources, identify smart city application domains and further examine their relationship with contextual factors (geography, demography, economy, development policies). Among others, they note that smart city initiatives are variably affected by contextual political, economic and cultural factors which present different obstacles, depending on the case. The authors highlight the need to adopt bottom-up engagement approaches in cities that are currently not very advanced in technological and economic terms.

Heo et al. (2014) explore the requirements and challenges in smart systems' integration through use cases. Their approach is purely technical, focusing on areas of i. smart power grids, ii. structural and surveillance applications, iii. transport and traffic management, iv. food, water quality and environmental monitoring and v. ubiquitous healthcare applications. The identified technical challenges with respect to the integration of the previous systems are related with interoperability, scalability, infrastructure management, data privacy and security.

This paper diversifies its positioning from the previous research efforts in that it engages in a investigation into the shortcomings of each smart city initiative, sourcing and processing material from published case study research, rather than settling with material from smart city project websites. It also differs substantially in that it seeks to create theoretical constructs from observation (Eisenhardt, 1989), rather than vice-versa, which is the standard approach followed in previous work.

3 RESEARCH APPROACH

The research approach used is "theory building from cases" (Eisenhardt, 1989), whereby a number of case studies are analyzed internally and comparatively in order to create a theoretical construct in an inductive way. The emerging theoretical constructs reflect relationship patterns within and across the cases and can be used, among others, to provide description. Following the recommendations of Eisenhardt (1989), the selection of the case studies aimed at the selection of polar types, i.e. cases that are very different and represent extreme situations. Other important factors that drove the selection of the cases is the maturity of the initiatives, which is a precondition for being able to identify shortcomings, and the availability of information through scholarly publications (academic journal and conference papers, theses and research reports) -particularly in-depth case studies into smart city cases and their shortcomings. The collected data were arranged in a tabular display,

³ the authors do not mention the exact smart city initiatives

⁴ Smart Amsterdam (Netherlands), Climate Smart Malmo (Sweden), Smart City Malta (Malta), Masdar Smart City (United Arab Emirates), PlanIT Valley (Portugal), Smart City Singapore, (Singapore), Smart Curitiba (Brazil), Smart Songdo (South Korea), Tianjin Eco-City (China), Yokohama Smart City (Japan).

⁵ the authors do not mention the exact smart city initiatives

which features shortcomings pertaining to the context of the smart city strategy and the strategy itself (Section 4, Table 1). Using this display, the collected information was scanned vertically and horizontally multiple times to uncover underlying patterns and hidden relationships. The patterns that appeared more frequently were in turn used to create two new constructs which describe relationships across smart city planning and development shortcomings.

4 RESEARCH FINDINGS AND SYNTHESIS OF RESULTS

4.1 THE SMART CITY CASES AND THEIR SHORTCOMINGS

This section presents the nine smart city cases of this paper and the shortcomings that appeared during their development and implementation.

Barcelona's Smart City strategy (Spain) is built around 'international promotion', 'international collaboration' and 'local projects'. The strategy establishes collaboration channels among government, industry, academia and citizens (Angelidou, 2016; Bakici et al., 2012; Barcelona Smart City official website, 2016). Harrison (2017) notes a misalignment of the city's strategy with the reality and needs of Barcelona's urban population –actually, the initiative faced opposition from specific neighborhood associations and raised 'splintering urbanism' concerns (March & Ribera-Fumaz, 2016). However, Barcelona's smart city initiative is currently in the process of transitioning from a more of top-down to a bottom-up one (Calzada, 2017), using tools and methodologies such as smart districts, open collaborative spaces, infrastructures and open data. To implement the strategy, a major organizational reform took place, resulting in the creation of the 'Urban Habitat Department' (the 'smart city' department). The City of Barcelona faced challenges in securing the necessary funds, providing exact and appropriate infrastructure and in the deployment and management of wireless networks. Cross-departmental cooperation has also been challenging, due to the difficulty to clearly define the roles and responsibilities of each person and authority (Bakici et al., 2012). In addition, the massive restructuring of services and budgets that took place for the creation of the Urban Habitat department faced opposition from some citizen groups.

In the smart city strategy of Stockholm (Sweden), environmental and information technology is tested and used extensively throughout the city's infrastructure, with the purpose of creating an innovation ecosystem that involves the city's inhabitants, industry and the public sector (Buscher & Doody, 2013; Stockholm smart city official website, 2014). One of the key challenges to the implementation of the strategy has been financing; the need to have funds available upfront in order to make investments is one of the constant issues to be tackled. Furthermore, as every change risks raising society's resistance, city employees and the city council need to be constantly informed and convinced about the importance of the smart city project (Buscher & Doody, 2013).

The city of Chicago (USA), driven by a vision towards more transparent, accountable and democratic governance, pursued a data driven smart city strategy for leveraging technology in order to promote inclusion, engagement and innovation. The project foresees the collaboration of the public, the private and the third (social) sector to develop the city's infrastructure, 'smart' communities, civic innovation and technology companies (Buscher & Doody, 2013; City of Chicago, 2013; Goldstein, 2013; O'Neil, 2013; Smart Chicago official webpage, 2014). The smart city of Chicago had to address a host of issues normally associated with open data, including privacy, interoperability, scalability, consistent and automatic updating of data, and creating user friendly interfaces (Goldstein, 2013). Also, building an ecosystem of open government, vibrant user communities, potential investors and meaningful datasets required a continuous and concerted effort on the side of the city (O'Neil, 2013). That said, acquiring the necessary financial capital and technical expertise for the project was one of the strategy's key challenges, as an array of private and public foundations were

required to contribute knowledge and other resources for the realization of the initiative (Buscher & Doody, 2013; O'Neil, 2013). Another key issue was re-tooling the Chicago City's IT department to meet the new requirements of the smart city strategy (Buscher & Doody, 2013).



Fig. 1 - 2 Rio Operations Center

The smart city of Rio de Janeiro (Brazil) is a collaboration of the city with technology vendor IBM to become a 'smarter city', created in the prospect of the 2016 Olympics and the 2014 World Cup. Rio is now equipped with a citywide Emergency Response System that collects sensor-and-camera-generated data that enable informed decision making in policing, traffic and energy management (Buscher & Doody, 2013; Goodspeed, 2015; Rio de Janeiro Centre of Operations official website, 2014). Rio de Janeiro's smart city initiative, however, focuses on anticipating and mitigating urgent situations across the city, rather than addressing 'wicked' problems of the urban environment, such as social inclusion and the provision of appropriate infrastructure (Goodspeed, 2015). Progress has been slow to fulfill the set goals, especially regarding user engagement and open data. Bureaucratic issues have also been raised.



Fig. 3 - 4 Images of PlanIT Valley

Cyberjaya (Malaysia) is a planned smart city which is part of the broader government policy for advancing the country's innovation and knowledge economy. The city is expected to become a global ICT hub by attracting world-class multimedia companies, professionals and students (Brooker, 2008; Cyberjaya official website, 2011; Nordin, 2012). The project has suffered bureaucratic challenges and political conflicts, as the city's development is shared among a federal authority, a private company and a government-owned company (Brooker, 2008). The initially foreseen development cost for Cyberjaya has more than doubled up to date, with 17 property developers involved in Cyberjaya's development so far (Nordin, 2012). On the physical level, the city has been criticized as overly labor-focused, suffering from lack of social amenities and neglecting the

need for social life (Brooker, 2008). Many workers of the city choose not to live there, but commute there only for their work (Nordin, 2012). Many companies have registered their address in Cyberjaya for tax benefit reasons, but did not actually move their major operations there (Brooker, 2008). Therefore, the city is practically empty; public spaces are empty; the city's streets -apart from working hours- are empty, too; the city is culturally destitute (Brooker, 2008) and socially dead (Yusof, 2008).

Masdar City (Abu Dhabi, United Arab Emirates) is another well-known planned smart city, designed on the principles of environmental sustainability. Its economy revolves around cleantech research and development, pilot projects, technology and materials testing (Crot, 2013; Cugurullo, 2013; Günel, 2014; Masdar City official website, 2013). Masdar is living proof of the challenges in achieving integrated, self-regulated urban development across different functional domains of the city (Glasmeier & Nebiolo, 2016). With the onset of the global economic crisis, the government of Abu Dhabi decreased its financial backing of the project (Cugurullo, 2013). What is more, Masdar faced difficulties in attracting investment and startups (Kingsley, 2013). *'There's limited indigenous talent and local markets are too small to justify localizing a lot of Research and Development'*, according to S. Geiger, Masdar's co-founder and director in the period 2006-2009 (Kingsley, 2013). In 2010, the project's leaders had to make a major review of the project and scale down and even shelve some of its parts (Alusi et al., 2010; Crot, 2013; Cugurullo, 2013). In 2013 only 100 people were living on the site (Cugurullo, 2013) and life there *'cannot be described as urban'* (Kingsley, 2013).



Fig. 5 - 6 Central Courtyard of the Masdar Institute Campus (left) and Central Spine Showing Light Rail Transit and Retailers -artist impression (right)

Songdo International Business District (South Korea) is a planned city which is a model of sustainable, city-scale development and innovation and aims to become a central business hub in Northeast Asia (Alusi et al., 2010; Lee & Oh, 2008; Shwayri, 2013; Songdo IBD official website, 2013; Yigitcanlar & Ho Lee, 2014). The city faced strong opposition by local stakeholders and environmentalist groups, as the reclaimed land upon which Songdo was built was formerly an area of important wetlands and fishing grounds (Shwayri, 2013). It is a city which combines green and smart urbanism in an environment of entrepreneurial urbanization which is socially segregated and presents limited learning, knowledge exchange and societal embedding opportunities (Benedikt, 2016; Carvalho, 2015). Songdo's history has been repeatedly shaped by governmental policies with periods of support and periods of neglect. Budget shortages have also been a major problem (Shwayri, 2013); the need for more funding has almost doubled the cost of the venture (Lee & Oh, 2008). There have been significant delays in permits and in construction (Lee & Oh, 2008) -actually the development and implementation plan was revised 10 times only in the period 2008-2010 (Shwayri, 2013).

The last city, Konza (Kenya), is a planned smart city to be developed close to Nairobi, designed on the basis of sustainable design principles and expected to advance technology growth in Kenya. Its economy will focus on four sectors: education, life sciences, telecom and information technology and business process outsourcing

(Konza City official website, 2014; Watson, 2013). The project has suffered major delays (Mutegi, 2014). Although some funds have already been allocated for Konza, they were not spent due to strict procurement laws or because they are dispersed across various government agencies (Mutegi, 2014). Konza has also been subject to criticism for social and spatial gentrification. There has been concern that Konza's properties and lifestyle will be financially unaffordable for locals (Watson, 2013).



Fig. 7 Aerial view of Songdo

4.2 SYNTHESIS OF FINDINGS

Arguably, some of the above smart city shortcomings stem from contextual factors, such as the broader political environment and related policy priorities, as well as the broader characteristics, structure and culture of the implementing authority. Other smart city shortcomings are related to the smart city strategy itself, and particularly how it has been designed and implemented. Table 1 arranges the research findings into these broad categories (context and strategy) and serves as the basis for a further analysis into the causal relationships among the identified shortcomings. After a thorough horizontal and vertical analysis of these findings, a series of insights emerged, as described in the followings.

Across all cases, it appears that the economic aspects of smart city strategies are the foremost issue of concern and source of problems both for planned and existing cities. Bureaucracy is also among the top challenges hindering the advancement of smart city strategies. It discourages investment and slows down financing procedures, resulting to delays in the implementation or downsizing of the smart city project. The main causes of bureaucracy in smart city strategies are complex legal frameworks, diverging political priorities, dissidence among stakeholders and the prevalence of political interests. Another significant challenge is ICT weaknesses, namely systems integration, software/hardware updates, lack of trained staff and a creativity gap. Stakeholder skepticism is more of an occasional challenge, which might be overcome by consultation and meaningful engagement in the smart city design and implementation process. The main causes of stakeholder resistance are accessibility and representation concerns, environmental, economic and real estate interests and a climate of resistance to a possible change of the status quo.

SMART CITY PLANNING AND DEVELOPMENT SHORTCOMINGS

CITY / LEVEL	CONTEXTUAL		STRATEGIC				
	POLICY	ORGANISATION	PHYSICAL PLANNING	TECHNOLOGY	FINANCING	TIMING	STAKEHOLDER RESONANCE
Barcelona (existing)		Organisational restructuring, cross departmental collaboration, roles' definition	Splintering urbanism' concerns	Infrastructure selection, deployment and management	Financing challenges		Stakeholder skepticism, resistance on the side of society
Stockholm (existing)		Organisational stakeholder scepticism			Financing challenges		
Chicago (existing)		Re-tooling organisation to meet requirements		ICT infrastructure challenges, Open Data challenges	Creative ways to increase funds, contribution for private and non-profit sector		Creating engaged, vibrant communities of developers and users
Rio de Janeiro (existing)		Bureaucratic legal framework & administrative structures	Splintering urbanism' concerns	Technologically determined, too ambitious		Schedule delays	Low citizen uptake
PlanIT Valley (planned)			Too ambitious	Technologically determined, too ambitious	Budget shortages	Schedule delays	
Cyberjaya (planned)	Changing officials, change in policy direction, diverging policies	Bureaucratic legal framework & administrative structures. Unclear organisational / leadership roles.	Poor urban design, too fragmented development, too ambitious, several plan reviews	Technologically determined, too ambitious, infrastructure challenges, services only partially implemented, surveillance and censorship	Cost more than doubled	Schedule delays	Low citizen uptake due to lack of social life, low investment attraction, inability to pass as international business hub
Masdar (planned)	Changing officials, change in policy direction	Bureaucratic challenges. Agency to facilitate bureaucratic processes	Poor urban design, too fragmented development, too ambitious, several plan reviews	Technologically determined, too ambitious	Authority reduced budget	Schedule delays	Low citizen uptake due to lack of social life, insufficient indigenous talent, small market potential, global financial crisis
Songdo (planned)	Changing officials, diverging policies	Bureaucratic legal framework & administrative structures	Too ambitious, plan reviews, real estate speculation, privatisation of public space	Technologically determined, too ambitious	Cost more than doubled	Schedule delays	Stakeholder skepticism, a socially segregated place. Inability to pass as international business hub
Konza (planned)		Bureaucratic legal framework, weak cross departmental collaboration, too many stakeholders		Technologically determined		Schedule delays	Low citizen uptake due to due to high cost of living

Tab. 1 Smart city planning and development shortcomings. Categorization of research findings

Brownfield (existing cities) initiatives usually face shortcomings related to organizational issues, such as securing cross departmental collaboration, aligning internal stakeholders, defining clear roles and workforce upskilling. Technological challenges are mostly related with issues of privacy, security and interoperability. While there are frequent financing challenges, as well, these are usually mitigated through the application of innovative or creative business models which establish alternative collaboration routes and bring in external stakeholders. Citizen uptake and stakeholder resonance is critical in smart city initiatives implemented in existing cities, as citizens need not only to be informed, but actively engaged in the co-design of the smart city solution.

Greenfield (new/planned) smart cities, on the other hand, face more massive challenges, typically associated with financing and timing. The research shows that greenfield developments, being massive and ambitious projects, usually face multiple challenges in terms of funding and investment attraction, which makes their advancement slow and sluggish within the current globally restrained real estate market and preference for low risk investment. In terms of physical and ICT infrastructure, many of them are too ambitious to realize, resulting in financing problems, slow advancement rate, and partial cancellation. Other smart city plans are characterized by poor urban design (too strict zoning regulations, inadequate social amenities, architectural repetition, spatial fragmentation etc.), which in hindsight discourage resident and investment attraction.

4.3 BUILDING THEORY FROM RESEARCH

What emerges is that most of the previous shortcomings are interconnected; some complications may be the outcome of the very same cause, while one complication may trigger the appearance of another. We can actually identify two principal path dependencies of co-existing shortcomings (Figure 10).

The first causal path begins with contextual shortcomings (top left box in Figure 10). The pattern is more or less the same in all the cases: the state does not adequately support and facilitate the smart city venture, while lingering bureaucratic problems and changes of key persons in the organizational structure render the venture slow, sluggish and costly. Implementing organizations fail to align stakeholders and establish internal and external collaboration channels. As bureaucratic, administrative and managerial problems accumulate, the interest on the side of investors fades away, and so does its uptake/embrace by citizens. The smart city project stagnates by being unable to secure funds due to the low uptake and low stakeholder resonance, resulting to schedule delays, which in turn enhance stakeholder disengagement and create a self-feeding cycle of entrapment.

The second causal path of shortcomings begins with poor or too ambitious planning, either or both in physical and digital terms (bottom left box in Figure 10). Physical plans of smart cities are characterized by poor and outmoded urban design (too strict zoning regulations, inadequate social amenities, architectural repetition, spatial fragmentation etc.). In other cases, the digital services of smart cities fail to live up to the set standards, rendering the city anything else but 'smart' and creating concerns of privacy, security and panoptic surveillance. Technically speaking, such smart city initiatives are partly or fully unrealizable, resulting to financing deficits, slow advancement, and in many cases cancellation of parts of the project. At the same time, this situation discourages the involvement of residents and the attraction of investment on the side of businesses. Failing to attract international and well educated citizens hinders the development of dynamic local economies that appeal to international businesses. Failing to engage and attract the interest of service users leads to a low uptake of the smart city services. The abovementioned self-feeding cycle of entrapment appears again. Complications backlog and become hard to overcome.

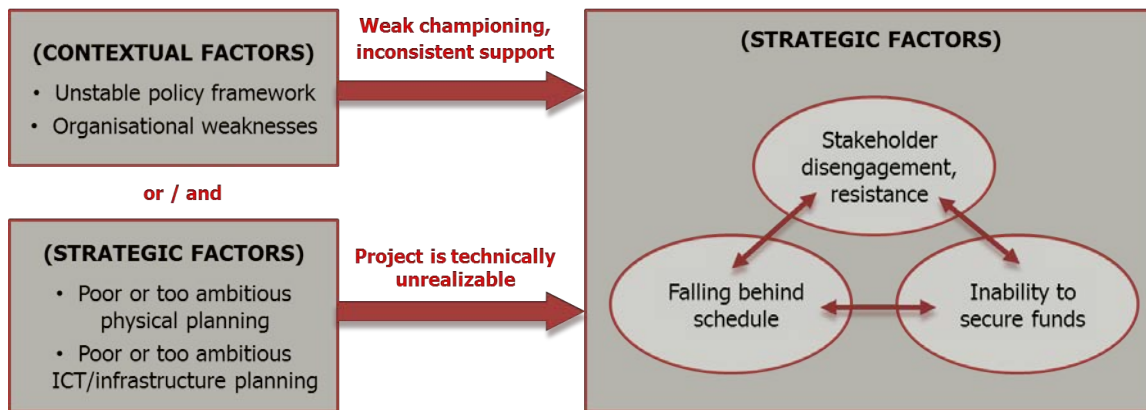


Fig. 8 Theoretical construct: two smart city challenges path dependencies

5 CONCLUSIONS

The smart city strategy discourse is full of smart city strategies that commence with very ambitious plans, only to soon confront detrimental challenges stemming from their context or their own design. In many cases, smart city initiatives were forced to downsize their scope, cancel or alter parts of their plans and revert to creative and alternative ways for securing funds. Based upon this general observation, it is suggested to maintain a more realistic grounding of how far a smart city strategy can go.

Becoming a smart city usually involves large investments in infrastructure and organizational change. Furthermore, smart cities capitalize both on physical and digital assets, meaning that a big number of stakeholders and possible partnership schemes may arise, as well as that highly complex procedural and financing processes are included. Therefore smart cities should be developed upon a clear and simple strategy and plan, capitalizing on thoroughly defined business and governance models.

In an ideal world, smart cities would be developed by solid administrative structures, free from bureaucratic shortcomings on all government levels and with funds allocated and secured in advance, guiding the smart city project firmly and efficiently towards its goals. The reality, however, is very different, and as with any urban development strategy, smart city shortcomings should be anticipated and planned for. By doing so, cities can both avoid their appearance and identify and mitigate them as they emerge.

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IMAGE SOURCES

Cover: author's elaboration

Fig. 1 - 2: <http://www-03.ibm.com/press/us/en/pressrelease/33303.wss>

Fig. 3 - 4: <http://www.living-planit.com>

Fig. 5 - 6: <http://masdarcity.ae/en/>

Fig. 7: <http://www.songdo.com/>

Fig. 8: author's elaboration

Tab. 1: author's elaboration

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Senior researcher at URENIO Research, Aristotle University of Thessaloniki, Greece, since 2004. As a researcher, she has worked in many European and national research projects related with urban, socio-economic, technological/digital growth. Since 2009 she has been also providing teaching support at the School of Architectural Engineering of the same university, lecturing in courses about Urban Planning and Development, as well as Smart Cities and technology-led urban growth. By education she is an architect and urban planner with a focus on urban, digital and social innovation (BSc, MSc, MBA, PhD). She has a PhD in Smart City Planning and Development and she is a post-doc research fellow of the Institute of the Greek State Scholarships Foundation in the field of Urban Digital Social Innovation. She has received numerous fellowships and outstanding performance awards. Her research interests revolve around urban planning and development policy, as well as digital platforms and tools for addressing urban problems, urban and social innovation and the knowledge society.

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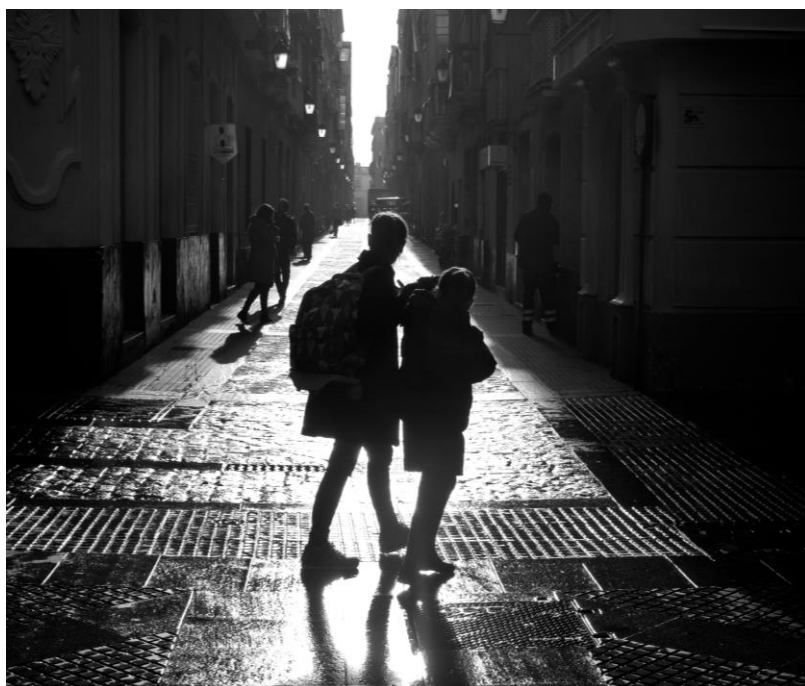
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ACTIVE TRANSPORT TO SCHOOL AND CHILDREN'S BODY WEIGHT

A SYSTEMATIC REVIEW

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ABSTRACT

Because of decreasing physical activity of children, they are becoming more obese. Moreover, commuting to school has become more passive during the past decades. The objective was to update the previous systematic reviews by narrowing down the topic to body mass index of children (3-12 years) as a representative of body composition. Applying search terms such as active transport to school, body mass index, childhood obesity, and so on in four online databases: PubMed, ScienceDirect, WorldCat, and Google Scholar. Peer-reviewed English journal papers published between 2005 and 2015 presenting empirical quantitative studies were eligible studies to be reviewed. 310 journal papers were screened, 27 of which were reviewed by studying the full text. The final 13 papers were limited to those that focused only on active commuting to school and body mass index of children and adolescents. Out of 13 final studies, 3 found conclusive associations, three indicate partial associations in subgroups or societal or geographical limitations, and seven show no correlations. The existing literature are still inconsistent, so this study suggests conducting surveys with larger samples on less-studied contexts and applying more complex statistical methods for adjusting some of the variables. It is also argued that this topic can be culturally and contextually specific.

KEYWORDS:

Active transport to school, body mass index, childhood obesity, overweight, children.

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主动学校通勤与儿童体重： 系统评价

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摘要

由于儿童的身体运动量在不断减少，他们也因此而变得越来越肥胖。而且，在过去的几十年里，被动方式的学校通勤已成为一种常态。本文的目的是为了通过详述反映儿童（3-12岁）身体结构的体重指数来更新以前的系统评价。在以下四个在线数据库中使用主动学校通勤、体重指数、儿童肥胖等搜索术语：PubMed、ScienceDirect、WorldCat 和 Google Scholar。2005 和 2015 年间发表的同行评审英文期刊论文对实证定量研究进行了介绍，符合审查资格。对 310 篇期刊论文进行了筛选，并对其中 27 篇进行了通篇研究审查。最后的 13 篇论文仅限于那些只关注主动学校通勤以及儿童和青少年的体重指数的研究。在最后 13 项研究中，有 3 项研究发现了存在明确的联系，3 项研究表示在群体或社会或地域限制方面存在部分联系，而另外 7 项研究没有联系。现有的文献仍然存在不一致，因此本研究建议对大量较少研究的情况进行调查，并应用更复杂的统计方法来调整一些变量。也可以针对具体的文化和内容来开展这类研究。

关键词：

主动学校通勤，体重指数，儿童肥胖，超重，儿童

1 INTRODUCTION

With continuous increase in body weight of the youth in several regions of the world, researchers and practitioners have recently sought for passive ways for prevention of obesity as a driver of a handful of diseases. The Active Transport to School (ATS)- Body Mass Index (BMI) studies as a part of research on ATS and children's body composition has been noted to be inconsistent in a couple of studies (Ford et al. 2007; Landsberg et al. 2008; Pabayo et al. 2010; Mendoza et al. 2011; Drake et al. 2012; Saksvig et al. 2012; Heelan et al. 2013). The objective of this study is to update our knowledge using the most up-to-date observations conducted recently and to check if the knowledge produced by the scholars of this topic has become consistent. It is meant to refer to a similar study done by Lubans et al. and update their work after six years, though that study targeted both children and adolescents and also investigated not only BMI but a broader range of health-related fitness. Although this review attempts to complete the previous ones, it is new because it narrows down childhood age and only to BMI as a body composition measure.

Respecting the fast-growing field of children's active commuting and their body weight, it would be appealing to test the inclusiveness of the results of the recent empirical studies. After six year of the previous systematic study, it would be relevant to update the feedback using the new quantitative investigations. The field is very much progressive, so it is logical to refresh the systematic reviews occasionally by means of the results of several research groups actively publishing their findings. The studies related to active transportation to school and the effects on children's body weight is currently being developed in several developing countries, thus the new findings may show contextual disparities.

Apart from the clear connections of the research theme to urban transportation planning and urban land use, there are direct connection between the subject and infrastructure planning and indirect but considerable associations with urban environment. The more sustainable transport modes children and their parents take for school commuting, the cleaner will the urban environment be; there are less air and sound pollution. The infrastructure side will be related to development of the sidewalks, bike routes and tracks, infrastructure customized for safety of children, safer and secure playgrounds, customized routes from populated areas to school, and the like. In addition to the benefits for the public health of the society, increasing suitability of the urban environment for walking and biking of children to school can lead to other outcomes in mobility and environment; our understanding about the relationship between the behavior of children and their parents show that changing the travel behavior of children can be associated in change in their parents' travels. Hence, undertaking fundamental research on the commute trips of children can help providing more sustainable mobility for several age groups. These interrelations between sub-topics form a multifaceted subject resulting in healthier, safer, and more livable urban environment for children and their parents.

For such an updating, systematic review without meta-analysis is applied in this paper. Few systematic reviews have been done on the theme of this paper for children and adolescents. Systematic review is considered to be suitable for concluding the results of quantitative studies during the past years since they "Systematic reviews are not only instrumental for implementing evidence-based practice but also for taking stock relative to a particular question (or set of questions) and for the shaping of future research. For development, the primary role of systematic reviews rests with the creation of data-based rationales for newly proposed development activities." (Schlosser, 2006).

2 BACKGROUND

Urban planning has gained importance in promoting public health during the past years (Hoehner et al. 2003). Built environment has been recently addressed by scholars as a determinant of public health (Frumkin, 2003; Jackson, 2003). The role of planners in enhancing public health has been highlighted in academic research

(Bors et al. 2009; Bors & Lee, 2012; Silver, 2012). Urban planning efforts such as interventions in form of community design, housing development, community organizing, greenspace planning, etc. are applied as Active Living by Design provide environments that support active living of residents (i.e. Miller & Scofield, 2009). During the past years, scholars have tried to draw attentions to the potentials of public policy approaches to urban transportation and land development to provide better conditions of public health (Frank & Engelke, 2001). Certain approaches to urban planning or the related shortcomings may be considered as sustainable forms suitable for promotion of public health, while others may be named as unhealthy urban development, i.e. urban sprawl is considered as unhealthy by some researchers: "among those with chronic conditions, including hypertension, diabetes, and lung disease, those who live in areas with more highly connected street networks have higher rated health." (Kelly-Schwartz, 2004).

The existing literature depicts a holistic image of the influences of the physical environment on physical activity (PA) as an important aspect of public health (Sallis et al. 2006; Aytur et al. 2008; Timmermans et al. 2016). Sustainable urban form is associated with forms of PA, when urban planning targets the concept of smart growth principles including housing opportunities, walkable neighborhoods, community and stakeholder collaborations, attractive communities with sense of place, mixed land use, diverse transport mode choices, preserved open spaces, etc.

The role of physical activity in obesity and overweight of children (Goran et al. 1999; Steinbeck, 2001; Hills, et al. 2012; Corder et al. 2016). The linkage between the physical environment and physical activity is built by active transportation, bicycling, and particularly walking as elements of sustainable urban transportation planning (Craig et al. 2002, Handy et al. 2002; van Dyck et al. 2010a & van Holle et al. 2014). Walkability is not the only essence of urban form that can increase PA; some other qualities such as regional accessibility, sidewalks, bike facilities and recreation facility access are also associated with physical activity and concludingly body weight and high blood pressure (Ulmer et al. 2014). This correlation may affect body weight of all age groups (Smith et al. 2008). Neighborhood walkability can be decisive for children's PA (D'Haese et al. 2014). Walkability of the local space around residential places as well as the way to school can be of importance regarding physical activity of the youth. Researchers have majorly suggested to adopt policy to make the surrounding of schools more walkable. The examples are providing safer environment for children to promote their walking to and from school (Shbeeb & Awad, 2013) and selection of school site according to street connectivity (Giles-Corti et al. 2011). In general, 14 different interventions were identified by Chillón et al. (2011) for promotion of active commuting to school in the United States, the United Kingdom, and Australia. The physical activity of children has decreased compared to previous decades (Tanter & Doyle, 1996; Karsten, 2005; Hillman, 2006). The reasons can lay in very different aspects of modern life such as built environment, lifestyles, socio-economics, objective and subjective safety and security, etc. Outdoor physical activities and organized sport practice of US children has been significantly reduced between 1981 and 1997. Lack of PA in children may come together with hypertension, insulin resistance, dyslipidemia, cardiometabolic risk, and finally obesity (Ekelund et al. 2006; Ness et al. 2007; Leary et al. 2008; Owen et al. 2010).

The literature attempting to analyze the circumstances of diminishing PA of children and its correlates are have discussed many aspects including the urban form and neighborhood, socio-economics and social interactions, safety, and security. In many cases, the results of the empirical studies are consistent and reliable. A newer topic that has drawn attention of scholars is the concept of ATS. During the past decades, children's walking and biking to and from school has been weakened. Children are chauffeured to school much more than previous decades in several countries (Department of Transport, 2001, 2009; Sturm, 2004; Karsten, 2005; Salmon et al. 2005; McDonald, 2007; van der Ploeg et al. 2008; Garrard, 2011). There is also evidence that childhood outdoor PA is decreasing (e.g. Sturm, 2004; McDonald et al. 2009) and their body weight is continuously increasing in several countries. The findings related to this topic clearly describe the advantages

of ATS and its contributions to PA. Nevertheless, when it comes to the associations of ATS with children's body weight, obesity, and BMI, the study results are not clear.

3 METHODOLOGY

The present paper presents a systematic review of literature dealing with ATS, BMI, and their associations. The objective is to clarify if the inconsistency in the results addressed in a couple of studies mentioned above still exists. The question that is to be answered by this study is are there significant associations between ATS and children's BMI? This study focuses only on children and avoids to broaden the age to adolescents; the age criterion of this study is thus limited to 3 to 12 years. It is clear that three to six-year old children do not go to school, but in this paper, ATS refers to a wider meaning than only attending elementary school. Here, both elementary school and kindergarten are addressed. The topic is studied in an international context using all the literature from high-income and emerging economies.

ATS and similar terms as well as BMI, "body weight", and obesity were searched for online. Nine different combinations were searched for as illustrated in Table 1. English peer-reviewed journal papers were searched and the results were arranged in Citavi citation management software. Location of published papers played no role in the search. As a result, 310 citations were collected.

CHILDREN'S MOBILITY PATTERNS		WEIGHT
Active Transport to School		BMI
Active Commuting to School	+	Body Weight
Active School Transportation		Obesity

Tab. 1 Search Parameters

Searches in four databases (PubMed, ScienceDirect, WorldCat, and Google Scholar) identified 310 citations published in 2005 and later. Fig. 1 depicts the inclusion/exclusion procedure.

The criteria employed for quality assessment of the final bibliography based on an adaptation of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement, which is also taken by Lubans et al. (2011). The six assessment criteria of Elm et al. were slightly changed to fit within the topic of this study. For making this study consistent with that of Lubans et al. (2011), the three common studies are assessed according to Lubans et al. These three studies are Heelan et al. (2005), Rosenberg et al. (2006), and Owen et al. (2010).

4 RESULTS

The number of studies on the target topic conducted in the recent years is increasing; four studies have been published in 2015. Nine studies (less than 70 percent) were published between 2010 and 2015, while between 2005 and 2010 only four were out. Five out of 13 studies (38.5%) were conducted in the US. Two studies (15.4%) were done in Canada. Australia, Norway, Sweden, Spain, and China had each one, and one study was international (Table 3). Four studies are longitudinal (Rosenberg et al. 2006; Pabayo et al. 2010; Chillón et al. 2012; Mendoza et al. 2014), which provides a higher quality in discussing causation than the existing evidence back in 2011 by Lubans et al. (2 out of 27 which equals 7.4%). Except Fulton et al. (2005) and DeWees & Ohri-Vachaspati (2015), who applied random-digit dial survey, others took self-reported questionnaires for collecting ATS and other data. Body composition data were measured by research staff, or by other equipment, or were self-reported. Sample sizes differ from 262 in Sweden (Chillón et al. 2012) to 21596 in China (Sun et al. 2015). Samples of one thousand or more have mostly been taken between 2013

and 2015. The widest age range has been 3-18 years (DeWees & Ohri-Vachaspati, 2015), while the narrowest ranges was 10.2 ± 0.7 years (Heelan et al. 2005). All 13 studies examined both sexes. Walking and biking were the essential modes of ATS of the selected studies. Only Yeung et al. (2008) did not observe bicycle trips. ATS ranged from 8.67% (Mendoza et al. 2014) to 69% (Gutiérrez-Zornoza et al. 2015) within the children of the samples, both conducted in the US.

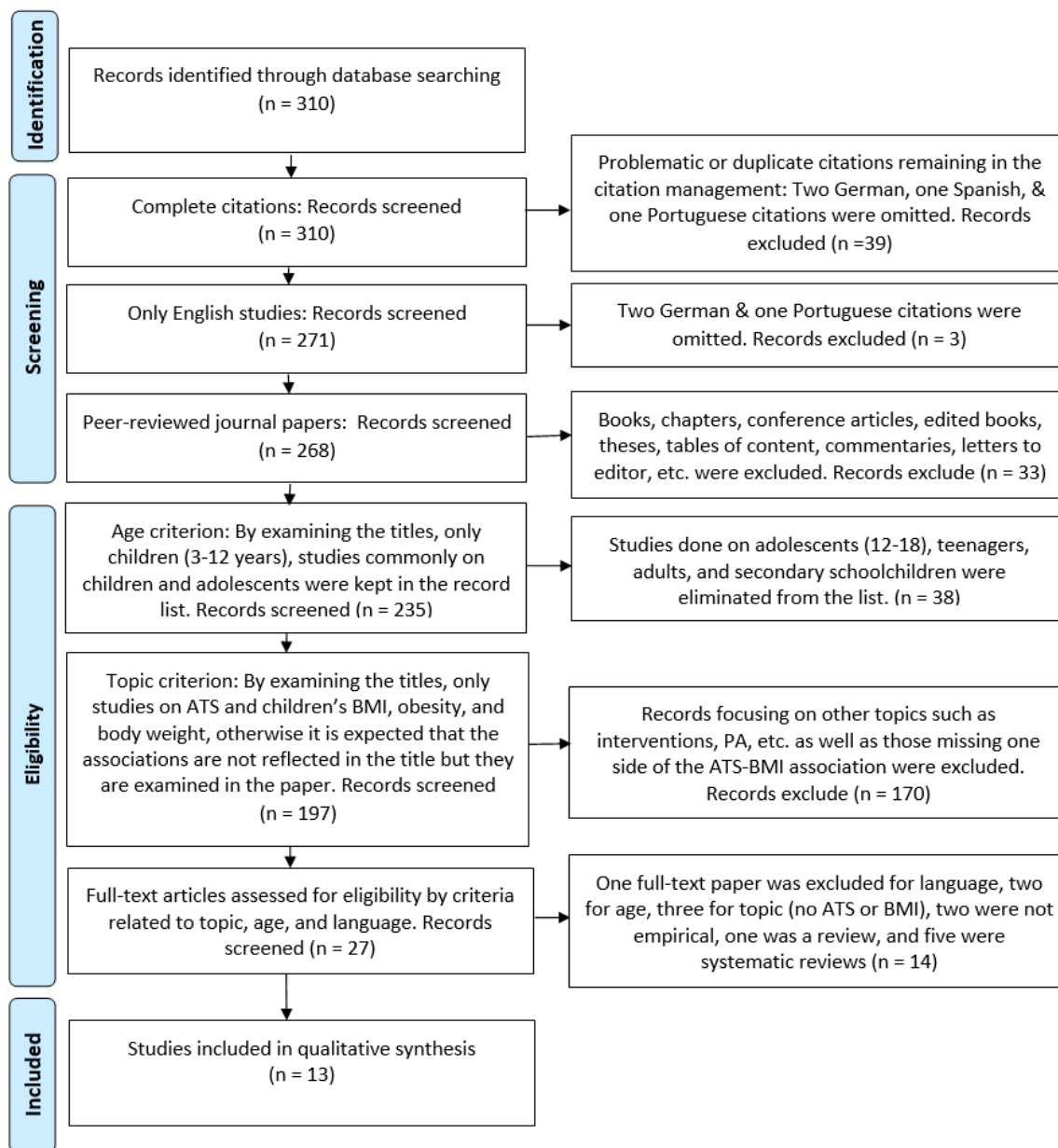


Fig. 1 Flow diagram of study selection. Note: ATS = Active Transport to School

As illustrated in Table 2, six out of 13 studies (46.2%) scored ≥ 4 , which is almost comparable with the quality of 27 studies analyzed in 2011 (Lubans et al.). Only five studies succeeded to provide convincing information concerning random selection of participants/schools (Fulton et al. 2005; Pabayo et al. 2010; Østergaard et al. 2013; Gutierrez-Zornoza et al. 2015; DeWeese and Ohri-Vachaspati, 2015). Reporting the sources and details of BMI was the strength of 10 studies. Most of the studies failed to fulfill the requirement of the last question regarding the number of respondents who completed each of the different measures, and if they succeeded to do so, they did not catch the 80% threshold.

Out of 13 studies, three conclusively confirmed existence of associations between ATS and BMI (Larouche et al. 2011; Sarmiento et al. 2015; Sun et al. 2015), three partially confirm such associations in certain conditions (Rosenberg et al. 2006; Mendoza et al. 2014; DeWeese and Ohri-Vachaspati, 2015), and seven reject any association (Fulton et al. 2005; Heelan et al. 2005; Yeung et al. 2008; Pabayo et al. 2010; Chillón et al. 2012; Østergaard et al. 2013; Gutiérrez-Zornoza et al. 2015). The example of the studies that found associations in specific conditions is Rosenberg et al. (2006) that found significant associations only for boys. The significant associations found by Mendoza et al. (2014) were limited to less safe neighborhoods. Finally, DeWees & Ohri-Vachaspati, (2015) reported inverse associations only for children who walk, bike, or skateboard to school beyond half a mile. The average sample size of the three conclusively confirming studies is 9569, while those of the three studies that found associations in subgroups and some of the measures and seven studies finding no correlations are 4784 and 2769 respectively (Table 3). Table 3 also depicts that more recent studies have found associations more than older ones; three fourth of studies published in 2015 found general or partial relations, four studies out of five conducted between 2005 and 2010 did not report any associations. Except Larouche et al. who found an association from a sample of 315 students, all the other five studies that reported correlations were based on larger samples of around one thousand students or more. Two out of three studies that reported general correlations (Sarmiento et al. 2015; Sun et al. 2015) were done in less-studied contexts or internationally. Both cross-sectional and longitudinal studies found correlations. Except Larouche et al. that did not report clearly about the modes of active transport to school in their study, only Yeung et al. (2008) took a one-mode ATS (walking). This only study found no relations with BMI.

STUDIES	(I)	(II)	(III)	(IV)	(V)	(VI)	QUALITYSCORE TOTAL/6
DeWees & Ohri-Vachaspati, (2015)	1	1	1	0	0	0	3
Sun et al. (2015)	1	0	1	1	1	1	5
Sarmiento et al. (2015)	0	0	1	1	1	0	3
Gutiérrez-Zornoza et al. (2015)	1	1	1	1	0	0	4
Mendoza et al. (2014)	1	0	1	1	1	0	4
Østergaard et al. (2013)	1	1	1	1	1	0	5
Chillón et al. (2012)	1	0	0	1	0	0	2
Larouche et al. (2011)	1	0	0	1	1	0	3
Pabayo et al. (2010)	1	1	1	1	1	0	5
Yeung et al. (2008)	1	0	0	0	0	1	2
Rosenberg et al. (2006)	1	0	0	1	0	1	3
Heelan et al. (2005)	1	0	1	1	1	0	4
Fulton et al. (2005)	0	1	0	0	0	1	2

Tab. 2 Assessment of study quality

- (I) Did the study describe the participant eligibility criteria?
 (II) Were the study schools/ participants randomly selected (or representative of the study population)?
 (III) Did the study report the sources and details of ATS measurement and did the methods have acceptable reliability for the specific age group?
 (IV) Did the study report the sources and details of body weight assessment and did the all of the methods have acceptable reliability for the specific age group?
 (V) Did the study report a power calculation and was the study adequately powered to detect hypothesized relationships?
 (VI) Did the study report the numbers of individuals who completed each of the different measures and did participants complete at least 80% of measure

Author, Year	Observation Location and Time	Study Design / Analysis Method	Data Collection Method	Sample Size	Participants' Age and Sex	ATS Type	Percent of Children Classified as Active Commuters	Result
DeWees & Ohri-Vachaspati, 2015	4 low-income cities in New Jersey (Camden, Newark, New Brunswick, and Trenton) / 2009-2010	Cross-sectional, T-Test and Chi-square tests with some demographic, food consumption and PA variables as covariates.	Random digit-dial household survey: An adult in the household (often parents) talked on phone and did the measurements.	1408 households: 1 randomly selected school-going student per household	3-18 / Both	walking, biking, or skateboarding	47.2%	Without fixing distance, no association were reported. Inverse associations between ATS and overweight/ obesity were found among students who commute beyond half a mile.
Sun et al. 2015	8 cities in different parts of China (Shenyang, Shanghai, Hefei, Wuhan, hengzhou, Chongqing, Kunming, Guangzhou) / 2010	Cross-sectional, multivariate linear regression	Questionnaires administered by research staff in classrooms. Measurements were done by staff.	21596 children and adolescents (9445 boys and 12151 girls), 21280 of whom had BMI information.	Students of grade 1 to 12 / Both	Walking, biking	Not reported	ATS is associated with lower body weight represented by BMI, percentage of body fat, and waist circumference. Children who walked to school were significantly less likely to be obese.
Sarmiento et al. 2015	15 cities in 12 countries (Australia, Brazil, Canada, China, Colombia, Finland, India, Kenya, Portugal, South Africa, UK, and USA) / 2011-2013	Cross-sectional / linear mixed model	Questionnaires. Measurements were done by staff.	6797 children	Students of age 9 to 11 years / Both	walking, biking, roller blades and scooter	37.2% walking and 4.9% bicycling, roller-blade, skateboard, scooter	ATS is associated with lower BMI.
Gutiérrez-Zornoza et al. 2015	Cuenca, Spain / May and June 2006	Cross-sectional / T-Test and Pearson's Chi-square test	Cluster randomized trial	956 participants (472 boys and 484 girls), who join 18 public schools in rural areas.	Students of age 10 to 12 in Grades 5 and 6 / Both	Walking, biking	69% (boys: 68.4%, girls: 69.5%)	No associations.

Mendoza et al. 2014	USA / 1998-2004	Longitudinal / ANCOVA	Questionnaires. Research staff did the measurements using a Shorr board and weight using a Seca digital scale.	12022	Kindergarten to fifth grade / Both	Walking, biking	8.67%	Children from less safe neighborhoods who did ACS had lower fifth-grade BMI z-scores than their peers who did not do ACS, and there was no difference in fifth grade BMI z-scores among children from more-safe neighborhoods.
Østergaard et al. 2013	Norway / 2005-2006	Cross-sectional / multiple linear regression	Questionnaires. Measurements were done by research staff.	2299	Children of age 9-15 from 40 elementary schools and 23 high schools /Both	Walking, biking	48.7% walking, 3.6% bicycling.	No association were found between transport to school and BMI after adjusting for age, gender and leisure time physical activity.
Chillón et al. 2012	Sweden / 1998-2005	Longitudinal / ANCOVA	Computerized self-reported questionnaire	262	9-15 / Both	Walking, biking	Walkers decreased from 54% to 35% during the study time, while bikers increased from 12% to 31%.	No associations were found between ATS and fatness (BMI, waist circumference, and sum of 5 skinfolds)
Larouche et al. 2011	Eastern Ontario, Canada / 2009-2010	Cross-sectional / T-Test, ANCOVA	Self-reported questionnaires. Measurements were done using a portable stadiometer (SECA: Hamburg, Germany)	315	Grades 4 to 6 /Both	Not reported.	21.0% and 30.9% in the Fall/Winter and Spring/Summer seasons	Children who use ATS had lower BMI values, and were less likely to be overweight and obese.
Pabayo et al. 2010	Quebec, Canada / 1997-1998	Longitudinal / growth curve analyses was applied to examine the relationship between sustained ATS and BMI Z-scores.	Questionnaires. Measurements were done by research staff.	1170	From kindergarten to grade 2 /Both	Walking, biking	ATS at age 6: 14.4%.	No association was found between ATS and being overweight (between 75% and 85% percentiles) or obese (>95% percentile).

Yeung et al. 2008	Brisbane, Australia / ?	Cross-sectional / Mann-Whitney U test	Self-administered parental questionnaire	318 participants (46.9% boys and 53.1% girls)	4-12 / Both	Walking	33.6%	No association
								Boys who actively commuted to school had lower BMI ($p < 0.01$). No such association was found for girls. Active commuting to school over 2 years was not associated with BMI change or overweight status.
Rosenberg et al. 2006	Southern California, USA / 1990-1992	Longitudinal / ANOVA	Supervised questionnaire in the classroom. Caltrac accelerometers.	924 participants in 5 th grade at the end of the study period (53.2% boys; 46.8% girls)	4 th and 5 th grade students in 7 suburban elementary schools / Both	walking, biking, skateboarding	20%	
								36% of the children who lived between 0.8 and 1.6 km from their school actively commuted at least 50% of the time. 9% actively commuted more than 75% of the time each week.
Heelan et al. 2005	Nebraska, USA /	Cross-sectional / multiple regression	Questionnaires sent to children's houses. Research staff did the measurements in schools using Seca Platform Scale, model 707.	320 participants (44% boys and 56% girls) in 8 rural schools	Age 10.2 ± 0.7 years / Both	Walking, biking, skateboarding / scooter		Significant positive associations were found between active commuting to school index (number of active commutes by distance to school) and BMI. No results were reported indicating ability of ATS in attenuating BMI.
								No associations: compared to obese/overweight participants, those with normal BMI have 0.8 (0.5-1.1) times the odds of using ATS.
Fulton et al. 2005	USA / 1996	Cross-sectional / multivariate logistic regression analysis	Random digit-dial household survey, Computer-assisted telephone interviews	1458 parent-child pairs	Students of grades 4 to 12 / Both	Walking, biking	Walk: 11.4%, bike: 2.6%.	

Tab. 3 Review results

5 DISCUSSION AND CONCLUSION

The results of this systematic review shows that after an increase in the number of studies on ATS and BMI of children, the results are still not consistent. No conclusive result is thus to be derived from the studies published after 2005. However, the partial conclusion can be active transport to school may lead to lower BMIs in children, particularly for longer walking/cycling distances, for boys, and in less safe neighborhoods. Despite conduction of several interesting studies during the past five years, the finding of this review is still in line with five older systematic reviews that did not find the international findings consistent and compelling (Lee et al. 2008; Faulkner et al. 2009; Lubans et al. 2011; Schoeppe et al. 2013; Larouche et al. 2014).

It is noteworthy that this study has been narrowed down to only children and BMI in hope of better quality of research, while most of the abovementioned systematic reviews have much wider topics; i.e. the associations of ATS with children's PA and weight (Lee et al. 2008; Schoeppe et al. 2013), the same associations in children and the youth (Faulkner et al. 2009), ATS with health-related fitness in children (Lubans et al. 2011), and finally ATS with PA, body composition, and cardiovascular fitness in children and adolescents (Larouche et al. 2014). For undertaking this study, it is assumed that narrowing down the effective factors of the associations as well as the age limit may promote the quality of the review.

Based on the results of this review, more studies are needed to clarify the possible associations. Two points are necessary to be cared about in the future research: (1) larger sample sizes; (2) less-studied contexts. The results of this review reveals that most of studies that found significant correlations were carried out enjoying at least one of the above conditions.

The findings of this study confirms the comment of Bere and Anderson (2009) who believe higher sample sizes may provide higher statistical power for finding associations of ATS and BMI. The literature studied in this paper suggest that in case seeking universal and conclusive associations may fail, investigating subgroups, geographical and contextual settings, or different socio-economics can lead to identifying relationships, e.g. some studies address the ATS-BMI relationship stronger in boys, or the associations may be stronger for cycling rather than walking. More complex statistical methods for controlling for some of the variables may help identify relative relationships.

Two recent studies published in 2015 focused on less-studied contexts like China (Sun et al. 2015) and an international group of countries mostly among emerging economies (Sarmiento et al. 2015) found conclusive correlations. This suggests that if the future studies are directed towards these regions, a better understanding of different ATS-BMI relationships are provided and more significant outputs maybe resulted. This idea is supported by limited number of a recent research that show the correlated of ATS may be context-specific (Larouche et al. 2015) and that in a multi-ethnic society like England, the ATS habits are different among ethnicities: "white European children were more likely to walk/cycle, black African Caribbeans to travel by public transport and South Asian children to travel by car" (Owen et al. 2012). If ATS behaviors are different inside a single country, then it can be hypothesized that habits like the speed and intensity of walking or biking to school may be various in different geographies and cultures. This may cause changes on the effectiveness of ATS on children's body weight. While in some cultures children may have interest to walk or bike faster than some other contexts, PA may be affected differently, and consequently BMI may be attenuated in a higher level. We have very little evidence about the culturally and contextually specificity of ATS-BMI correlations. Thus, this topic deserves more observations and analyses.

To sum up, this systematic review of recent literature indicates inconsistency in ATS-BMI relationship research results. Further research by means of larger samples in less-studied contexts and cultures may be useful for shaping the overall structure of the subject.

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IMAGE SOURCES

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TeMA

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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 1(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.

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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.

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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开，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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METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 1(2017)

REVIEW PAGES: WEB RESOURCES

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In this number

IDEAS AND APPROACHES TO FACE CLIMATE CHANGE IN CITIES

Climate change is a systemic challenge for cities (EEA, 2016). It is influenced by environmental and socio-economic factors of urban contexts. While lifestyle, consumption and production affect the amount of GHG emissions, hence the mitigation challenge, the spread presence of cities in risk areas reduces the capacity of urban systems to respond effectively to climate change impacts (i.e. heatwaves, extreme rainfalls, sea level rise, etc.). Therefore, cities have started to implement different measures of urban adaptation.

Considering that urban areas can be seen as melting pots for human activities and often hit by several climate change impacts simultaneously, adaptation measures need to cover a broad range of issues, including technological, informational, organizational, etc., at various governance levels, as well as sectoral and cross-sectoral levels (Biesbroek et al., 2010; Papa et al., 2015). Indeed, climate impacts vary significantly from country to country. Therefore, different adaptation measures are defined considering the specific urban context. Many of those actions are part of long-term strategy, but the majority of them are low-cost and soft measures, such as emergency plans, institutional procedures and behavioral advice. Today, although the definition of climate change adaptation promoted by IPCC (2014) is largely shared, different approaches are adopted in order to face climate change and to build up resilient cities. Moreover, in the last years, many efforts have been oriented toward a definition of a methodology to develop adaptation strategies in different urban contexts (Carter et al., 2015).

In this number, three websites are presented in order to describe different methodological approaches aimed at improving the capacity of urban systems to face future changes associated with climate change. The first one is the website of research project TURAS, which has developed a twinning approach bringing together decision makers in local authorities with SMEs and researchers to improve and fulfill urban resilient strategies and measures; the second website is FRC – FloodResilientCity, an EU-funded project for implementing urban resilience in eight cities of North West Europe to the increasing likelihood of floodings due to sea-level rise and increased flood flows on rivers, streams or due to extreme rain (pluvial flooding). Finally, the third website is the one developed by ISET-International, a non-profit research, training and technical support organization, which supports sustainable solutions to improve the resilient capacity of local communities and urban areas, in particular in the cities of developing countries of Asia.



TURAS (Transition towards Urban Resilience and Sustainability) is the website of an EU funded project, started in October 2011 and finished in September 2016. The project aimed to bring together urban communities, researchers, local authorities and firms for a total of 26 project partners (specifically, 11 local authorities, 9 leading academic research institutions and 6 SMEs) to develop, realize and disseminate strategies and measures in order to improve the resilience capacity of European cities. The specific challenges addressed in TURAS included: climate change adaptation and mitigation; natural resource shortage and unprecedented urban growth. Therefore, TURAS has developed a framework and a process for collecting data at neighborhood scale through a geospatial ICT infrastructure. Such data were used to develop and test new approaches to increase urban resilience and reduce the urban ecological footprint of each participating city to the project.

The main results are articulated in six work packages:

- geospatial ICT – Support Infrastructure for Urban Resilience;
- greening Public and Private Green Infrastructure;
- urban/Industrial Regeneration, Land Use Planning and Creative Design;
- climate Change Resilient City Planning and Climate-Neutral Infrastructure;
- limiting Urban Sprawl;
- short-Circuit Economies.

The TURAS website presents four sections: *About TURAS*, *Results*, *Resources* and *Contact us*. The *About TURAS* section is composed by the homepage of the website with general information about the projects, a list of project partners and a useful sitemap for website users. The second section, *Results*, contains 85 TURAS solutions, divided into four categories:

- *TURAS tools*: such tools consist in analytical toolkits, process methodology, community engagement tools and implementation guidelines to help cities respond to a broad range of urban challenges from climate change adaptation. For instance, the *Space-Engagers* is a tool made of guidelines and online platform to identify the underused urban spaces in order to improve the strategic urban planning to “address multiple challenges and facilitate the transformation of social and ecological systems in the city”;
- *Integrated Transition projects*: these projects combine the above-mentioned TURAS tools in an integrated cross-disciplinary approach to dealing with large scale urban challenges;
- *TURAS Pilots*: TURAS Pilot projects are implemented by TURAS participants. In total, there are 33 Pilots and each project reports obstacles and resources limitations faced by stakeholder for implementing the solutions;
- *Place-based Strategies*: Place-based Strategies presents the experience and lessons learned from TURAS cities through combination, adaptation, implementation and check.

Instead, the *Resources* section is articulated in eight pages which collect a wide variety of materials which are related both to the TURAS project itself and to the related topics. *Videos* page contains several interviews to project partners related to different initiatives’ topics. *Blog* and *News* report information about TURAS activities. In *TURAS Events* there is a list of events organised by TURAS or to which has taken part and the *Images* page collects several photos of such events. In *Documents* and *Deliverables* pages more than hundred documents and research reports can be freely downloaded. Finally, about the *Contact us* section for each project outcome there is a nominated contact person for further information, even if the project is finished.



The FRC project (acronym of FloodResilienCity) is a project funded within the INTERREG NEW – the EU Programme aimed at promoting the economic, environmental, social and territorial future of the North-West Europe. The main aim of the FRC project is to enable public authorities in eight cities across North West Europe region to better cope with floods in urban areas, also thanks to a combination of transnational cooperation and regional investments. What it is worth to note is that the project brings together experts (e.g. water engineers and flood managers) and public authorities, but it also involves “*people who have interests in other aspects of water management such as for supporting ecosystems*”. The purpose and the main structure of the website are described in the page *Using this Website*. Indeed, this website has been developed with a twofold goal:

- to communicate and disseminate the detailed results of the FRC project for people involved in urban design and water management, as well as university researchers and the people in the FRC partner organisations. The specific section *FRC Output* includes these results and it is can be seen directly from the home page;
- to represent an on-line resource for introducing of the flood management topic “*to all the people affected by or interested in flooding and whose jobs and roles may make them stakeholders in flood management*”. In order to reach this goal the section *Adaptation in the built, natural and water environments* has been added to the homepage.

Specifically, the user interested to FRC results can access the *FRC Output* where contents are grouped into 4 sub-sections:

- the *Our end conference*, where the final presentations can be downloaded;
- the *Sharing learning and experience* pages, which share the knowledge and experience developed into the project framework;
- the *Flood resilient actions in FRC*, where the actions to improve resilience to different types of flooding taken by the eight case studies are described,
- the *Training* part that collect material to understand flooding concepts, flood management and resilience for towns and cities as well as the FRC project framework and results.

However, if the user prefers to investigate the FRC topics in accordance with the project framework, he can click on the *Adaptation in the built, natural and water environments* tab from the homepage. Then, the user can access the topics in three different ways: depending on the topics by means of the navigation tools *Themes*, depending on the type of water (e.g. water supply and drought) thanks to the navigation tool *Water types* or typing the terms directly in the *Search website*, available on the top of the above mentioned navigation tools. In addition to this, the website provides the users with the *Glossary* section where technical contents are explained in order to increase awareness about the flooding in urban context using simple language.

Since one of the aims of the FRC project is to provide as many people as possible with useful information and materials, there is also a section about the *Links* section where related projects are briefly explained, as well as the possibility to translate the site in other five languages, which are the ones of the project partners. The importance of dissemination and communication is also highlighted by the presence of links to two image hosting and video hosting websites (i.e. YouTube and Flickr channels). Finally, on the bottom part of the website, there is a sliding bar that allows users to visualise the logos of the partners involved in the project. In detail, project's partners are equally constituted by research institutes and public administrators.



ISET ISET-INTERNATIONAL
<http://i-s-e-t.org/welcome.html>

ISET-International – namely Institute for Social and Environmental Transition – is involved in the development of strategies to improve the resilience and the adaptation capability of the cities (mainly Asiatic ones) towards natural resource, climatic, environmental and social challenges. It is important to note that this foundation has some core principles (e.g. Partnership, strategic thinking, communication, and commitment) as the basis for its research, training and implementation activities.

The website is subdivided into 4 main sections, and an additional section with the contact form. The four sections are the followings:

- Projects: in this section, the projects where ISET has been involved are collected year by year, since 2006. The projects are related to the topics of urban resilience, the resilience assessment, disaster risks, resource management, etc...
- Resources: within this section, there are several materials such as reports, case-studies, discussion papers, journal articles and resources and training materials to support the needs and approaches of different groups, as well as videos and conference presentations.
- Network Capacities: as already introduced, the partnership and communication are strategic principles for ISET. In order to foster the collaboration between partners, a presentation of ISET core activities is shown. Moreover, also the members and the collaborators are listed in order to provide information about possible contact persons.
- Blog and news: thanks to the contributions of the partners and the collaborators, this section includes information and news about their research from all over the world. In detail, the section leads to another website (blog.i-s-e-t.org) where information and news are subdivided into specific categories.

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IMAGE SOURCES

The images are from: <http://www.turas-cities.org/about>; <http://www.floodresiliency.eu/>; <http://i-s-e-t.org/welcome.html>

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF
URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 1(2017)

REVIEW PAGES: BOOKS

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In this number
THE URBAN ADAPTATION TO CHANGES

The urban areas and especially the cities have become the most desired place to live. In fact, the population living in cities is greater than the rural population. In recent years this has caused significant migratory movements that have no comparisons in human history. This urbanization process is which will significantly influence the economic, political and social transformation of societies and their spatial impacts. It is evaluated that up to 70% of the global population will be living in cities by 2050. So, spatial and functional interrelations between cities, settlements and their surrounding rural areas are increasing and the metropolitan scale is gaining more and more relevance for integrated urban and city-regional planning, governance, financing, and implementation. The urban areas are becoming spatially, functionally and economically interdependent with their surrounding areas constituting metropolitan regions. The need for holistic approaches to govern these urban agglomerations becomes ever more pressing. Local authorities, planners, decision makers as well as the international development community consequently need to look beyond traditional administrative and jurisdictional boundaries. This is why there is now an increasing focus on metropolitan governance as an essential mechanism for cooperation beyond city boundaries, achieving efficiency gains for cost effectiveness, improving delivery of basic services for all, ensuring equitable distribution of resources, promoting balanced territorial development, and many other needs.

An additional challenge, that the cities are facing, concern the evident and worrisome effects of climate change. So for the urban areas it is necessary to forecast some long term adaptation strategies to reduce the negativness. In fact, climate change seems to currently represent the main threat to urban development in the near future: cities are indeed the main contributors to energy consumption and GHG emissions paying, at the same time, the highest price for increasing climate impacts (Papa et al., 2015). There are many challenges to cope especially for the local authority. The financial crisis has reduced the municipality and metropolitan budget and public and private investors are hard to find.

According to these themes, this section suggests three books and reports that help to better understand the issue of this number: Metropolitan Governance: A Framework for Capacity Assessment, The lightweight city. Smart city and operative planning and Smart Governance Successful Initiatives and Financing urban adaptation to climate change.



Title: **Metropolitan Governance: A Framework for Capacity Assessment**

Author/editor: Jenny Pear son

Publisher: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Publication year: 2016

ISBN code: -

The Sector Project “Sustainable Development of Metropolitan Regions”, implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), develops action-oriented advisory services on the role of metropolitan regions as drivers for sustainable development. This Framework for Metropolitan Governance Assessment – Guidance Notes and Toolbox forms part of the publication series “Sustainable Development of Metropolitan Regions” that gives conceptual guidance and recommendations for hands-on approaches for development organizations as well as partner countries in the field of sustainable development of metropolitan regions.

The Metropolitan Capacity Assessment Methodology (MetroCAM) presented here has been developed to offer a set of tools for actors in metropolitan regions who want to initiate change, and for the agencies planning to support them do so. It is a generic methodology that provides guidance about what needs to be covered when assessing the governance capacity of a metropolitan region, starting with existing capacity, future needs, and potential trigger points and then identifying what else is needed to deal with a particular need or challenge (e.g. mobility, resilience, social inclusion).

The MetroCAM presented here has been developed to offer a framework and accompanying tools for any actors in metropolitan regions who want to initiate change, and for the agencies planning to support them do so. It is a generic methodology that provides guidance about what needs to be covered when assessing governance capacity of a metropolitan region. The approach stresses the need to start with understanding existing capacity as the first step and then to identify what else is needed to deal with a particular need or challenge. As important as the capacity assessment itself, the MetroCAM is also a process to build consensus. The whole assessment process is a way to foster dialogue and get political buy-in to initiate or deepen a reform.

The Part A provide guidance and a structure to lead decision making about: start up activities; how to conduct the assessment process - through steps such as stakeholder mapping, gathering core data, conducting consultative workshops, and so on; a framework for assessment and analysis; and using the analysis to identify recommendations and next steps for action. There is also guidance on issues such as resources considerations and working on a theme. Part B is a selection of useful tools for conducting the relevant activity steps.

The ultimate aim of the MetroCAM is to lead to an informative analysis of key issues, capacities and needs, that in turn result in recommendations for initiatives that would contribute to solving problems, creating innovations, or improving existing services and conditions.

In conclusion the tool is useful for two purposes:

- (i) as a workshop exercise, to get participants engaged in a discussion about the current state of services and the priorities for change or improvements in the specific sector;
- (ii) it can be used as part of the decision making process at the end of the assessment, when reviewing key findings and recommendations, to help decide which challenges or initiatives should be addressed first.



Title: Financing urban adaptation to climate change

Author/editor: European Environment Agency

Publisher: European Commission

Publication year: 2017

ISBN code: 978-92-9213-845-5

This report was written through a collaboration between European Environment Agency (EEA) and European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation (ETC CCA).

Notwithstanding the global, European and national efforts to unlock climate change finance, this is a major challenge for relevant authorities and private stakeholders. To advance adaptation measures in municipalities, it is important to improve the capacity to find these sources, apply for funding and negotiate the various financing streams. The report supports the public and private stockholders who wants to make use of the experience of a specific case study to get in direct contact with the relevant municipality, and eventually to set up a peer-to-peer learning process. In the first part of report, the authors list and describe some main local adaptation financing measures, that are: Governmental sources - mostly grants, including international and EU funding instruments, national, regional and local municipality budgets; Banks and other financial institutions provide loans or guarantees, either directly or in partnership with local retail banks; Private stakeholders, including foundations, real estate developers, companies, house owners and individuals, that invest in measures directly or via crowdfunding and green bonds; Free/low-cost solutions exist through early integration of adaptation needs into urban planning and design, mainstreaming of adaptation measures into other municipal areas such as water management, health, nature, etc., or through supporting regulations such as building standards. In the second part, the report proposes short and schematic descriptions of eleven European case studies that have adopted some financial models for implementing adaptation measure, so to provide an insight into the different ways to finance urban adaptation actions. The cases featured in the report can inspire and share valuable practical experience but require creative handling and adjustment to specific local conditions to make them work elsewhere.

After the analysis of the case studies the report proposed a summary of interesting lessons can already be learned from this limited set of studies, that are collect in three different paragraph listed below:

- Wise use of financial sources. Many successful instances of financing adaptation measures, European cities and municipalities combine different types of financing from various sources in different sectors and from different governmental levels;
- Essential capacities are needed in or for cities. Some of key factors for advancing adaptation action in municipalities is to establish the capacity to identify, apply for and negotiate various financing streams. This requires an expert staff, which is a problem in particular for smaller municipalities, where adaptation is often only an office with one staff member;
- Communication, reasoning, convincing. Implementing measures successfully requires more than financial resources. It also requires sufficient awareness and support among decision-makers in the public and private domain, and among citizens and other stakeholders. An adaptation strategy or plan often helps to raise such awareness.

In conclusion, financing of the adaptation measures, that change the way a city is built and organised, can be easy or difficult to implement. Because the measures often fall under the responsibility of many different sectors. However, taking the comprehensive perspective of integrated and long-term urban development, and considering the municipality as a whole, can result in lower overall costs and many additional benefits.



Title: The lightweight city. Smart city and operative planning

Author/editor: Giuseppe Mazzeo

Publisher: Fedoa press

Publication year: 2016

ISBN code: 978-88-6887-005-8

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. This research work is a further advancement of the SEM project - Smart Energy Master to development a model of governance for energy saving and efficiency of the territory with reference to both the urban areas. The project was financed within the Smart Cities and Communities PON projects and ended in January 2016.

The aim of this book is to analyse urban structures and knowing what features could have to contrast the two opposing forces acting on the same scene: on the one hand the unabated urbanization process, on the other the ever growing demand for real sustainability. So, the author proposes an urban planning response focused on the transformations of urban sectors to be achieved using innovative operative tools. The goal is to include in the cities innovative actions that can provoke a domino effect with repercussions on the entire urban structure. The book is divided in five sections, that are briefly described below: the first one addresses the issue of urbanization and the development of the urban systems, with the related implications in terms of resource consumption and concentration of people and functions; the second part discusses some models that explain the mechanisms of urban sprawl and the derived scenarios; the third part deals with one of the key nodes of the relationship between urban systems and environmental resources, namely the energy; the fourth part analysis some international and European case studies to extrapolate recurring characteristics that can affect the operative planning in terms of sustainable and smartness; the fifth part, finally, it deepens the structure and elements that must be part of this new type of plan, with the aim to start in the cities localized innovative actions such as to involve the entire urban structure.

In conclusion, this book seeks to start the development of scientific debate and good practice of implementing urbanism that are weak of theoretical bases and lack of interest in the management level. One of the ways, in which it is possible to give consistency and coherence to the study of urban systems is to steer the growth and development of the cities fairly and sustainably. So that the interaction between technology and man is able to make the city balanced in consumption and efficient of energy.

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METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 1(2017)

REVIEW PAGES: LAWS

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URBAN PLANNING AND GOVERNANCE IN EUROPEAN METROPOLITAN AREAS

European cities have been facing very serious economic, environmental, social and demographic challenges during recent years, especially in urban areas. If, on one hand, economic growth has driven the fast spatial expansion of urban areas in the last decades, on the other hand, European local governments have not updated their territorial architecture, which has remained unaltered for decades in most countries. Therefore, in many cases *"the 'economic city' has become much larger than the 'administrative city'. With the outdated institutional and territorial structures, public interests are poorly represented and remain a long way behind the dynamism of private actors"* (Tosics, 2011).

In this context, as globalization moves forward, European countries have been trying to modernize their government structure and their spatial organization in order to promote growth and innovation. Hence, new governance models on functional spatial levels have emerged for integrating urban planning strategies and decision-making processes (Barresi & Pultrone, 2013).

The conceptual idea of metropolitan cities (or regions) was born based on these considerations. In particular, *"the hypothesis at the basis of Metropolitan cities concern the idea that, within metropolitan areas, the main city and the smaller edge towns are characterized by close economic and social interdependences, which are, however, beyond the jurisdiction of individual municipal governments"* (Crivello & Staricco, 2017). In this light, different European States have promoted territorial reforms and, according to a study by the Thomas More Institute (2009), *"encouraged by the European Union, regions will become the frame of reference for European regional politics, aiming to promote the development of competitive territories whilst maintaining their cohesion"*. Therefore, this issue of TeMA focuses on the different territorial organization and governance models of three European countries:

- Italy, which recently changed its administrative structure introducing fourteen metropolitan cities;
- France, which reorganized its territorial architecture reducing the number of regions from twenty-two to thirteen, strengthening the role of metropolitan cities;
- Germany, with its eleven metropolitan regions assigned by the Ministerial Conference on Regional Planning between 1997 and 2005.

Three different names for similar urban conurbation, which have been created for similar reasons, such as better managing economic and social growth, reduce public costs and promote more equality across territories.



URBAN PLANNING & GOVERNANCE IN ITALY

Italian Metropolitan Cities were first introduced by the Law 142/1990, which identified nine urban areas – Torino, Milano, Venice, Genoa, Bologna, Firenze, Rome, Bari, and Naples – that should have become metropolitan cities. However, the legislative provisions have been only on paper for over twenty years because of bureaucracy and political impasse (Piolette, Soriani). Only in 2014, with Law 56/2014 (also called Delrio Law) the nine metropolitan cities became effective, and by January 2016, they become operative. In addition to the nine metropolitan cities defined by the Delrio Law, five new metropolitan cities have been instituted between 2016 and 2017: Reggio Calabria, Catania, Palermo, Messina and Cagliari. Therefore, up to now, Italy has fourteen metropolitan cities, whose administrative boundaries correspond to those of the former Provinces. Crivello and Staricco (2017) argue that the Delrio reform had three main objectives: (1) *"first, it aimed at cost containments and savings, as the newly appointed councillors of the remaining Provinces and Metropolitan cities do not receive a salary"*; (2) *"second, the law tried to promote inter-municipal cooperation as the main governance approach at the intermediate level between Municipalities and Regions"*; (3) *"third, the law conferred to Metropolitan cities not only functions originally held by Provinces but also new ones concerning infrastructures, services and national and international relations"*.

Nevertheless, several issues have emerged since the law has been approved, especially with regard to the third goal identified by Crivello and Staricco (2017). In particular, there is still lack of transparency involved in the distribution of competences among regions, metropolitan cities and municipalities. Indeed, the different roles often overlap, thus slowing down the empowerment of metropolitan cities.

A clear example of this ambiguity in the division of roles concerns the adoption of the *metropolitan general spatial plan*. According to the Law 56/2014, metropolitan cities should develop and adopt this new urban planning tool, but the content of this plan is not specified in the Law, which gives this responsibility to the twenty Italian regions, according to their specific planning regulations. This type of administrative organization inevitably reduces the power of metropolitan cities and their functions.

Another critical issue about the role of metropolitan cities is funding streams. By replacing former provinces, indeed, metropolitan cities have access to provinces' budget, which has been severely cut during the last years; at the same time, the number of the strategic competencies of metropolitan cities has increased, thus bringing to light the need for additional funds. This issue has been substantially addressed by the European Commission in 2015 with the adoption of the National Operational Programme (PON) "Metropolitan cities 2014/2020". The total budget of the program for the fourteen Italian metropolitan cities amounts to about 893 million. The program was born in the framework of the European Urban Agenda and aims at strengthening the role of big urban areas by investing in the modernization of public services as well as in improving social inclusion, especially in disadvantaged territories. The program focuses on four priority axes: (1) digital metropolitan agenda; (2) sustainability of services and of urban mobility; (3) public services for social inclusion; (4) infrastructure for social inclusion. Based on these four main areas, the program identifies three groups of expected results that include the following: (1) regarding the digital agenda, one of the goal is providing 70% of metropolitan citizens with digital interactive services; (2) regarding urban sustainability, the PON aims to modernize lighting systems, reducing electricity consumption for public lighting by 8.8%, increase cycling and the number of passengers of public transport systems; (3) regarding social inclusion, one objective is to create and renovate over two thousand apartments for disadvantaged families.



URBAN PLANNING & GOVERNANCE IN FRANCE

A new map of France reorganized its internal administration, reducing the number of regions from twenty-two down to thirteen. After months of debate, resistance, changes, and much reshuffling of cartography, the 13-region version was adopted by the *Assemblée Nationale* – the lower house of the bicameral Parliament of France – with effect in January 2016 with the aim to simplify bureaucracy and save costs.

The French state is decentralised territorially in order to coordinate and deliver state functions more effectively. While French regions do not hold legislative authority – they do not write their own laws – they do indeed have considerable discretionary power over infrastructure and operational spending in education, tourism, public transit, universities and research, unemployment, and assistance to businesses.

The new map ratifies the merging of the following regions:

- Alsace, Lorraine and Champagne-Ardenne;
- Nord-Pas-de-Calais and Picardy;
- Burgundy and Franche-Comté;
- Upper Normandy and Lower Normandy;
- Rhône-Alpes and Auvergne;
- Midi-Pyrénées and Languedoc-Roussillon;
- Aquitaine, Limousin and Poitou-Charentes.

And six unchanged regions:

- Brittany;
- Corsica;
- Ile-de-France;
- Centre;
- Pays de la Loire;
- Provence-Alpes-Côte d'Azur.

There are two main principles behind the French reform: (a) simplify the administrative organization by strengthening the couple region/inter-municipal grouping at the expense of the historic couple (inherited from the French Revolution), department/municipality (these two levels do not disappear); (b) clarify the competences between levels of local governments with specific roles, avoiding duplication and rationalizing public spending.

Furthermore, The French government wanted to give its regions a "European size" in order to compete with its European neighbors. The redrawing, indeed, has increased the size of French regions, which were generally smaller than regions in other EU member states. Four French regions are part of the 50 most-populated regions in Europe, including Champagne-Picardie, Normandy, Alsace-Lorraine and the Centre-Poitou-Limousin.

Lastly, the territorial reform aims *"to give new impetus to economic development and to address the challenges of sustainable and inclusive growth, relying on the metropolitan cities and the regions as the two main levers. The metropolitan reform could have a significant impact on long-term GDP growth if it is implemented effectively without recreating intermediate layers that could diminish its impact"* (OECD, 2014).



URBAN PLANNING & GOVERNANCE IN GERMANY

Germany has eleven metropolitan regions, seven of which were identified by the Standing Conference of Federal and State Ministers Responsible for Spatial Planning in 1997 – Berlin/Brandenburg, Hamburg, Munich, Rhine-Ruhr, Rhine-Main, Stuttgart and Halle/Leipzig-Saxon Triangle – and four of which were added in 2005 – Nuremberg, Hanover, Bremen and the Rhine-Neckar Triangle. According to the German Federal Office for Building and Regional Planning (BBR) and the German Federal Ministry of Transport, Building and Urban Affairs (2006), metropolitan regions are *"primarily high-density urban agglomerations with at least 1 million inhabitants. They are spatial and functional locations whose prominent functions extend beyond international borders and are the main driving forces behind societal, economic, social and cultural development"*.

As presented in the document "Concepts and Strategies for Spatial Development in Germany" (BBR, 2006), four main factors are crucial for the functional sphere of influence and cooperative activities of the eleven German metropolitan regions:

- the concentration of political and economic centres of power and the control of international flows of capital and information;
- a high density of scientific and research establishments and the presence of high-quality cultural facilities and creative environments;
- good international accessibility provided by high-quality transport infrastructure and many and varied options for the exchange of goods, knowledge and information;
- a high degree of significance in historical, political, cultural and urban development terms and a corresponding international reputation.

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IMAGE SOURCES

Fig. 1 https://commons.wikimedia.org/wiki/File:Flag_of_Europe.svg; Fig. 2 <https://pixabay.com/it/photos/italy%20flag/>; Fig. 3 https://it.wikipedia.org/wiki/File:Flag_of_France.svg; Fig. 4 https://it.wikipedia.org/wiki/File:Flag_of_Germany.svg

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 1(2017)

REVIEW PAGES: URBAN PRACTICES

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In this number

PLANNING FOR BIKE SHARING: TWO CASE STUDIES IN THE U.S.

Sustainable mobility planning, as a relatively new approach in transport planning, requires the implementation of policy measures that produce a modal shift towards non-motorized form of transport such as walking and cycling (Banister, 2008; Morelli et al., 2013). Cycling, in particular, offers a number of environmental and health benefits, and represent a fast and cheap transportation option for short-distance trips in urban areas (Fraser and Lock, 2011). Accordingly, in recent years, transport planners and policy makers have focused much of their attention in promoting the use of bicycles in urban areas as an alternative to intensive car use (Pirlone e Candia, 2015).

One way in which cities can seek to capitalize the benefits associated with an increase in the use of bicycle is by implementing bike sharing schemes (BSS) to facilitate short term bicycle rental in urban areas. Typically a BSS involves the provision of a pool of bicycles across a network of strategically positioned bike sharing stations, which can be accessed by different types of users for short-term use, allowing point-to-point journeys (Meddin, 2015). By addressing the storage, maintenance, and secure parking aspects of bicycle ownership, BSS can encourage cycling among users who may not otherwise use bicycles. Additionally, the availability of a large number of bicycles in multiple dense, nearby locations frequently can creates a “network-effect,” further encouraging cycling and, more specifically, the use of public bike-sharing for regular trips (Parker et al., 2013). BSS have existed for almost fifty years but only in the last decade they have significantly grown in prevalence and popularity to include over 800 cities across the world and a global fleet exceeding 900,000 bicycles (Meddin, 2015). Technological advances, such as bike tracking, solar powering, telecommunicating and on-line shopping, have helped transform bike-sharing from an aspiration to reality.

In the United States, bike sharing has steadily increased year-over-year, from four systems in 2010 to 55 systems in 2016. In addition, 80% of systems that have been in operation for more than a year have expanded since they launched (NACTO, 2016). A number of U.S. cities, such as Detroit, New Haven, and New Orleans, have either selected vendors or are planning to launch systems, and many existing systems are also rolling out major expansions. The expansion and densification of bike sharing systems across the United States has helped many cities in moving bike share towards realizing its potential as an integrated, low-cost part of city transportation systems. This contribution presents two relevant U.S. case studies where BSS have been successfully implemented in recent years: i) Los Angeles and ii) Philadelphia.



LOS ANGELES

The County of Los Angeles is the most populous county in both the United States and the state of California. With over 10 million inhabitants, the county is home to more than one-quarter of California residents and is one of the most ethnically diverse counties in the U.S.. Despite its reputation as a car-oriented city, Los Angeles (and its county) has made huge investments in recent decades to improve its once-nonexistent public transportation system. This city now has a network of nearly 200 bus lines and six rail lines, as well as an extensive regional commuter rail system, mainly operated by the Los Angeles County Metropolitan Transportation Authority, also known as Metro.

In 2016, Metro launched the *Metro Bike Share*, the first regional bike share program that establishes the business model to bring bike share to more cities within L.A. County. In particular, the planning document “*Regional Bikeshare Implementation Plan*” envisions a bike share system that is accessible to Los Angeles County residents, students, workers and visitors, and that integrates with existing Metro services to improve the reliability, efficiency and usefulness of Metro’s transportation system. The Plan envisions a pilot bike share system of 99 stations in downtown L.A., implemented in two phases, and three future expansion phases, comprising 155 stations in eight communities.

Four interesting features make the *Metro Bike Share* a particularly interesting case study:

- *Integration with the public transport system.* Not only unique for its regional administrative plan, *Metro Bike Share* is also purpose built for regional accessibility. Indeed, it is the first U.S. large regional bike share program to offer transit fare integration, introducing bike share as a component of, rather than a compliment to, transit. At the *Metro Bike Share* website, customers can register their transit fare card to ride Metro bikes, using the same card to also ride Metro buses and trains. Integration is also accomplished by shared branding, service area and fare media.
- *Equity considerations.* A transportation equity perspective illuminates the plan. For the stations located in Downtown Los Angeles, Metro performed an analysis of the share of minority population within a quarter-mile and half-mile radius of the bike share stations, ensuring that stations are placed near neighborhoods and transit lines that low-income riders use in order to increase the likelihood that they can integrate the system into their regular travel.
- *Public engagement.* Metro and the city of Los Angeles worked closely with downtown L.A. community stakeholders, taking into consideration crowdsourced public input to select initial station locations that will better connect people to key neighborhood destinations. Special consideration was given to locations that created better access to museums, libraries, schools, retail, employment, residential areas and transit hubs.
- *The development of a Bikeshare Suitability Index.* In order to identify the most efficient locations for bicycle stations, Fehr & Peers, the transportation consultant that supported Metro in the development of the plan, developed a Regional Bikeshare Suitability Index. The index is based on a combination of basic variables associated with high bikeshare ridership. Integrating this index with other criteria for financial, political and community support resulted in a ranked list of potential expansion communities. Fehr & Peers then analyzed the effect of the demographic and built environment characteristics on ridership levels in four established bikeshare systems and applied the resulting regression models to estimate

ridership for the network of stations proposed for Downtown Los Angeles, Pasadena, and Santa Monica. Comparing the resulting ridership level estimates with the operating characteristics of other established bikeshare systems informed recommendations for the needed number of bikes and docks to support bikeshare demand.



PHILADELPHIA

Philadelphia is the largest city in the Commonwealth of Pennsylvania and the fifth-most populous city in the United States, with an estimated population of 1,567,442 and more than 6 million in the seventh-largest metropolitan statistical area, as of 2015. Philadelphia is considered to be one of the most bike-friendly cities in the U.S. with dedicated bike lanes on city streets, hundreds of miles of trails and a growing number of bicycle commuters.

In the spring of 2015, Philadelphia launched *Indego*, the first city's bike sharing programme. Based on the findings of a 2009 bike share feasibility study, the City of Philadelphia has worked to build support and funding for a bike sharing system. A *Bike Share Working Group* was formed to evaluate business models and develop a feasible business plan. The Working Group includes the City of Philadelphia Mayor's Office of Transportation and Utilities, the Bicycle Coalition of Greater Philadelphia, the Delaware Valley Regional Planning Commission and the Pennsylvania Environmental Council.

In 2013, the Working Group developed the *Bike Share Business Plan*. The plan examines the potential for success of a proposed bike share program in Philadelphia. It includes a comprehensive planning-level analysis of the bike share concept while also exploring key ancillary issues—such as bike-lane infrastructure and interoperability with public transit—that are likely to influence the potential success of the system. The program envisioned for Philadelphia entails an initial deployment of approximately 1,750 bicycles in a defined “core” area that will be further developed in a flexible way, according to the result of the first phase.

Key features of the Philadelphia bike sharing programme can be summarized as follows:

- *A clear definition of goals and objectives.* According to the business plan, Philadelphia's bike share system will establish a new form of public transportation for Philadelphia, one that is healthy and safe, is environmentally friendly, affordable for users, and financially sustainable to operate. Bike share will be an important part of the city's integrated public transportation network, connecting communities to more destinations across the city.
- *The definition of key performance measures.* The purpose of the performance measurements is to provide stakeholders and the public a clear and concise way to measure the effectiveness of the Philadelphia bike share program. A set of measures have been developed that fit within the overall framework of the program's vision, goals, and objectives. Each objective has one or more performance measurements that can be tracked over time. These measures can be grouped in four main domains: i) Personal Mobility; ii) Livability & Economic Competitiveness; iii) Health & Safety and iv) Finances & Transparency.
- *The development of a solid business plan.* Philadelphia's bike share system has been developed to be a financially self-sufficient system that requires neither operating subsidy nor additional capital funding from the City of Philadelphia. For this reason, the plan identifies the necessary actions to raise operating

revenue through three main channels: memberships, usage fees, and station advertising. In order to project revenue from memberships and usage fees, a revenue model was created and a market analysis was performed in order to assess as best as possible the potential level of bike share usage in Philadelphia. In order to achieve this, it was also critical to acknowledge both the experiences of other bike share cities as well as specific travel demand patterns in Philadelphia. In addition, it was important to identify local factors likely to influence the outcome of the Philadelphia bike share program, including climate, topography, demographics (populations of user groups), mode split, and infrastructure.

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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>.

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF
URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 1(2017)

REVIEW PAGES: NEWS AND EVENTS

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In this number

GREEN INFRASTRUCTURE AS DUAL-USE SYSTEM FOR ADAPTIVE PLANNING

Rapid urbanization and rapid growth of urban centers have been accompanied by the rapid growth of highly vulnerable communities, many of which settle on land at high risk from extreme weather. This rising complexity of urban structure, together with the expecting negative impacts of climate change, has brought a great deal of attention to the seductive theory of resilience through its capacity to evoke systemic adaptation before and after disasters. It is in fact increasingly shared the awareness that the possibility to support climate change adaptation via effective city governments goes through the thorough understanding of the complex inter-dependent system of city. Nevertheless, one of the main limits of this theory consists in the practical and economic difficulty for local governments of investing in preventive actions for adequately addressing the security and emergency response needs without a clear economic and political return.

In their paper *Toward Inherently Secure and Resilient Societies* Allenby & Fink (2005) offered an interesting perspective on this issue proposing the concept of dual-use systems. In their vision the urban systems should be redesigned by "implementing dual-use technologies that offer societal benefits even if anticipated disasters never occur".

In this perspective green infrastructure could represent an efficient dual-use system for adaptive planning. In fact, on the one hand, the implementation of green infrastructure represents one of the main key strategies to moderate the expected increases in extreme precipitation (Zellner et al., 2016) or temperature (Gargiulo et al., 2016; Salata & Yiannakou 2016); while on the other, it represents an important contributor for improving human health and air quality, lowering energy demand, expanding wildlife habitat and recreational space, and even increasing land-values (Foster et al., 2011).

Therefore, green infrastructure approaches help to achieve different goals over a range of outcomes, in addition to climate adaptation.

In this perspective, the value of green infrastructure can be calculated in terms of benefits, by comparing the costs of green practices to "hard" infrastructure alternatives, the value of avoided damages, or market preferences that enhance value, like property value.

Green infrastructure benefits generally can be divided into five categories of environmental protection:

- land-value;
- quality of life;

- public health;
- hazard mitigation;
- regulatory compliance;

For these reasons, green technologies and infrastructure solutions should be implemented by considering a comprehensive accounting of their multiple benefits.

The selected conferences represent a fertile level playing field of the latest methods to address the issue of green infrastructure and its multiple-use role in the increasingly pressing challenges that cities have to face.



GRAY TO GREEN CONFERENCE

Where: Toronto, Canada

When: 8-10 May 2017

<https://greytogreenconference.org/>

The main conference topic is “quantifying green infrastructure performance”; it aims at analyzing and quantifying the many benefits of investing in living green infrastructure such as urban forests, green roofs and walls by exploring the latest in performance, economic valuation, design, policy, and technology.

Grey to Green conference also includes different activities, like workshops, tours of outstanding networking events, and presentations of Toronto projects such as the Toronto's new Green Streets Guideline and the Province of Ontario's new Stormwater Design Guidelines.

The core of the conference will be the six unique workshops organized in the following tracks:

- green Roof Professional Exam;
- green Wall 101: Systems Overview & Design;
- how to Properly Construct Low Impact Development Stormwater Management Practices;
- integrated Water Management for Buildings & Sites;
- introduction to Rooftop Urban Agriculture;
- lighting for Indoor Vegetable and Medicinal Crop Production and Living Walls.

Another interesting initiative is the Green Infrastructure Charrette: A one-day Green Infrastructure Design Charrette where multi-disciplinary volunteers are tasked to redesign specific neighborhoods in need, with 15 generic types of green infrastructure as their tools.



RESILIENCE 2017: RESILIENCE FRONTIERS FOR GLOBAL SUSTAINABILITY

Where: Stockholm, Sweden

When: 20-23 August 2017

<http://resilience2017.org/>

The Anthropocene is a proposed epoch dating from the beginning of significant human impact on the Earth's geology. Based on this, the Resilience 2017 conference intends to discuss resilience as a key lens for biosphere-based sustainability science, aiming to set out future directions for research. A main focus will be on global sustainability, which today is influenced by the speed, scale and connectivity of the Anthropocene. A resilience thinking approach tries to investigate how the interacting systems of people and nature – or social-ecological systems – can best be managed to ensure a sustainable and resilient supply of the essential ecosystem services on which humanity depends.

Under this thread the conference will be articulated in four major themes:

- social-ecological transformations for sustainability;
- connectivity and cross-scale dynamics in the Anthropocene;
- multi-level governance and biosphere stewardship;
- approaches and methods for understanding social-ecological system dynamics.



EUGIC 2017

Where: Budapest, Hungary

When: 29-30 November 2017

<http://eugic.events/>

EUGIC 2017 conference provides a forum for the coming together of research, policy and practice in urban green infrastructure to share nature-based solutions for resilient cities. It will explore how urban centers are addressing climate change and biodiversity loss, managing water, air quality and energy, and designing for health and wellbeing by working with nature.

The conference is organized in different sessions. Session 3, called “Key Urban Green Infrastructure Discussions”, represents the core of the conference and it will be articulated in the following main tracks:

- the Green Infrastructure Fabric of Europe: the EUGIC Vision;
- implemented Green Infrastructure Projects;
- how do we evaluate Green Infrastructure in the urban realm?;
- what can we learn from each other?.



ICUGSPHEJ 2017: 19TH INTERNATIONAL CONFERENCE ON URBAN GREEN SPACE, PUBLIC HEALTH, AND ENVIRONMENTAL JUSTICE

Where: Istanbul, Turkey

When: 21-22 December 2017

<https://www.waset.org/conference/2017/12/istanbul/ICUGSPHEJ/call-for-papers>

The conference will bring together leading academic scientists, researchers and scholars from around the world, focusing the debate on the main topics of Urban Green Space, Public Health, and Environmental Justice. The conference proposes a huge list of more specific topics for submission; in particular the focus on the roles of green infrastructure in the urban planning is declined in many aspects, thus underlining the multiple functions of urban green areas and their different relationships with other urban system elements especially connected with urban risk topics. The following are just few example of this very rich list:

- green Infrastructure and Renewable Energy;
- green Infrastructure and Urban Flooding;
- green Infrastructure and Water Management;
- green Infrastructure for the City;
- green Infrastructure for Urban Climate Adaptation;
- green Infrastructure in Urban Land Use;
- green Infrastructure: Planning for Sustainable and Resilient Urban Environment.



ICGIUR 2018 : 20TH INTERNATIONAL CONFERENCE ON GREEN INFRASTRUCTURE FOR URBAN RESILIENCY

Where: London, UK

When: 24-25 April 2018

<https://www.waset.org/conference/2018/04/london/ICGIUR/home>

Green Infrastructure is considered one of the most widely applicable, economically viable and effective tools to combat the impacts of climate change and help people adapt to or mitigate the adverse effects of climate change. Is not a case that *The Land Use, Land Use Change and Forestry* (LULUCF) as defined under the UNFCCC's Bali Action Plan of the Kyoto Protocol, encourages Green Infrastructure initiatives in the agriculture and forestry sectors that have a positive effect on carbon stocks and the greenhouse gas balances in Member States, thus helping to put EU climate policies into practice. Therefore green infrastructure solutions that boost disaster resilience, against climate change related risks, are an integral part of EU policy on disaster risk management.

Based on these premises the conference provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Green Infrastructure for Urban Resiliency.

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IMAGE SOURCES

The image shown in the first page is taken from:

<http://rym.fi/results/ecosystem-services-approach-in-urban-forest-planning/>

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Engineer, graduated in Environmental and Territorial Engineering at the University of Naples Federico II with a specialization in governance of urban and territorial transformations. Since 2014 he has been a PhD student in Civil Systems Engineering at the Department of Civil, Building and Environmental Engineering – University of Naples Federico II. In July 2013 he won a scholarship within the PRIN project on the "Impacts of mobility policies on urban transformability, environment and property market". Since 2011 he represents the UISP (Italian Union Sport for all) in the Forum Civinet Italy. In December 2012 he started collaborating with TeMA Lab.

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Hunters Point Park South. United States - Landscape Architect - Thomas Balsley Associates with Weiss/Manfredi - Landscape Architecture, Temple University, Waterfront Design, ASLA (2016)

TeMA

Journal of
Land Use, Mobility and Environment

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

2 (2017)

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 promote 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

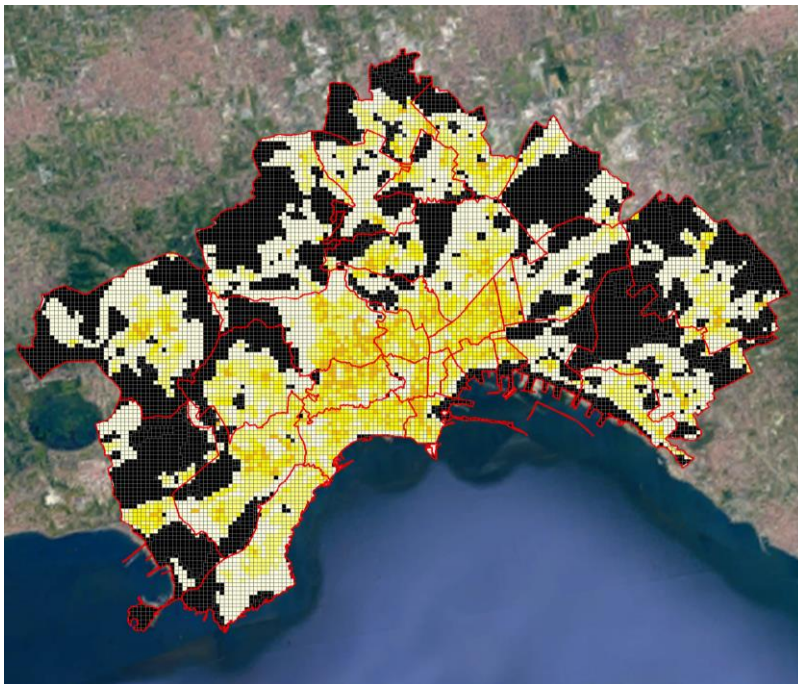
The third article, titled "Metropolitan Governance for Territorial Cohesion", by Francesca Pirlone, Ilenia Spadaro and Selena Candia (University of Genoa), analyses in deep the case of the Italian metropolitan cities proposing a new governance approach to increase the capacity of urban systems to adapt 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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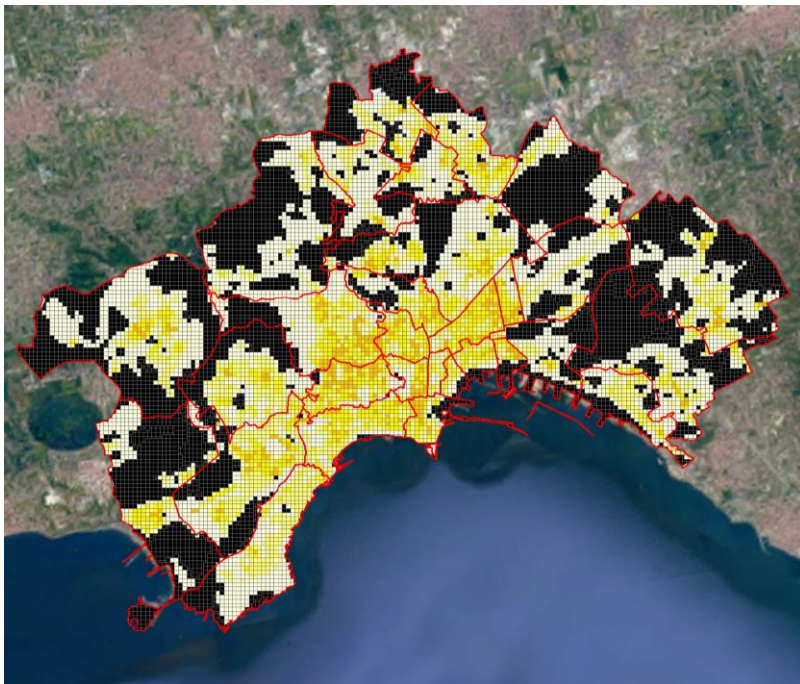
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城市区域终端用电能耗：基于GIS的研究方法。

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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.

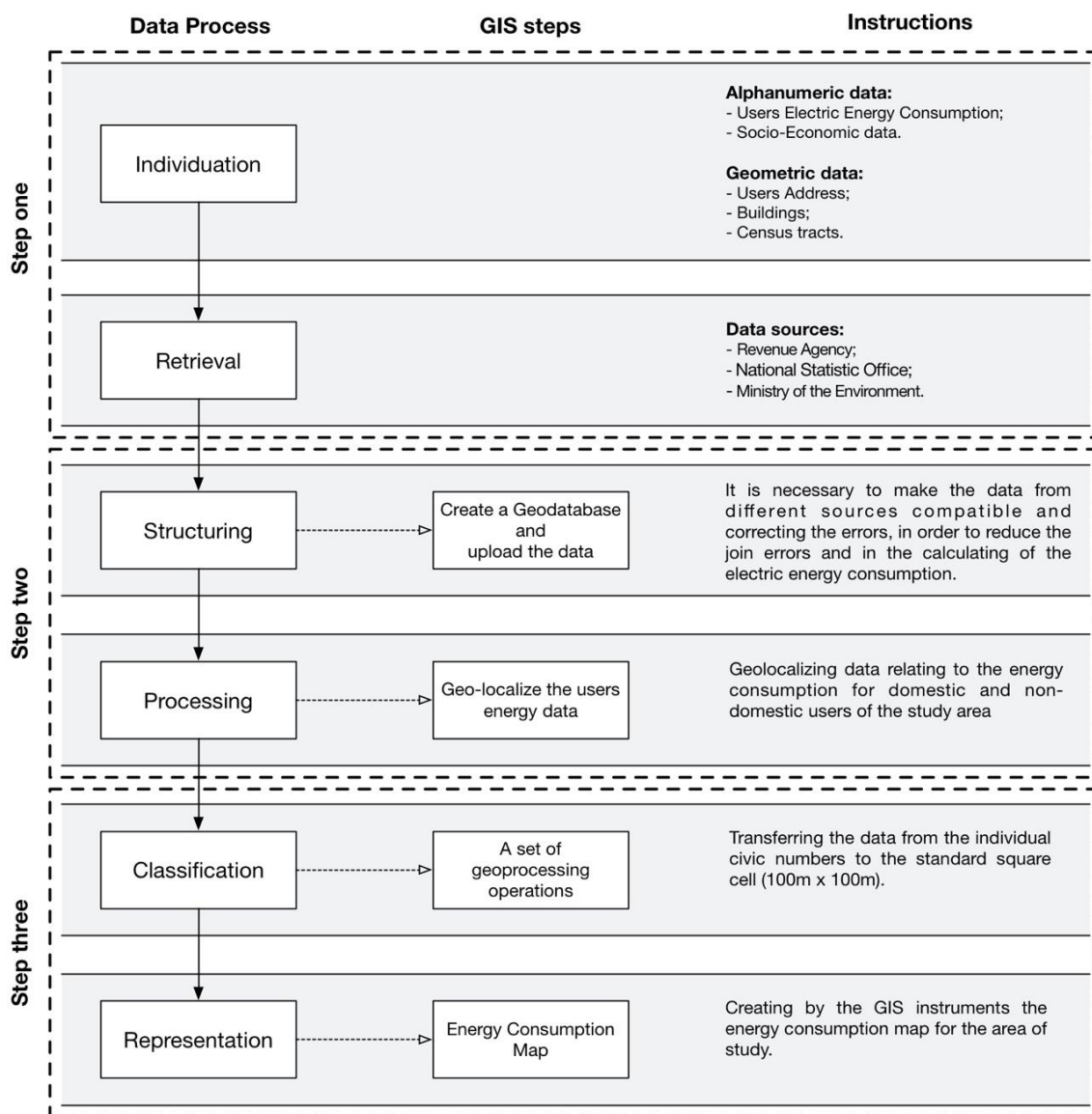


Fig. 1 GIS-based methodology workflow of Urban Energy Consumption Tool

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 law 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	ID	Indirizzo
241789	VIA S.DOMENICO FAB.CETIPA 29C A 4 1	241789	VIA SAN DOMENICO 29
182635	VIA S.EFR.VEC. 35A IS.6	182635	VIA SANT'EFRAMO VECCHIO 35
215374	VIA S.F.SCO DE GERONIMO 10	215374	VIA SAN FRANCESCO DE GERONIMO 10
212721	VIA S.F.SCO DE GERONIMO 13	212721	VIA SAN FRANCESCO DE GERONIMO 13
183864	VIA S.F.SCO DE GERONIMO 2A	183864	VIA SAN FRANCESCO DE GERONIMO 2
186786	VIA S.FERRARA 7	186786	VIA SALVATORE FERRARA 7
19488	VIA S.FILIPPO 30/E	19488	VIA SAN FILIPPO 30
291839	VIA S.FRANCESCO 9	291839	VIA SAN FRANCESCO 9
231120	VIA S.FRANCESCO 9	231120	VIA SAN FRANCESCO 9
302165	VIA S.FRANCESCO 9A	302165	VIA SAN FRANCESCO 9
299852	VIA S.FRANCESCO 9A	299852	VIA SAN FRANCESCO 9
60712	VIA S.FRANCESCO 9A	60712	VIA SAN FRANCESCO 9
165602	VIA S.FRANCESCO 9A	165602	VIA SAN FRANCESCO 9
392103	VIA S.FRANCESCO 9A	392103	VIA SAN FRANCESCO 9
71771	VIA S.FRANCESCO 9A	71771	VIA SAN FRANCESCO 9
236812	VIA S.FRANCESCO 9A	236812	VIA SAN FRANCESCO 9
232455	VIA S.FRANCESCO 9A	232455	VIA SAN FRANCESCO 9
12703	VIA S.G DEI CAPRI PALAZZO ASTINO SN	12703	VIA S.G DEI CAPRI PALAZZO ASTINO SN
187584	VIA S.G. CAPRI 52	187584	VIA SAN GIACOMO DEI CAPRI 52
187585	VIA S.G. CAPRI 52	187585	VIA SAN GIACOMO DEI CAPRI 52
55833	VIA S.G. DEI CAPRI 53 SCALA A1P.IN2	55833	VIA SAN GIACOMO DEI CAPRI 53
167526	VIA S.G. DEI CAPRI 63/E	167526	VIA SAN GIACOMO DEI CAPRI 63
228975	VIA S.G. DEI CAPRI 15	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.

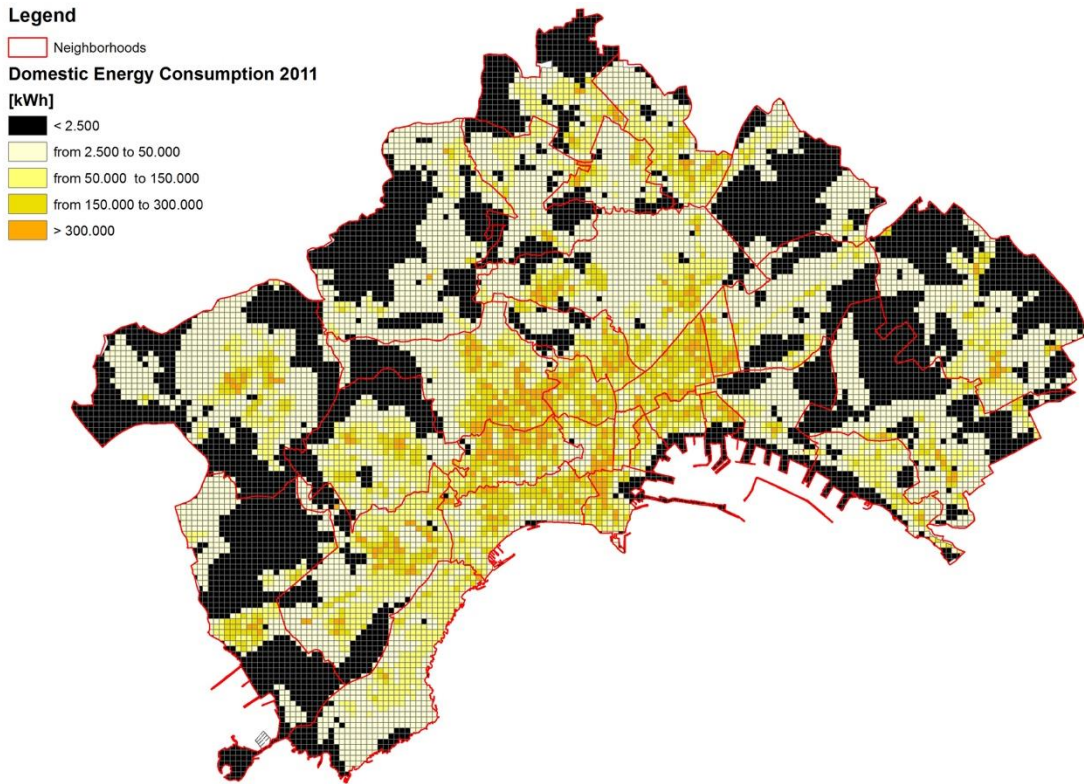


Fig. 4 Electric energy consumption map in kWh for domestic users in 2011

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.

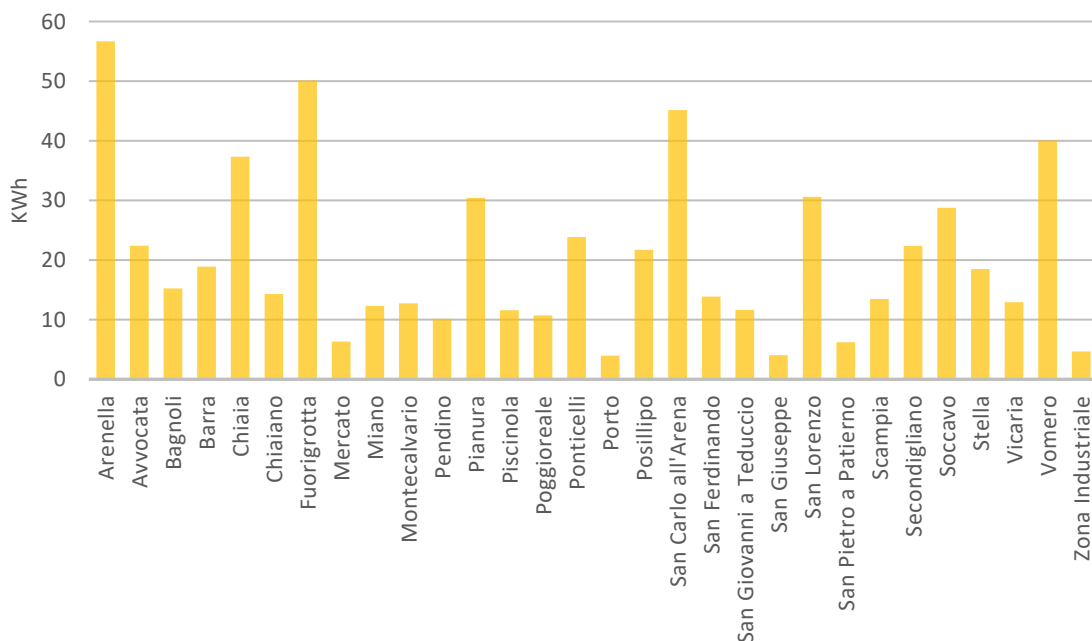


Fig. 5 Electric energy consumption of domestic users for the neighbourhoods of the city of Naples in the 2011

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.

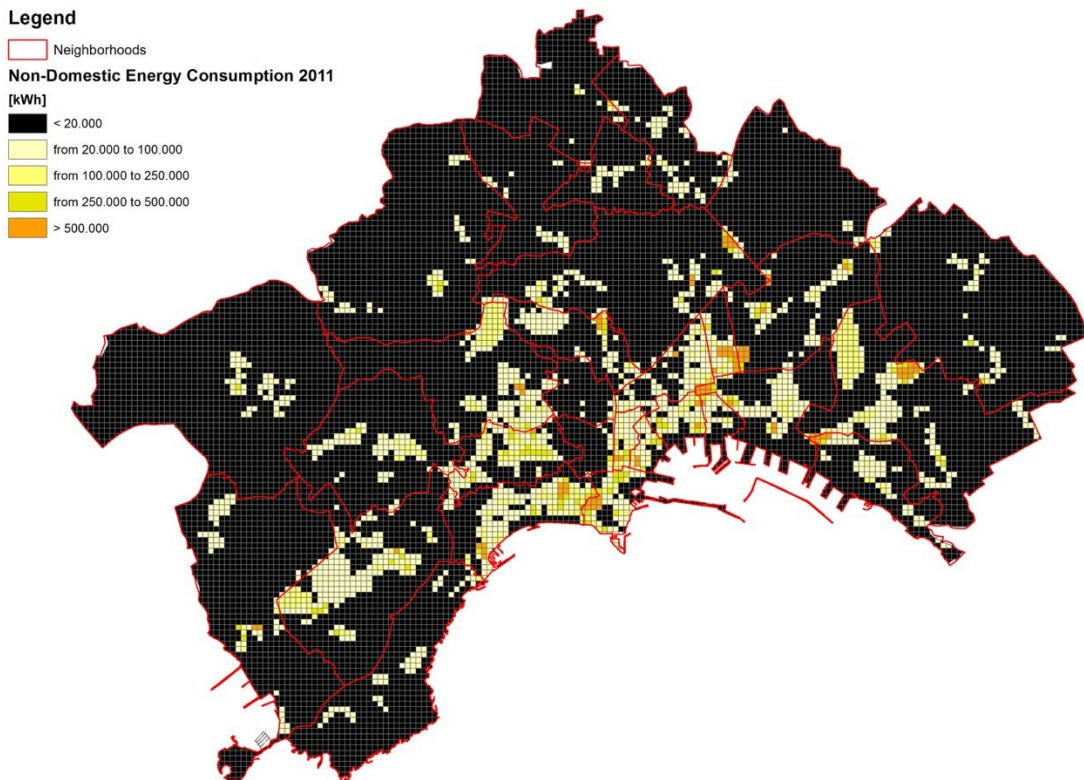


Fig. 6 Electric energy consumption map in kWh for the non-domestic users in the 2011

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.

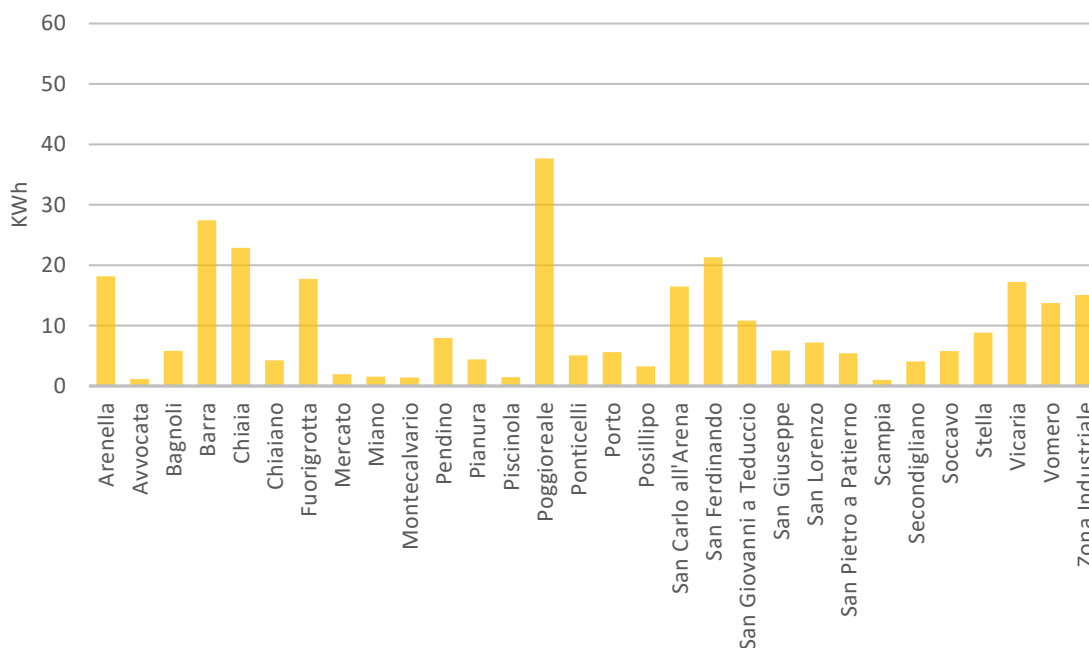


Fig. 7 Electric energy consumption of non-domestic users for neighbourhoods of the municipality of Naples in 2011

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 Secchi¹.

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 center².

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 prestigious³ to smaller yet equally famous ones⁴, 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 squares⁵ 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 agorà⁶, 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 ἀγειρω = 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 actions⁸ that make it a continual field of community life. Conventional 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

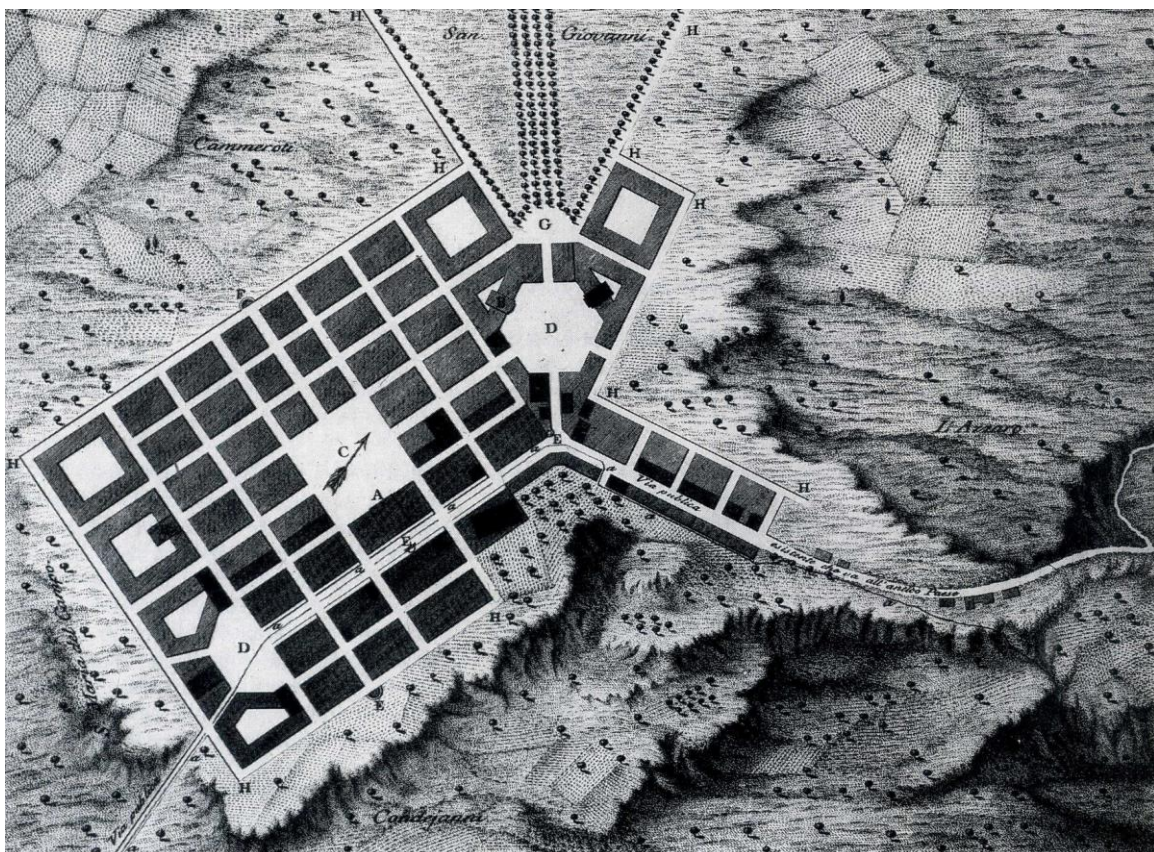


Fig. 3 The Enlightenment plan of Palms with central plaza

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 Crotona (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 hostilities⁹, were created. In any case, membership in a neighbourhood¹⁰ 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 fuoco 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 models¹¹ 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 coast¹² (including Fuscaldo¹³ and, further south, Monterosso, Arena¹⁴) and of the Ionian coast (in the case of Staiti, St. Severina, Rocca Imperiale and some villages of Greek Sila¹⁵) 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 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.

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.

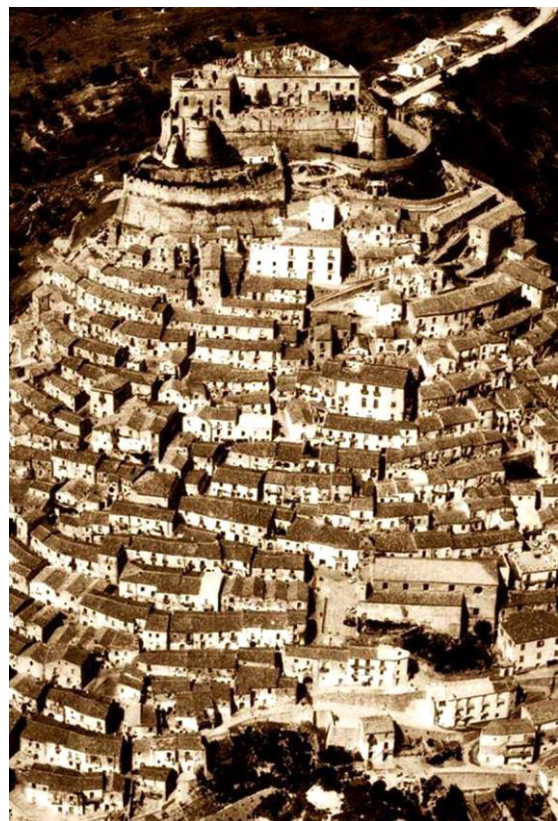


Fig. 11-12-13 Curvilinearity in the villages of Monterosso and Arena. The village of Rocca Imperiale.

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 today¹⁶.

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; Crotona, 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 *Grecià*; 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'Epiro¹⁷, San Demetrio Corone¹⁸, 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 (*sheshhe*). 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 “gijtonia” 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 century¹⁹ foundation/expansion (Figure 19), or those rebuilt after 1783 according to Enlightenment models²⁰, 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 spaces²¹.

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 buildings²². 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

Cover: the Cattolica and burg of Stilo, by Paolo Ferlito

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Fig. 2: from cosenzaturismo.it

Fig. 3: from Collection Zerbi

Fig. 4: from calabriaonweb.it

Fig. 5, 6: from Collection Chimirri

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

Fig. 13: from concorsiletterari.net

Fig. 17: from Land Agency of Cosenza

Fig. 20: from comune.crotone.it

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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 multi-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. Abstract; 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 texttexture.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).

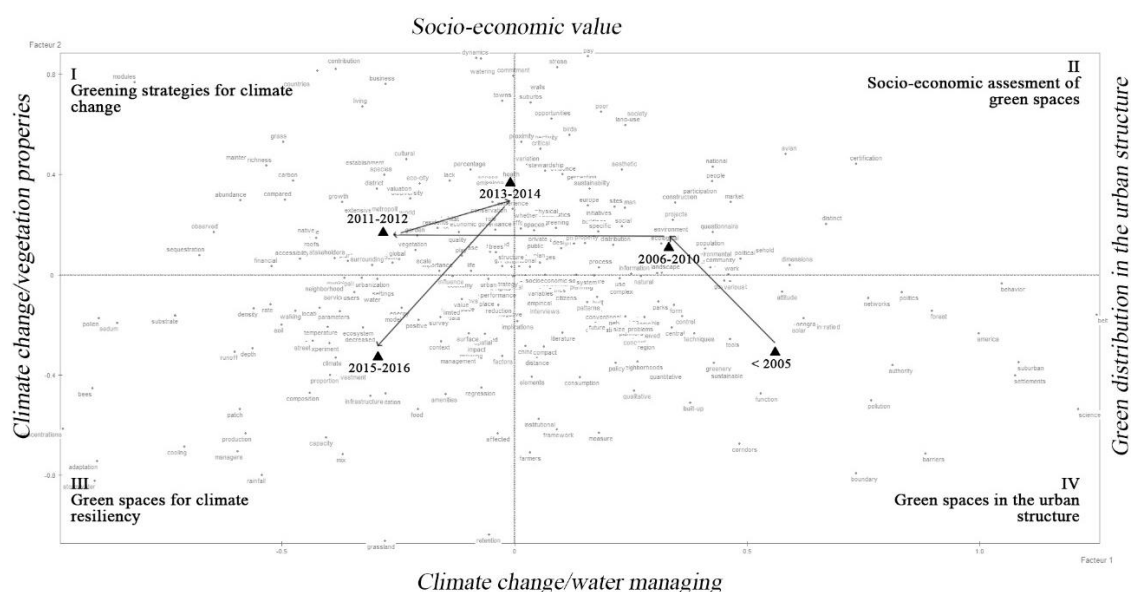


Fig. 1 LCA result describing the evolution of the concept of *green* within the most cited articles of urban studies journals over the last 20 years

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 PERSPECTIVE

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.

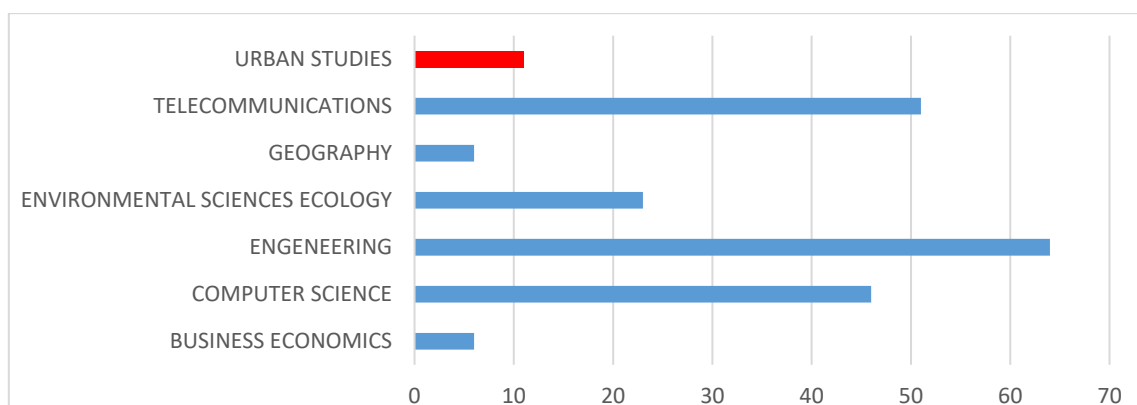


Fig. 2 Number of scientific papers written in the last 20 years, indexed on web of science, with “green network” as research topic key per different research areas

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.

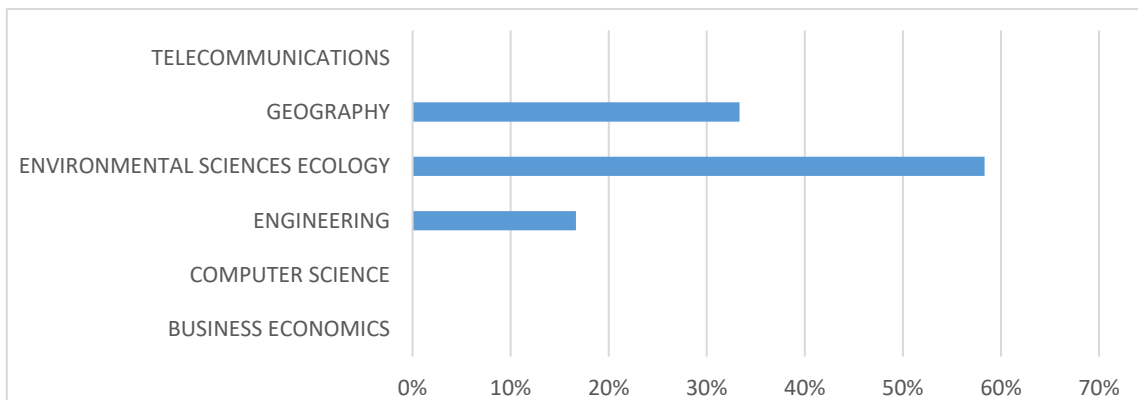


Fig. 3 Percentage of papers with "green network" as main topic in the field of Urban studies belonging also to other research areas according to web of science classification

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 texttexture.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.

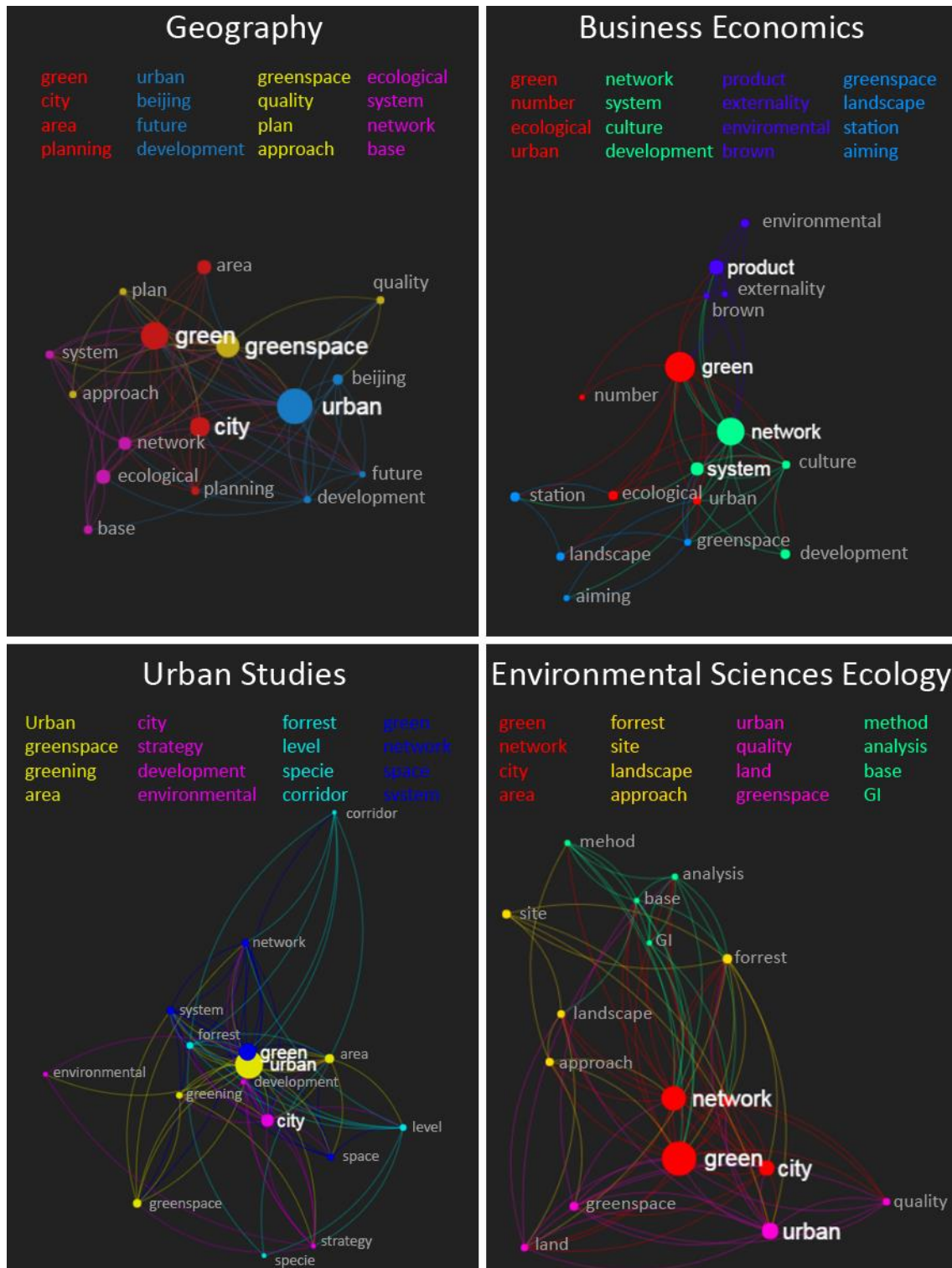


Fig. 4 Network text analysis results: most influential context per research area

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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Architect, graduated in Architecture from the University Federico II in Naples in 2006. In January 2014 he holds a PhD in Environmental Technology with a research focus on rehabilitation strategies for semi-enclosed spaces in the "Compact City". Since 2014 he collaborates with the Department of Civil, Architectural and Environmental Engineering (DICEA); his research activity is currently focused on the different roles the greenspaces could have for a sustainable development of urban areas.

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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.

DECISION-MAKING TOOLS FOR URBAN REGENERATION PROCESSES: FROM STAKEHOLDERS ANALYSIS TO STATED PREFERENCE METHODS

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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 and 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 identify 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.

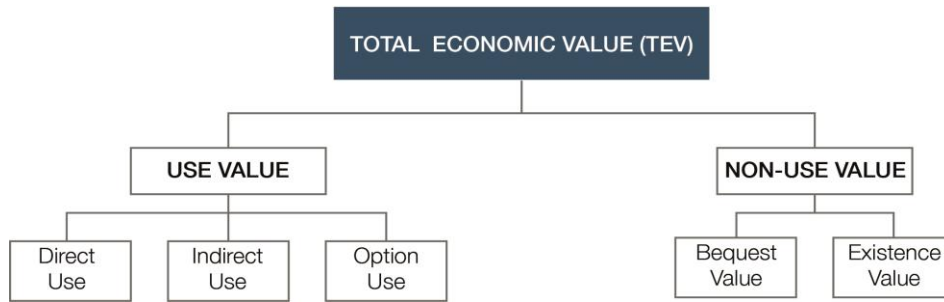


Fig. 1 The concept of Total Economic Value

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.

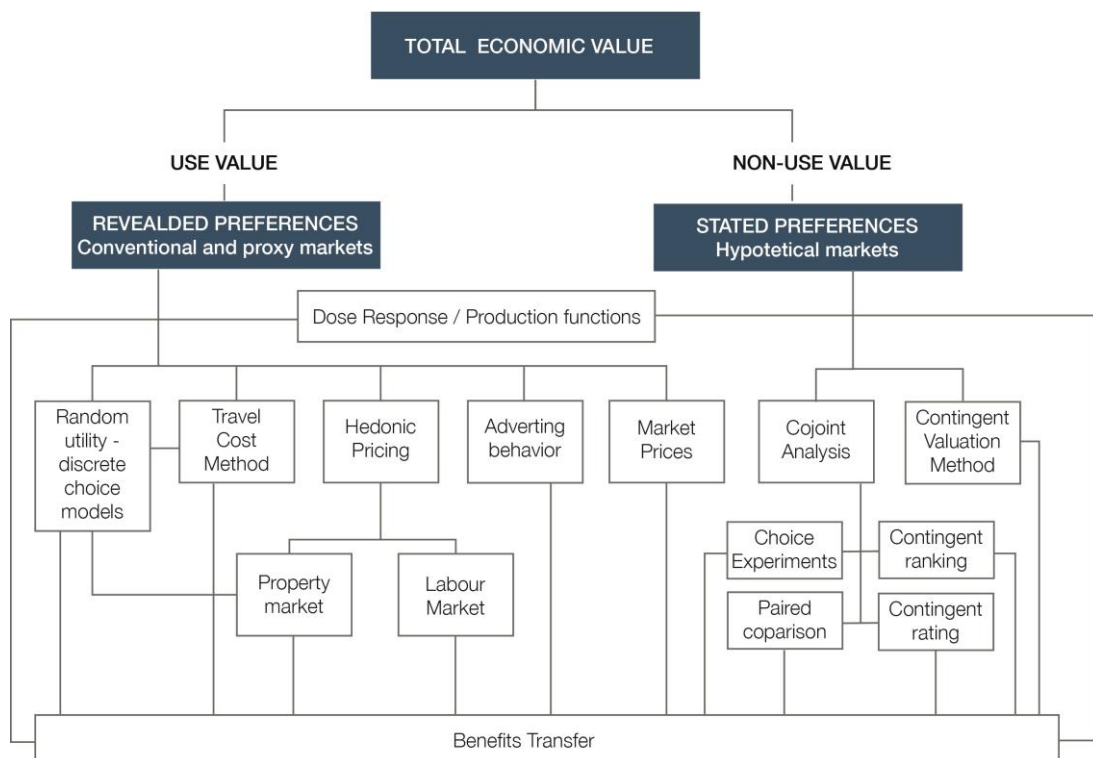


Fig. 2 Valuation techniques for estimating the Total Economic Value

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.

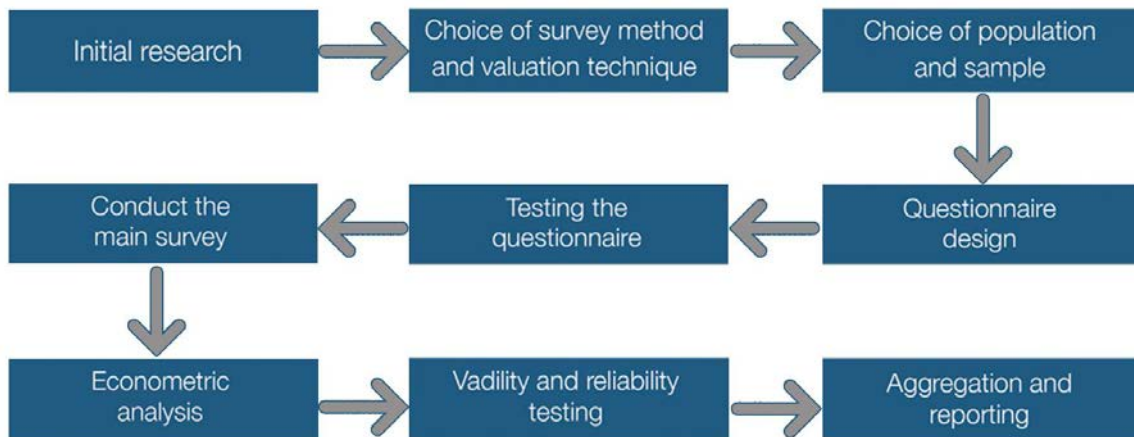


Fig. 3 The multi-stepped procedure for the development of the SPM study

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 (Strazzeria 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 resources 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

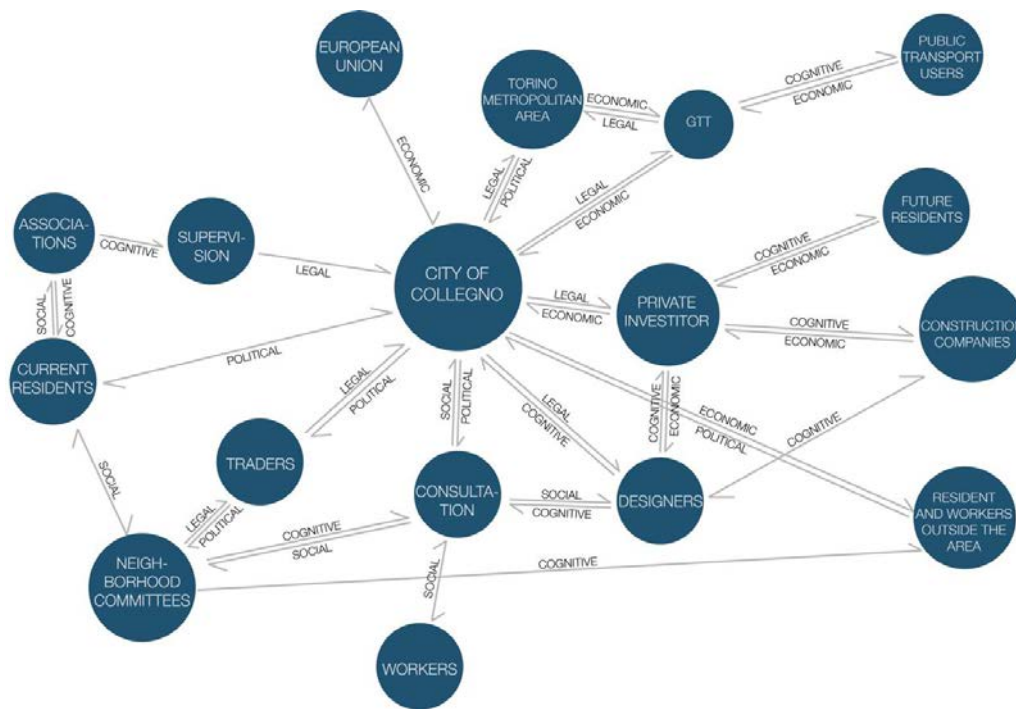


Fig. 6 Stakeholders map of the urban regeneration process under examination

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 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 through the calculation of a specific index as represented in equation (1):

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

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)

$$C_i = \frac{k_i}{\sum K_i} \quad (2)$$

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.



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
<i>Being able to use a park with different function?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Knowing that the city of Collegno has a park with these characteristics?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Passing on to future generations the park?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Protecting with the intervention the site of the Campo Volo?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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.

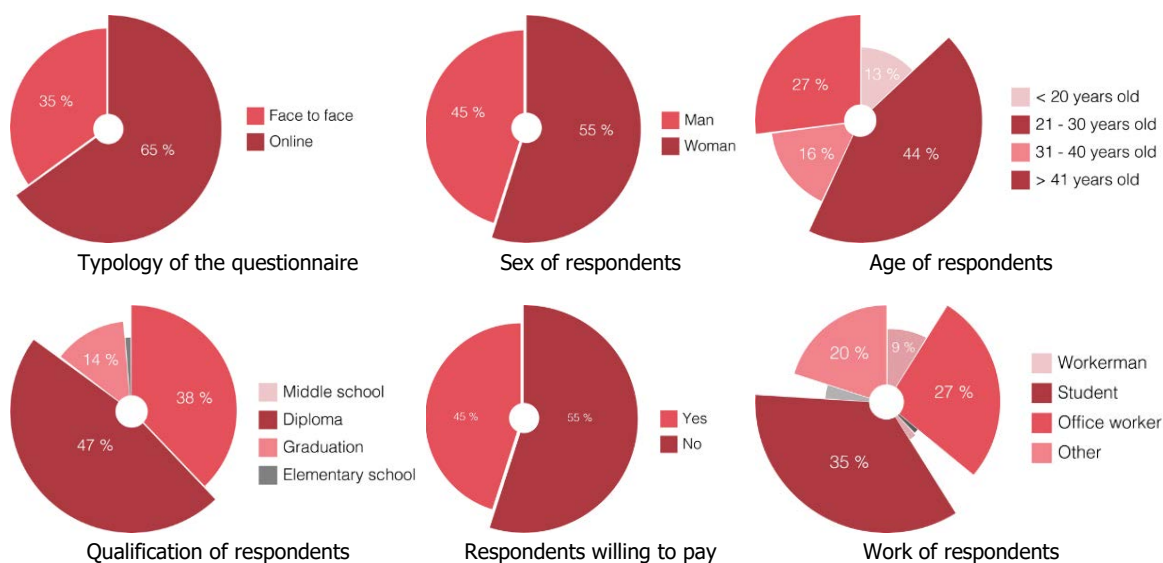


Fig. 8 Socio-economic characteristics of the respondents

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.

TEV

WTP classes		Sample	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

TEV

WTP classes		Sample	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

TEV

WTP classes		Sample	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

TEV

WTP classes		Sample	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 than people who do not know the area (Table 9).

No.	WPT [€]	Sample Frequency [%]	TEV Do you know the area of the Campo Volo?	
			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.

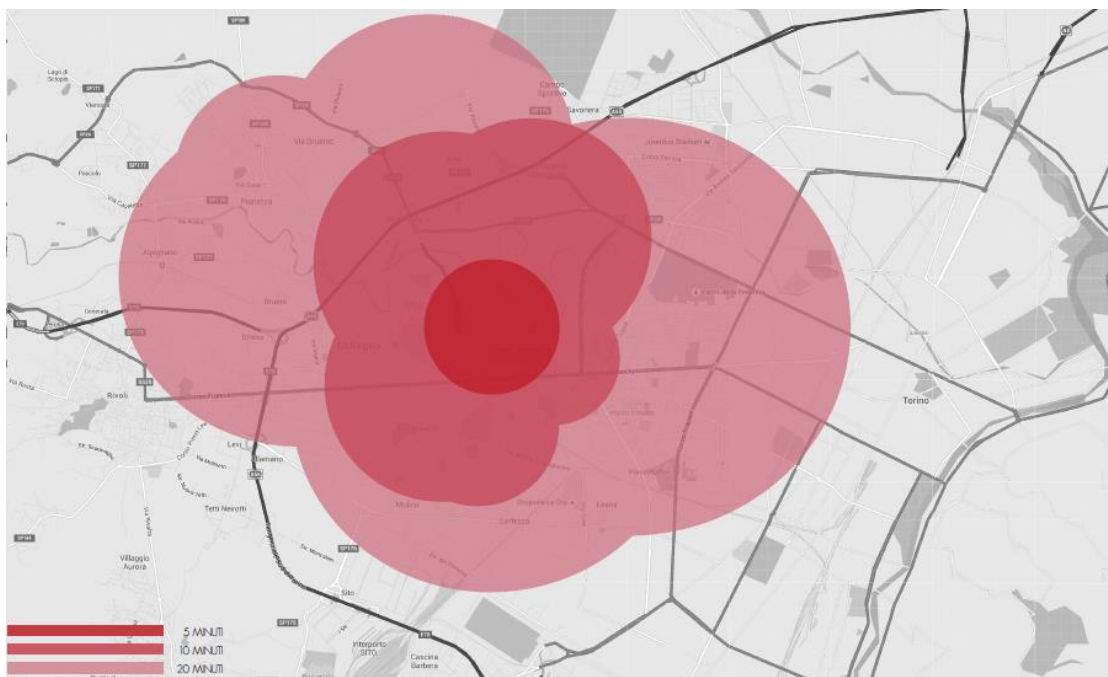


Fig. 9 Isochronous map for the definition of the catchment area.

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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Giulia Datola, graduated in Architecture Construction City at Politecnico di Torino. Her recently scientific interests and research mainly focus on techniques, methodologies and tool for evaluating and support urban regeneration strategies. She has been recently involved in an experimental research about the combined use of Multicriteria Decision Analysis and Fuzzy Cognitive Maps to evaluate alternative urban regeneration strategies, using urban resilience as complementary analysis.

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 through 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 spaces
 - 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 sports, 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowing that the city of Collegno has a park with these characteristics?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Passing on to future generations the park?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Protecting with the intervention the site of the Campo Volo?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

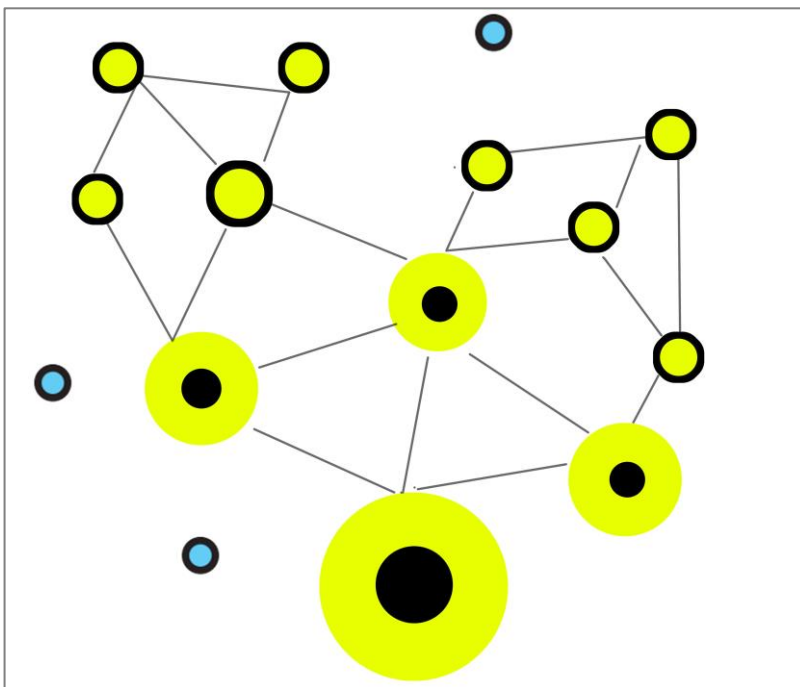
Which is the average net income per year of your family, including all the revenues at disposal?

(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 characterized 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

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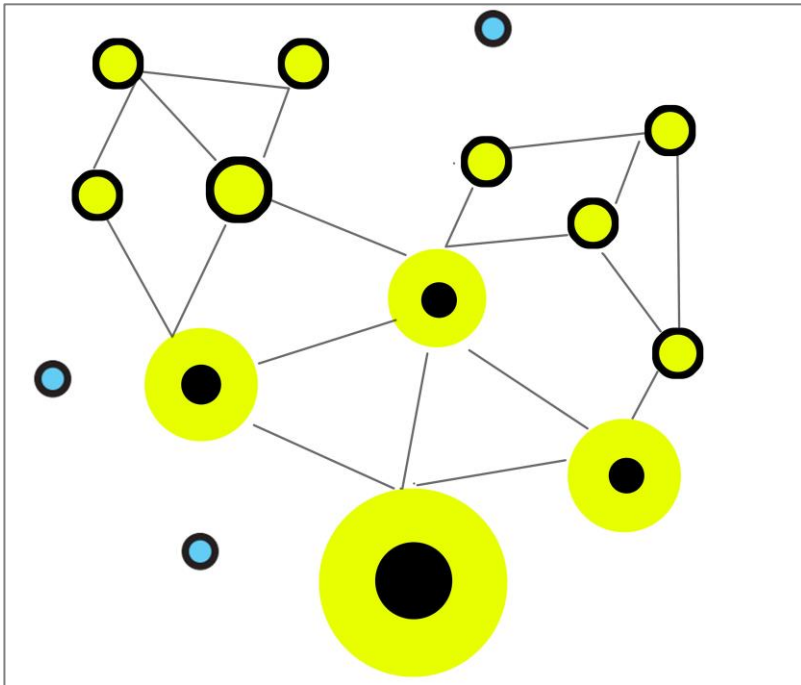
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以区域凝聚力为目的的大都市管治

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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都市治理策略。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、大都市治理、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 and 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 inland 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 GDP¹.

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.

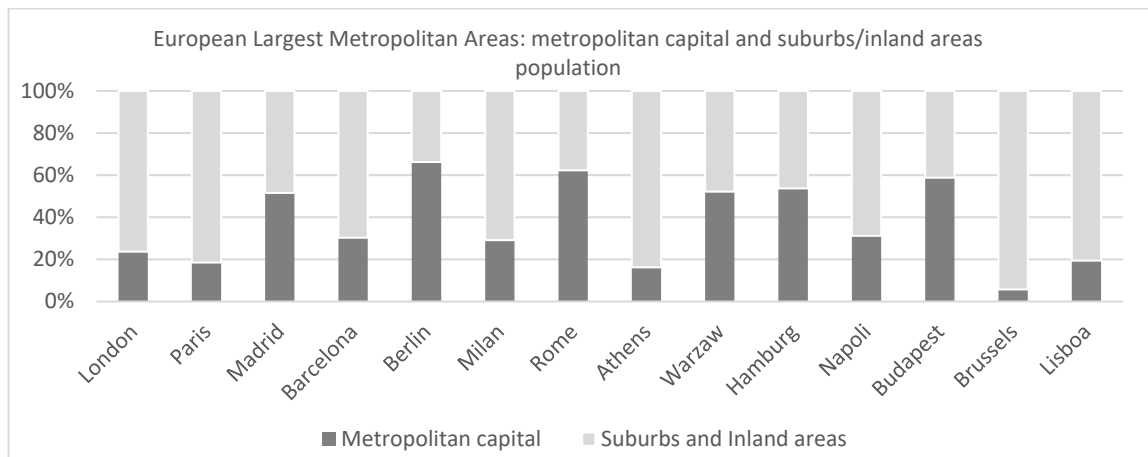


Fig. 1 Percentage of European metropolitan residents that live inside the metropolitan capital or outside (suburbs and inland areas)

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).

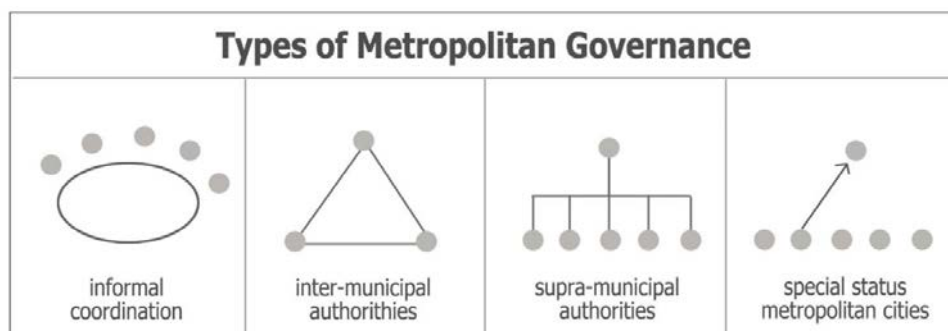


Fig. 2 Types of metropolitan governance in Europe according to the Organization for Economic Co-operation and Development

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 Daejeon 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, held 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).

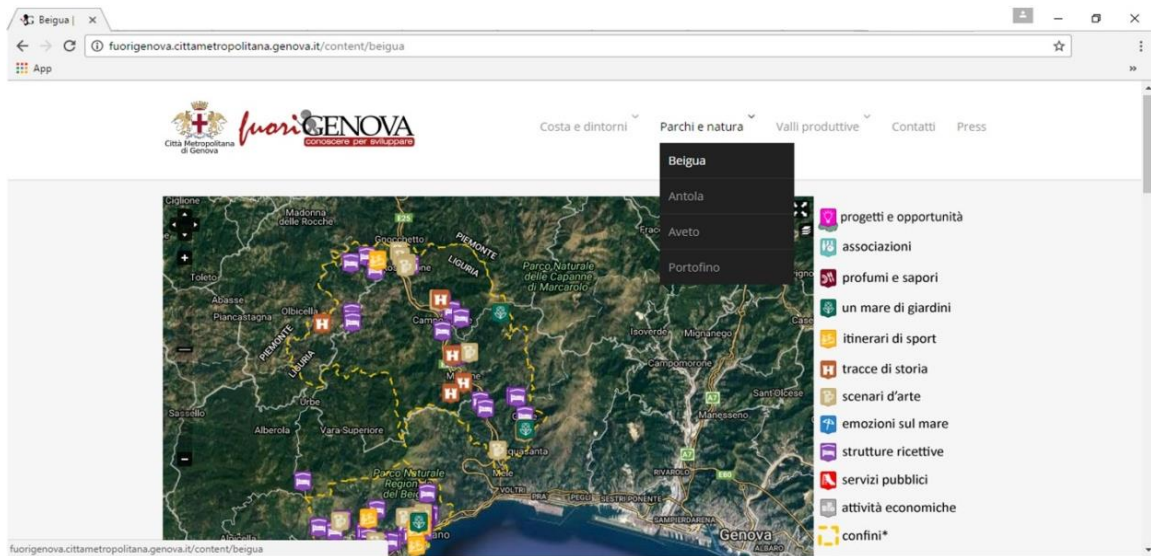


Fig. 3 The web site realized by the Metropolitan City of Genoa to promote and valorise all the metropolitan area

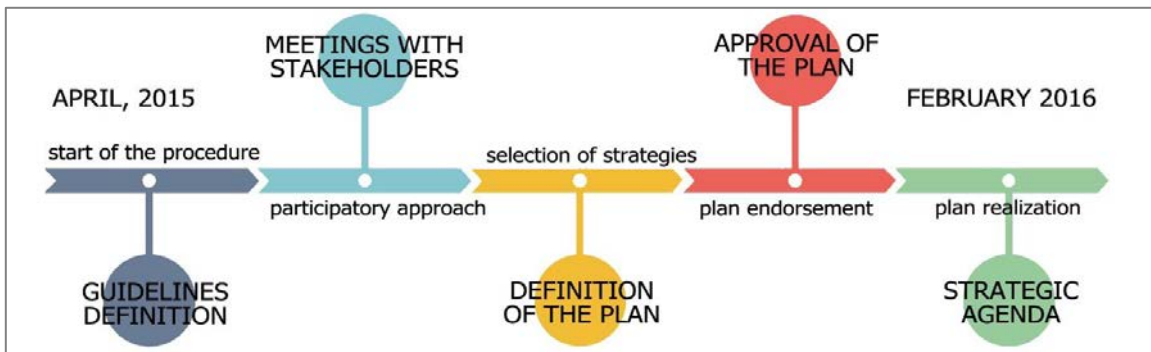


Fig. 4 The Strategic Plan of the Metropolitan City of Milan: The planning process

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	<ul style="list-style-type: none"> – 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	<ul style="list-style-type: none"> – 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	<ul style="list-style-type: none"> – 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_(km²)	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 policies³ 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 strengthens 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.	<ul style="list-style-type: none"> - 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.	<ul style="list-style-type: none"> - Inland and urban areas relationship - Territorial cohesion - Resilience - Participatory process
Goals definition	Strategies selection, strategic goals definition and approaches identification.	<ul style="list-style-type: none"> - 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.	<ul style="list-style-type: none"> - 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.	<ul style="list-style-type: none"> - 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.	<ul style="list-style-type: none"> - 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 realities 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)

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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.

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02_BOOKS

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

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

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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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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开，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。

author: Gerardo Carpentieri
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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。

author: Laura Russo
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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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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 Medellín 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 Arctic, 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 RESILIENCETOOLS.ORG – EMPOWERING RESILIENT CITIES “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/>.

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.

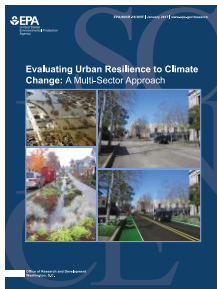
Furthermore, the global greenhouse gas emissions continue to rise and have been shown to lead to a range of major and potentially adverse effects on the environment and public welfare.

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.

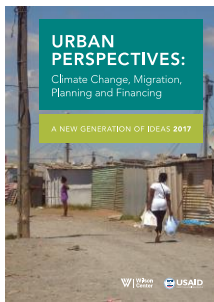
One of the objectives of this office within the U.S. Environmental Protection Agency is to provide the scientific basis for climate adaptation choices that support sustainable, resilient solutions at individual, community, regional, and national scales. To support this objective, the Office developed 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 contributors are divided by four main research themes are listed below:

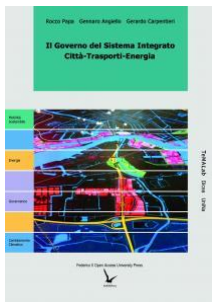
- *Arrival Cities: Responding to Migrants and Refugees;*
- *Climate Change;*
- *Innovation in Urban Planning;*
- *Financing Sustainable Urban Development.*

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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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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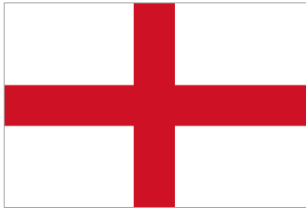
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URBAN PLANNING AND GOVERNANCE IN EUROPE

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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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 scarce. 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>.

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 RESILIENT 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 were 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 adopted 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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TeMA

Journal of
Land Use, Mobility and Environment

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

3 (2017)

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

CALL FOR PAPERS: SPECIAL ISSUE 2018

Urban Travel Behavior in the Middle East and North Africa

The characteristics of urban travel behaviors and the attitudes of passengers in the Middle East and North Africa (MENA) is less-studied. When it comes to the effects of urban form, residential self-selections, and lifestyles, it is entirely not investigated in majority of the countries of the region. There is a considerable knowledge gap about the circumstances of how people think and decide about their short-term, medium-term, and long-term mobility for commute and non-commute travels. The we do not know if the land use traits such as population and employment densities as well as mix of land uses, accessibility to public transportation and neighborhood amenities, and connectivity of street networks are as influential as they are in western counties or in higher income societies. There is a very limited understanding about the extent to which the personal preferences, lifestyles, and in general psychology of the people of the region affect their transport behaviors. The complexity of the analysis methods applied for studying urban travel phenomena of the MENA region is even less-developed. Longitudinal or discrete choice molding methods are applied in mobility research considerably less than studies coming from high-income countries.

This special issue collects the results of some of the most-recent studies on the MENA countries to fill out a part of the gap in English-language publications. The main topics covered by the issue include the following with focus on the MENA region:

- The role of urban form and land use in forming urban travel behavior;
- Urban sprawl and urban travel behavior;
- The effects of historical urban transformations on urban mobility decisions;
- Car ownership and use; car dependency;
- The impacts of socioeconomics and culture in forming the transport patterns;
- Lifestyles and personal preferences and urban travels; Perceptions of mobility, safety, security, neighborhoods;
- The interactions of travel behavior and health effects of different ages, genders, and income groups;
- Travel behavior of public transport riders;
- and similar topics.

The target countries of this issue are the ones that are referred to as the MENA counties in most of the definitions. Studies on the cities of Turkey and Pakistan are also of particular interest and welcome. Manuscripts about all city sizes are reflected by the issue. The authors interested in submitting manuscripts addressing the aforementioned issues may consider the deadline of 31st January 2018. All submissions will go through rigorous double-blind review, and if accepted will be published. Interested authors are requested to contact Houshmand Masoumi at masoumi@ztg.tu-berlin.de, to discuss submission and review procedure.

TeMA

Journal of
Land Use, Mobility and Environment

EDITORIAL PREFACE: TEMA JOURNAL OF LAND USE MOBILITY AND ENVIRONMENT 3 (2017)

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

ROCCO PAPA

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The 10th volume of TeMA Journal, given the relevance of the topics, dedicates the three issues of 2017 to promote 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 third issue address some themes, such as the resilience capacity of urban system, relationship between the relationships between cities and energy, the renewal and regeneration challenge, the planning and landslide monitoring.

The section "Focus" contains the article "Cities and Energy Consumption: a Critical Review" by Carmela Gargiulo and Laura Russo (University of Naples Federico II), that systematize and compare the approach, methodology and results of the relevant literature on the relationship between cities and energy consumption over the last twenty years. Furthermore, this critical review identifies the knowledge gap between what is known and what is still under debate and, based on that, it proposes a conceptual framework that will help to outline a new direction for future research and support local policy makers in the definition of strategies and actions that can effectively reduce urban energy use and CO₂ emissions.

The section "Land Use, Mobility and Environment" collects four articles. The first one, titled "Implementing ITI for urban development locally" by Garyfallia Katsavounidou (University of Ioannina) deals with Integrated Territorial Investment (ITI), a new strategic instrument introduced by the European Commission in the 2014-2020 Programming Period. ITI shifts the decisions on allocation of funds to the local level and, most importantly, enables drawing of funds from several priority axes and from several European Structural and Investment Funds. The paper focuses on the Greek city of Veria, in the Region of Central Macedonia, where this approach has been implemented for the design of an ITI of urban scale (ITI-SUD). The paper describes the benefits and challenges of the new approach as applied in the local context, in a context of "procedural learning" that offers an insight on how European cohesion policy strategies and tools are tested at the local level.

The second article, titled "Urban Voids: renewal and regeneration experiences in Naples", by Gabriella Punziano (Gran Sasso Science Institute) and Anna Terracciano (University of Naples Federico II), focuses on experiences of renewal, regeneration and recycle, the objective of this exploratory study is to investigate their different impacts in a well-known complex urban system as Naples. The study emphasizes on the urban

and social dimensions, favouring a descriptive and visual perspective from those who experience life in the city, considering the processes implemented by local actors and the reactions of inhabitants to these processes.

The third article, titled "UAV Based Agricultural Planning and Landslide Monitoring" by Servet Yaprak (Gaziosmanpasa University), proposes the adoption of UAVs photogrammetry to study landslides as an alternative to more complex and costly approaches. To this end, the authors observe two different areas, one for agricultural planning and another one for landslides. The study of the first area provides, among the other, useful information about the accuracy of the approach. The study of the second area has been conducted with five different observations in five months. At the end, the authors show that the DSM obtained with an accuracy of 10 cm is useful to quantify landslides, shown on a map with land height decrease or increase.

The fourth article, titled "What is a learning town? Reflections on the experience at Wirksworth", by Peter Wiltshier (University of Derby), explores the legacy of regeneration project work and knowledge management and transfer as a result of intervention through a charity designed to support new business opportunities, specifically in arts and entertainment, tourism, skills development and training. As part of the University of Derby's own work-related learning and problem-based learning, a project team was assigned to work alongside the charity 'New Opportunities in Wirksworth!' (NOW!).

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) Enhancing Urban Climate Change Resilience. Seven Entry Points for Action; (ii) Essential Capacities for Urban Climate Adaptation. A Framework for Cities and (iii) Redefining the city Athens Resilience Strategy for 2030. The Urban Practices section by Gennaro Angiello presents two case studies in the us for planning for sharing mobility: (i) Los Angeles and (ii) Minneapolis. 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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CITIES AND ENERGY CONSUMPTION: A CRITICAL REVIEW

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ABSTRACT

The relationship between cities and energy consumption has been of great interest for the scientific community for over twenty years. Most of the energy consumption, indeed, occurs in cities because of the high concentration of human activities. Thus, cities are responsible for a big share of carbon dioxide emissions (CO₂). However, the debate on this topic is still open, mainly because of the heterogeneity of published studies in the selection, definition and measurement of the urban features influencing energy consumption and CO₂ emissions, as well as in the choice of the energy sectors to be considered, in the territorial scale of analysis, and in the geographical distribution of the sample. Therefore, the goal of this research is to systematize and compare the approach, methodology and results of the relevant literature on the relationship between cities and energy consumption over the last twenty years. Furthermore, this critical review identifies the knowledge gap between what is known and what is still under debate and, based on that, it proposes a conceptual framework that will help to outline a new direction for future research and support local policy makers in the definition of strategies and actions that can effectively reduce urban energy use and CO₂ emissions.

KEYWORDS:

Cities; energy consumption; CO₂ emissions; compact city; sustainability.

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城市与能源消耗: 一种批判性评论

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摘要

在 20 多年时间里，城市与能源消耗之间的关系一直是科学界关注的问题。大部分能源消耗的确是发生在城市中，因为在这里人类活动高度集中。因此，城市要为很大一部分二氧化碳（CO₂）的排放负责。但是，围绕这个话题仍然存在争论，这主要是因为已经在已经发表的研究中，在选择、定义和测量能够影响能源消耗和 CO₂ 排放的城市功能时存在异质性，并且在选择要考虑的能源部门、在分析的地域范围、以及在样本的地理分布方面也有不一致。因此，本研究的目标是实现过去 20 年中有关城市与能源消耗之间关系的相关文献的途径、方法和结果的系统化和对比。此外，这项批判性评论还确定了已知内容与争议内容之间的知识差距，并据此提出一个概念框架，有助于概述未来研究的新方向，并支持本地政策制定者确定能够有效降低城市能源使用和 CO₂ 排放的战略和行动。

关键词:

城市；能源消耗；CO₂ 排放；紧凑城市；可持续性。

1 INTRODUCTION

Adopting the Paris Agreement in 2015, for the first time governments from all over the world agreed to “hold the increase in the global average temperature well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change” (FCCC, 2015). Local governments play a key role in the implementation of actions aimed at decarbonisation (OECD, 2014). According to IEA (2016), urban areas consume about two-thirds of primary energy demand and produce over 70 per cent of global carbon dioxide emissions (CO₂). Consequently “cities are the heart of the decarbonisation effort” (IEA, 2016) and can be the solution to climate change (Papa et al., 2014). However, urban growth shows no sign of slowing, and the energy and carbon footprint of cities doesn’t seem to decrease. Therefore, energy efficiency improvements in urban areas are urgently needed to meet national and global ambitious sustainable goals (Barresi & Pultrone, 2013; Morelli et al., 2013).

To support local policy makers’ decisions and foster the transition towards a low-carbon future, a growing body of international research has been studying the complex and multidimensional relationship between cities and energy consumption. These studies differ from each other in a wide variety of ways. First of all, they take into account different types of urban characteristics (e.g. density, household size, income, etc.) and consider different types of energy consumption (e.g. total, transport, or residential energy consumption). Additionally, the samples of cities analyzed differ in scale, size and geographical location. Therefore, it is no surprise that this heterogeneity in approaches and methodologies leads to a variety in results. Literature does not provide a comprehensive critical review highlighting the gap between what we know – and we all agree about – and what we need to know about how cities affect energy consumption and CO₂ emissions (Jabareen, 2006). So the aim of this paper is to critically categorize and compare recent interdisciplinary scientific literature on the relationship between cities and energy consumption to develop a conceptual framework to guide future research based on the resultant new knowledge.

The paper is structured as follows. In Section 2 we present the approach used for this review and sets the temporal and contextual limitations of this work. In Section 3 we describe the critical review of the relevant literature on the relationship between urban areas and energy use, comparing approaches, methodologies and results of the different contributions. Finally, in Section 4 we propose a conceptual framework that provides new understanding based on the integration of the results previously described, and helps stimulating the debate on this topic. This framework aims to help define a new direction for future research and support local policy makers in the definition of strategies, policies and actions that can effectively reduce urban energy use and carbon dioxide emissions at city scale.

2 APPROACH

The relationship between cities and energy consumption is multidimensional, especially because cities are complex and dynamic systems (Batty, 2008; Papa, 2009); therefore, a comprehensive review about this topic calls for a holistic approach that considers a wider range of urban factors – physical, functional, geographical, social, economic – influencing the energy and carbon footprint of cities. Moreover, an integrated approach rather than a sectorial one also allows the identification of the existing trade-off between different urban features and energy saving (Doherty et al., 2009; Lee & Lee, 2014; Papa et al., 2016; Battarra et al., 2016; Gargiulo & Lombardi, 2016), providing a broader and more complete framework on such a complex topic.

A good review on the relationship between urban form and travel patterns can be found in Stead & Marshall (2001), while a detailed review on the relationship between urban structure (construction, maintenance and

use of residential dwellings) and residential and transport related energy use can be found in Rickwood et al. (2008). However, urban form and structure are just two aspects of a bigger picture. In both reviews an integrated approach is missing, which takes into account the variety of urban factors affecting energy consumption and CO₂ emissions at city level.

Based on these considerations, this review combines interdisciplinary researches that investigate the multidimensional relationship between cities (in their complexity) and energy consumption. Using a holistic perspective, the critical review of these contributions revealed that different studies have considered different categories of urban features influencing energy consumption and CO₂ emissions. We have classified and summarized these features into four groups, each including a different number of variables: (1) physical features; (2) functional features; (3) geographical features; (4) socio-economic features. Giving that there is no single way of identifying different categories (Stead & Marshall, 2001), this classification is based on the General System Theory (von Bertalanffy, 1969) applied to the urban phenomenon (Gargiulo, Papa, 1993). In particular, according to the systemic principles, cities can be defined “as sets of elements or components tied together through sets of interactions” (Batty, 2008) and an urban system can be represented as a set of four subsystems: *physical subsystem*; *functional subsystem*; *geomorphological subsystem*; *anthropic subsystem* (Papa et al., 1995). The four categories of urban features previously introduced reflect the aforementioned four urban subsystems.

The first group of urban features – physical features – includes those variables measuring the *physical subsystem* of a city, which consists of the spaces/areas of an urban system that have been transformed in order to accommodate all different types of human activities. This set of variables describes the so-called urban form of a city. There is a little doubt that urban form – typically measured in terms of density – has been given a brighter spotlight within the overall scientific debate. Nevertheless, there are other physical factors whose influence on energy consumption and CO₂ emissions has been investigated by the reviewed studies, including those measuring polycentricity (Bereitschaft & Debbage, 2013; Chen et al., 2011; Lee & Lee, 2014) and fragmentation (Chen et al. 2011) as well as green areas (Banister et al., 1997; Gargiulo et al. 2016; Gargiulo et al., 2017; Holden & Norland, 2005; Ye et al., 2015).

The second group of urban features – functional features – includes those variables describing the type and scale of activities carried out in a given city and, therefore, it reflects the urban *functional subsystem*. Some examples of functional factors include the proportion of jobs in the city center (Camagni et al., 2002; Mindali et al., 2004; Newman & Kenworthy, 1989) or the mix of housing, business and services (Holden & Norland, 2005; Jabareen, 2006) within a specific area.

The third group of urban features – geographical features – comprises those factors that refer to the specific context of reference and describe the differences in geographic aspects such as topography – e.g. percentage of coastal area (Creutzig et al. 2015; Ewing & Rong, 2008) – and climate – e.g. heating/cooling degree days (Baur et al., 2013; Creutzig et al. 2015; Ewing & Rong, 2008; Kennedy et al., 2009). This group provides a characterization of the whole urban territory, so reflecting the city’s *geomorphological subsystem*.

Finally, the fourth and last group of urban features – socio-economic features – reflects the urban *anthropic subsystem*, which consists of all of the city’s inhabitants as well as those people conducting activities for a limited amount of time within the urban perimeter. These urban features describe both social and economic aspects: examples of social variables analyzed by the reviewed studies include the level of education (Brownstone & Golob, 2008; Holden & Norland, 2005) and the proportion of young population (Banister et al., 1997), while examples of economic indicators are the income (Baur et al., 2013; Clark, 2013; Creutzig et al., 2015; Ewing & Rong, 2008; Holden & Norland, 2005; Kennedy et al., 2009; Makido, 2012) and the number of vehicles per inhabitant (Banister et al., 1997; Brownstone & Golob, 2009; Mindali et al., 2004).

In addition to this first categorization, the review also allowed the identification of different categories of energy consumption and/or CO₂ emissions. Therefore, we have distinguished between: (a) energy

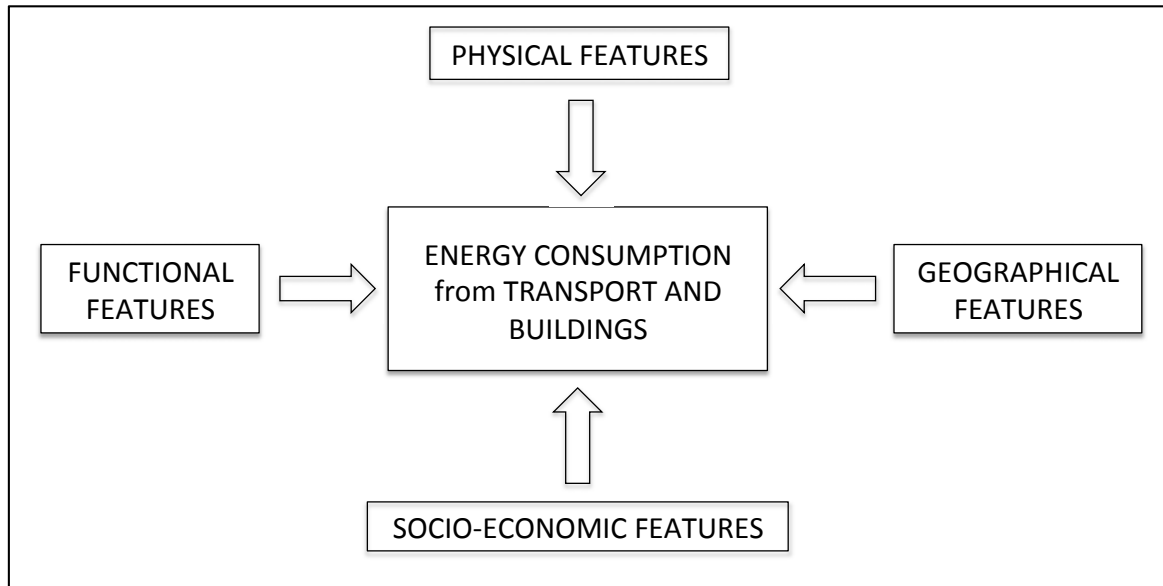


Fig. 1 Structure of the review

consumption/CO₂ emissions from the transport sector; (b) energy consumption/CO₂ emissions from the residential sector; (c) total energy consumption/CO₂ emissions. Based on this structure (Figure 1), we have developed a conceptual framework that integrates the different connections between urban features and energy consumption/CO₂ emissions that have been empirically evaluated by published studies.

In particular, this review includes empirical and modeling peer-reviewed studies that encompass a variety of cities samples, many of which located in Western Europe, in the United States and East Asia. Although some studies up to 2000 are reviewed, greater attention is given to those studies published after 2000. As to the scale of analysis considered in this paper, we limited our analysis to those studies that evaluate the connections between urban areas and energy use at urban scale. Table 1 presents a synthesis of the review. In particular, each article has been categorized based on the urban feature/s (axis y) and the type of energy consumption/CO₂ emissions (axis x) considered. This table helps identifying on what researchers' attention has mainly focused and where critical knowledge gaps concentrate.

3 RELATIONSHIPS BETWEEN URBAN FEATURES AND ENERGY CONSUMPTION

3.1 PHYSICAL FEATURES AND ENERGY CONSUMPTION

The aim of this paragraph is two fold: to shed light on the lack of a shared definition of urban form and to clarify the ongoing debate on the relationship between urban compactness and environmental sustainability. Despite numerous efforts to define urban form, a shared approach for measuring the physical component of a city is still missing (Jabareen, 2006; Levy, 1999; Marshall, 2005; Newton, 2000). The complexity of connections between the city and both natural and anthropic activities makes the definition of urban form a challenging task that depends on multiple factors, which are often underestimated or even unrecognized (Lynch 1981). Nevertheless, there is a wide consensus of opinions that urban form – in all its definitions – can have an influence on energy consumption and CO₂ emissions, and consequently a great number of

studies have investigated this relationship. In this context, the dichotomy between compact and dispersed city appears to be a key factor in the identification of a sustainable urban form. However, although it has long been argued that sprawling cities tend to consume higher amounts of energy than compact ones (Banister et al., 1997; Clark, 2013; Ewing & Rong, 2008; Marshal, 2008; Newman & Kenworthy, 1989), there has also been some criticism (Baur et al., 2013; Brownstone & Golob, 2008; Echenique et al., 2012; Mindali et al. 2004). Therefore, the relationship between urban compactness and environmental sustainability is not straightforward, yet (Chen et al., 2008, Williams et al., 2000).

URBAN FEATURES	CATEGORIES OF ENERGY CONSUMPTION/CO₂ EMISSIONS		
	ENERGY CONSUMPTION / CO ₂ EMISSIONS FROM TRANSPORT	ENERGY CONSUMPTION / CO ₂ EMISSIONS FROM BUILDINGS	TOTAL ENERGY CONSUMPTION / CO ₂ EMISSIONS
PHYSICAL	Banister et al. (1997)	Chen et al. (2008)	Baur et al. (2013)
	Baur et al. (2013)	Chen et al. (2011)	Creutzig et al. (2015)
	Bereitschaft & Debbage (2013)	Echenique et al. (2012)	Echenique et al. (2012)
	Brownstone & Golob (2009)	Ewing & Rong (2008)	Kennedy et al. (2009)
	Camagni et al. (2002)	Holden & Norland (2005)	
	Clark (2013)	Kennedy et al. (2009)	
	Creutzig et al. (2015)	Lee & Lee (2014)	
	Echenique et al. (2012)	Makido et al. (2012)	
	Holden & Norland (2005)	Ye et al. (2015)	
	Kennedy et al. (2009)		
	Lee & Lee (2014)		
	Makido et al. (2012)		
	Marshal (2008)		
	Mindali et al. (2004)		
	Newman & Kenworthy (1989)		
Nuzzolo et al. (2014)			
FUNCTIONAL	Banister et al. (1997)	Holden & Norland (2005)	Creutzig et al. (2015)
	Camagni et al. (2002)		
	Creutzig et al. (2015)		
	Holden & Norland (2005)		
	Mindali et al. (2004)		
GEOGRAPHICAL	Newman & Kenworthy (1989)		
	Bereitschaft & Debbage (2013)	Ewing & Rong (2008)	Baur et al. (2013)
SOCIO-ECONOMIC		Kennedy et al. (2009)	Creutzig et al. (2015)
		Makido et al. (2012)	
	Banister et al. (1997)	Ewing & Rong (2008)	Baur et al. (2013)
	Baur et al. (2013)	Holden & Norland (2005)	Creutzig et al. (2015)
	Brownstone & Golob (2009)	Kennedy et al. (2009)	Kennedy et al. (2009)
	Camagni et al. (2002)	Makido et al. (2012)	
	Clark (2013)		
	Creutzig et al. (2015)		
	Holden & Norland (2005)		
	Kennedy et al. (2009)		
Makido et al. (2012)			
Mindali et al. (2004)			
Newman & Kenworthy (1989)			

Tab.1 Scientific researches categorized by urban feature and type of energy consumption / CO₂ emissions

When applying the general system theory to the urban phenomenon, and considering the physical subsystem, urban form should be measured in terms of housing density (i.e. the number of dwelling units in a given area) rather than population density (i.e. the number of inhabitants in a given area). Housing density, indeed, specifically refers to the built-up area of a city and provides a more precise idea of the physical urban development. However, most studies have considered population density a reliable and effective variable for the measurement of urban compactness (Breheny, 2001). Among these studies – both empirical and modeling – many agree that population density is negatively correlated with energy consumption and CO₂ emissions from transport and buildings. In particular, as far as the transportation sector is considered, Newman & Kenworthy (1989) find a strong negative correlation between population density and annual gasoline use per capita for a global sample of 32 cities, using an analysis of correlation. Similar results are shown by Camagni et al. (2002) for the case study of Milan, that find a significant inverse relationship between population density and the index of mobility impact (which refers to the mobility demand generated in each municipality within the city's perimeter), using an analysis of regression. Same results are found by Banister et al. (1997) for five cities in the UK, that argue that "higher density urban areas may help reduce the need to travel", and by Kennedy et al. (2009), whose analysis of ten big cities in the world shows that GHG emissions from ground transportation fuels are negatively correlated with population density.

If the residential sector is considered, supporters of compactness are Holden & Norland (2005), who compare eight residential areas within the Oslo region and show that "in densely developed areas, residents use less energy than do residents in areas with lower-density housing. This is mainly the result of more efficient energy supply systems – such as remote heating systems based on heat pumps – than can be introduced in areas with a large number of housing units per area unit". In line with this argument, the study carried out by Chen et al. (2008) for a sample of 45 Chinese cities evaluates the relationship between population density and a set of urban environmental variables, including domestic electricity and natural gas consumption. Through an analysis of correlation, the authors find a weak inverse relationship between urban compactness and domestic energy consumption.

More recently, new support to the theory that compact developments are more energy efficient than dispersed ones came from Makido et al. (2012), Clark (2013), Bereitschaft & Debbage (2013), and Creutzig et al. (2015): Makido et al. (2012) use a correlation analysis and a multiple linear regression analysis to investigate the relationship between urban form and CO₂ emissions in 50 Japanese cities and find that higher population density is associated with less CO₂ emissions from the passenger transport sector; according to Clark (2013), "higher population density – particularly in core areas – correlates with lower levels of per capita travel, and transport-related energy consumption and carbon emissions in the United States", but it is also associated with diminished housing affordability and increased congestion; same geographical context – the U.S. – for the study carried out by Bereitschaft and Debbage (2013), that find for every standard deviation increase in residential density, CO₂ emissions from on-road vehicles decreases of approximately 1.9 million tons. On the other hand, Creutzig et al. (2015) find a strong negative correlation between population density and both transport energy use and GHG emissions for a sample of 274 global cities, using both a correlation and a regression analysis.

Along the same line of thoughts, however using a modeling approach rather than an empirical one, Marshal (2008), Lee & Lee (2014) and Nuzzolo et al. (2014) support the greater sustainability of denser urban areas, and quantify the impact of density on transport energy consumption and emissions. In particular, by comparing five U.S. urban growth scenario – high sprawl, business as usual (BAU), reduced sprawl, no sprawl, infill – Marshal finds that the reduced sprawl, no sprawl and infill scenarios decrease on-road gasoline CO₂ emissions compared to BAU, between 2005 and 2054, by 41%, 53% and 60% of a wedge

respectively. Weaker but similar results are estimated by Nuzzolo et al., who compare five different scenarios – compact, transit oriented development, sprawl, trend, and BAU – for the city of Rome, and find that the compact scenario reduces CO₂ emissions and energy consumption deriving from car use by 24%. Analogously, Lee & Lee estimate for 125 urbanized areas in the U.S. that a 10% increase in population-weighted density – “*estimated as the weighted mean of census block group level densities, with each block group’s population being used as the weight*” – decreases CO₂ emissions from travel and residential energy consumption by 4.8% and 3.5% respectively.

Criticizing all findings previously described, a smaller but consistent body of literature doubts the inverse correlation between population density and energy consumption/CO₂ emissions from transport and buildings. In particular, Mindali et al. (2004) highlight the inconsistency of the data collection method used by Newman and Kenworthy in the 1989 study and find very different results using the same sample and data set but a multivariate statistical approach: when cities are divided into clusters – one of North American and Australian cities and one of European cities – urban density has no effect on energy consumption from transport for both groups. Similarly, Baur et al. (2013) critic the robustness of the sample used by Newman and Kenworthy, in terms of geographical heterogeneity and numerosity. Also for a group of 62 European cities of different size they find that “population density is not, per se, a strong determinant of greenhouse gas emissions (neither for transportation GHG emissions, nor for total urban GHG emissions)”. Similar results, but limited to California, are shown by Brownstone & Golob (2009), who argue that higher housing density decreases household vehicle use and resulting CO₂ emissions, but the impacts are too modest in magnitude to be considered significant – i.e. a 40% increase in housing density corresponds to a 5.5% fuel use reduction. In line with these findings, Echenique et al. (2012) use different models to estimate the sustainability of four spatial options – compaction, sprawl, edge expansion, and new town – for three different English city regions. They find that compaction decreases vehicle distance travel, but only by 5% compared to the trend, and the associated CO₂ reduction benefits are too small compared to “the potential socioeconomic consequences of less housing choice, crowding, and congestion”.

In addition to the studies just described, which measure urban form in terms of population density, other researchers considered more complex indicators for assessing urban compactness and the way it affects energy consumption. Ewing & Rong (2008) measure urban form using Ewing et al.’s (2003) county sprawl index, which is calculated based on population density as well as street accessibility and clustering of development. For a sample of 266 U.S. counties, the authors indirectly estimate that urban sprawl positively affects residential energy use and, therefore encourage compact development. Similarly, Ye et al. (2015) analyze the case study of Xiamen and propose a normalized compactness index (NCI) based on Thinh et al.’s (2002) metric, which measures urban compactness in terms of gravity or attraction of a specific urban area. They find a positive correlation between the NCI and residential energy consumption, and interpret these results suggesting “that a compact city with heat and energy conservation from less-exposed wall and roof areas per capita, and more multifamily houses sharing foundations and resources, has residential energy savings”.

A plurality of indicators is used by Chen et al. (2011) and Makido et al. (2012), who describe urban form using five and four different variables respectively. In particular, Chen et al. (2011) adopt a panel data analysis to study the relationship between five landscapes metrics – total urban class area, number of urban patches, mean perimeter-area ratio, Euclidean nearest neighbor distance, largest patch index – and energy intensity in production and living, in five Chinese cities. They find that (1) bigger cities consume more energy; (2) fragmentation in urban development increases energy consumption; (3) connectivity between patches is negatively correlated with energy consumption; (4) the largest patches index is negatively correlated with energy consumption, which suggests that concentration of urban activities should be

encouraged, supporting the environmental sustainability of compact development. A similar approach is that employed by Makido et al. (2012), who consider three spatial metrics – the buffer compactness index (BCI), the compactness index (CI), and the area weighted mean patch fractal dimension (AWMPFD) – in addition to population density (measured in terms of urban area per capita and previously discussed), to estimate the relationship between urban form and CO₂ emissions from transport and buildings in Japan. Using a multiple linear regression analysis, the authors find that the BCI is the only spatial metric significantly correlated with energy consumption; in particular, increased BCI (i.e. increased compactness and monocentricity) decreases emissions from the passenger transport sector, but increases residential CO₂ emissions.

Although studies on the relationship between urban form and energy consumption mostly focus on the dichotomy between compact and sprawl development, some researchers include other physical urban variables in their analysis, such as house size, house typology, house age and availability of green spaces. In this context, it is shared opinion that bigger house size is associated with higher CO₂ emissions from transport (Lee & Lee, 2014) and buildings (Baur et al., 2013; Ewing & Rong, 2008; Holden & Norland, 2005), and that attached new houses are more energy efficient than detached old ones (Ewing & Rong, 2008; Holden & Norland, 2005). As far as green areas are concerned, results are not unanimous. In particular, Banister et al. (1997) find that the amount of open space is positively correlated with transport energy use in the case of Banbury and negatively correlated in the case of Oxford, while Ye et al. (2015) find that a greater connectivity and a weaker accessibility of green spaces is associated with higher CO₂ residential energy use. Furthermore, the study by Gargiulo et al. (2016), which specifically focuses on the influence of green spaces on urban microclimate, for the case study of Naples finds that there is a threshold value (i.e. 5.000 square meters) for green areas size that most effectively reduce residential summer cooling, and thus resulting CO₂ emissions.

To summarize, two main groups can be recognized in the debate on the relationship between urban form and energy consumption: those who support the compact city and those who question the relevance of its environmental benefits. While compact development advocates support the idea that people living in dense urban settlements are less automobile dependent, tend to live in multifamily houses, and thus consume less energy than do residents in sprawl areas, critics suggest that the energy savings associated with the intensification of land use are too small to be considered significant, and they may be associated with negative externalities such as congestion, higher housing price, and less availability of green areas.

3.2 FUNCTIONAL FEATURES AND ENERGY CONSUMPTION

Some of the studies on the relationship between urban form and energy consumption (described in the previous paragraph) also evaluate the energy and carbon footprint of a number of urban features that measure the functional organization of an urban system. It is of interest to note that the scientific literature does not offer any research that is exclusively focused on the relationship between urban functional features and energy consumption, but functional and physical features are always considered together. This may be because these two types of urban characteristics are very much connected to each other, and are both associated to the aforementioned compact city concept: in general, high-density and mixed-use development are typical of what can be defined a compact urban settlement (Burton, 2000), while the segregation of different land uses is typical of urban sprawl (Anderson, 1996).

In this context, the study carried out by Holden & Norland (2005) – earlier described for its results in terms of physical features and energy consumption – finds that the mix of housing, business and services does not have any significant effect on energy consumption from transport. Furthermore, the authors find a similar result for housing density, and suggest that “high density and high local mix must be combined with

proximity to a center offering everyday services to bring about a reduction in energy use for everyday travel". However, stronger results are those found by Camagni et al. (2002), which use the ratio of jobs to resident population to measure the functional mix of a specific urban area, and find that this indicator is significantly inversely correlated with mobility, thus showing that higher mobility impact is associated with residential areas rather than with mixed ones. Similar results are those of Banister et al. (1997), that also use the ratio of jobs to population as a measure of functional mix, and find that mixed developments consume less energy from transport if local jobs and facilities are appropriate for local residents.

The proportion of jobs in the city center – calculated as the percentage of jobs within the central business district (CBD) – is one more indicator that describes the functional characteristics of different urban development and that has been considered by the scientific literature for its impact on energy consumption. In particular, Mindali et al. (2004) divide Newman & Kenworthy's (1989) sample of 32 global cities in two groups (i.e. North American and Australian cities; European cities) and find a strong negative correlation between this variable and gasoline consumption for both groups. This result confirms Newman and Kenworthy results from 1989. However, Newman and Kenworthy also find no correlation between the absolute number of jobs in the city center and gasoline use for their sample of 32 global cities. The two results together suggest that the effect of the strength of the city center on gasoline consumption is not straightforward and that it may be that "it is largely the transportation policies applied to central cities that determine whether or not a significantly centralized work force is going to have a positive or negative effect on gasoline use" (Newman & Kenworthy, 1989).

Finally, it is of interest to also look at the indicator employed by Creutzig et al. (2015) for measuring the economic activity of the world cities included in their sample. The authors use the "center of commerce index" (Worldwide Mastercard, 2008), which classifies 75 leading urban centers based on their role in enabling commerce worldwide, and find a positive correlation between this proxy and the total final energy use. This finding highlights the role of production activities as key factors affecting the carbon footprint of urban areas.

In summary, there are relatively few studies that investigate the impacts of urban functional features on energy consumption. Although some results may appear contradictory, the general argument that emerges is that the positive effect of mixed-use development on energy saving from transport is not significant by itself, but becomes significant when combined with high density and supply of transit services.

3.3 GEOGRAPHICAL FEATURES AND ENERGY CONSUMPTION

Ewing & Rong (2008) are the first to consider topographic and climatic variables in their analysis on the relationship between cities and residential energy consumption. In particular, they find a positive correlation between heating degree days (HDDs) and energy use for heating, as well as between cooling degree days (CDDs) and energy use for cooling. Furthermore, they include data describing the topographic configuration of the 266 U.S. counties in their sample, but employ these two dummy variables – coast and valley – only to evaluate their relationship with climate. Thus, the authors don't provide any information about the way territorial geography may affect energy consumption. In this context, Creutzig et al. (2015) conduct a similar analysis by including HDDs, CDDs and coastal city location in their study of 274 global cities. Their analysis of regression shows that HDDs are positively correlated with both final energy and GHG emissions and "explain an important fraction of the energy use variability of cities", while CDDs and coastal city location do not significantly affect either energy use or GHG emissions. The positive effect of HDDs on residential energy use found by both Ewing & Rong (2008) and Creutzig et al. (2015) is further confirmed by Kennedy et al. (2009), who analyze 10 global cities and find that the amount of fuel used for heating and industrial

activities increases with HDDs. On the contrary, Baur et al. (2013) don't find any significant influence of HDDs on total GHG emissions for 62 European cities, possibly because their data on GHG emissions were previously corrected for seasonal variations, as specified by the authors. Similarly, in their analysis on urban form, air pollution and CO₂ emissions in 86 U.S. metropolitan areas, Bereitschaft & Debbage (2013) show that the two climate factors considered – temperature and moisture – are not associated with total CO₂ emissions, but only with O₃ concentrations and PM_{2.5}, VOCs, and NO_x respectively. More controversial are the results of Makido et al. (2012), who use cities' average temperature instead of HDDs, and find a negative effect on residential CO₂ emissions. In this case, the authors admit the difficulties in interpreting such results and suggest the inclusion of HDDs rather than the average temperature in a future research.

To synthesize, the relationship between geographical features and energy consumption has been interpreted by the literature as that between climate – specifically HDDs – and energy consumption from buildings. In this context, it is widely argued that an increase in HDDs is associated with an increase in CO₂ emissions from heating. As far as the geographical location of cities is concerned, only one research finds that the proximity to the ocean does not affect energy consumption. Future research should further investigate the importance of these aspects as well as that of urban topography with respect to energy consumption.

3.4 SOCIO-ECONOMIC FEATURES AND ENERGY CONSUMPTION

Researchers have extensively studied the impacts of economic and social factors on energy use. As far as the economic features are concerned, most of the attention has been focused on the effects of three main variables – income, fuel price and car ownership – on transportation first, and on residential and total energy consumption later. In particular, Newman & Kenworthy (1989) find that these three indicators are responsible for about 60% of gasoline use, while the remaining 40% depends on urban form and land use factors. With respect to income, it is widely recognized that higher standard of living results in higher emissions from both transport (Brownstone & Golob, 2009; Clark, 2013; Holden & Norland, 2005; Newton & Kenworthy, 1989) and buildings (Ewing & Rong, 2008; Kennedy et al. 2009). In this regard, the results by Creutzig et al. (2015) are of particular interest. When considering the whole sample of 274 global cities, the authors find that final energy consumption is strongly positively associated with economic activity, but in the moment that they divide the sample in eight groups based on gross domestic product (GDP) per capita, density, fuel price, and HDDs, they find that "energy consumption for urban transport increases with GDP at low GDP levels, but decreases with GDP at high GDP levels". These findings give new insight into the question, and open up new avenues for future research. With regard to fuel price, Newman & Kenworthy (1989) argue that this economic factor is inversely correlated with transport energy consumption, and Ewing & Rong (2008) find a similar negative relationship between energy price and residential energy demand. More recently, Creutzig et al. (2015) find a negative relationship between fuel price and total energy use and emissions, thus supporting both previous results. Finally, if we consider car ownership, as reasonably expected, studies find that higher levels of car ownership are associated with higher energy use from transport (Banister et al., 1997; Mindali et al., 2004). As far as the social features of urban areas are concerned, the impacts of different social aspects on energy consumption have been investigated by the scientific literature, but weak consensus exists among researchers. According to Camagni et al. (2002), for example, population growth rate positively affects mobility, while on the contrary, Baur et al. (2013) find that this indicator doesn't significantly influence total GHG emissions. Similar contradictory results are found when household composition is investigated: while Brownstone & Golob (2009) show that in California fuel use increases with the number of children, Ewing & Rong (2008) don't find any significant relationship between residential energy consumption and either the number of children or the number of adults, in the

U.S. There is the same debate when the level of education is considered, because those who find that education positively affects transport energy use – “households headed by a respondent with a college degree tend to have a vehicle fleet with greater overall lower fuel economy than their less educated counterparts. This effect is accentuated if the household is headed by a respondent with a postgraduate degree” (Brownstone & Golob, 2008) – are criticized by those who don’t find any significant correlation (Holden & Norland, 2005). One last social aspect considered for its potential impacts on energy consumption is ethnicity; in particular, both Ewing & Rong (2008) and Brownstone & Golob (2009) find that energy consumption varies by race, but this relationship needs more specific research to be fully understood.

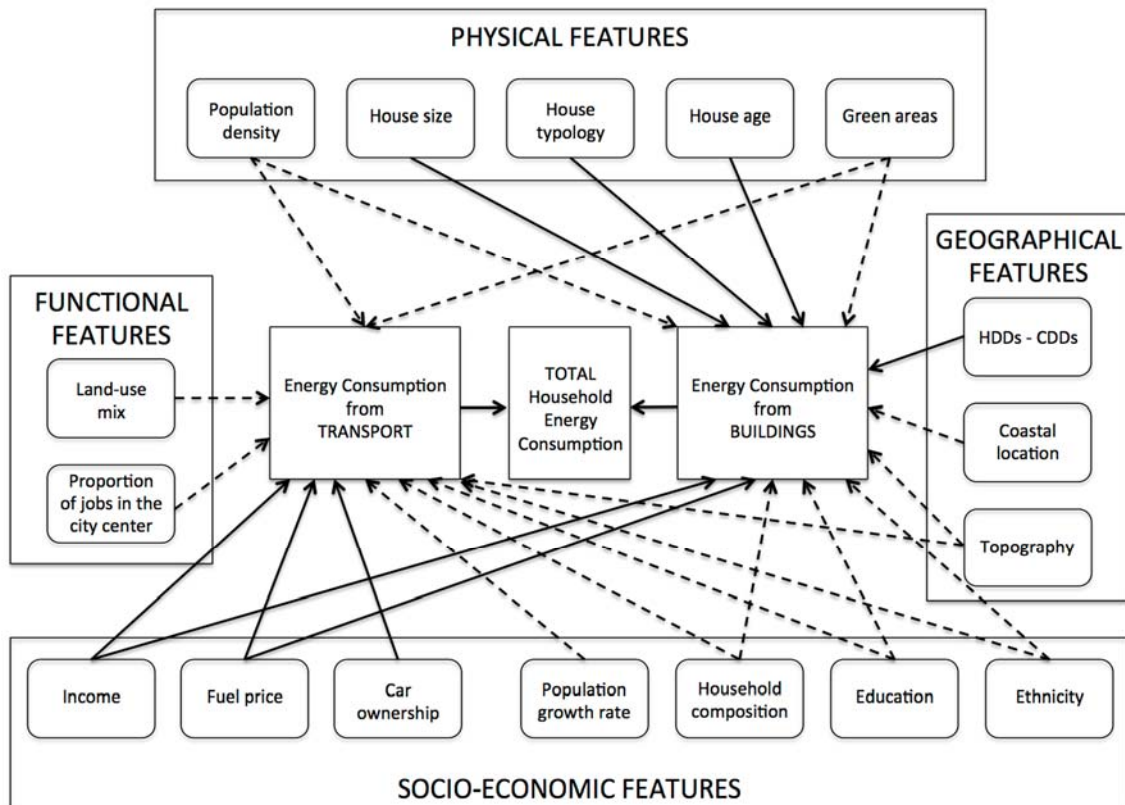
To summarize, it is widely recognized that social and economic factors affect energy consumption. However, while there is great consensus about the relationships between economic variables – income, fuel price, and car ownership – and energy consumption, there is far less agreement about the way social characteristics, such as demographic growth, household composition, education, and race may influence energy use.

4 A CONCEPTUAL FRAMEWORK TO GUIDE FUTURE RESEARCH

The review of the scientific literature on the relationship between cities and energy consumption allows the construction of a conceptual framework (Figure 2), which has two main goals: (1) to provide a state of the art summary on this topic, and (2) to suggest some directions for future research. The conceptual framework is built based on the integration of the findings previously described, and it takes into account the four categories of urban features that have been used to represent the urban system (according to the general system theory applied to the urban phenomenon). In particular, for each group of features, the main variables are specified and the relationships between these variables and the two types of energy consumptions – from transport and from buildings – are identified. Two different types of arrows are used: solid arrows represent those relationships for which there is a wide consensus within the scientific community, both in terms of “sign” (i.e. positive or negative relationship) and significance; on the contrary, dashed arrows indicate those relationships that require further investigation because of the conflicting results found in the literature so far.

At the top of the figure are the five physical features – population density, house size, house typology, house age, and green areas – that emerge from the literature review as key factors significantly affecting energy consumption at city scale. As far as population density is concerned, two dashed arrows connect this variable with both types of energy consumption; this is because, although there are numerous studies on the relationship between urban form and energy use, and the majority agree that population density is negatively correlated with both transport and building energy use, there is still a lack of consensus among researchers about the size of this correlation, and thus its significance. Similarly, further research is needed to explore the way green spaces affect energy consumption. On the contrary, the scientific findings about the relationships between the other three physical features – house size, house typology, and house age – and residential energy consumption are sufficiently reliable and widely shared in the literature, thus these arrows are solid.

At the left of the figure are the two functional variables – land use mix and the proportion of jobs in the city center – influencing energy consumption from transport, but in both cases the relationship is not straightforward, either because of the relatively small number of studies on this issue or because of the strength of these two relationships depend on other external variables (e.g. urban density and transit service), as previously described in par. 3.2. Therefore, embracing the complexity of the urban system, additional effort should be made to investigate the influence of the urban functional subsystem on energy consumption.



Note: Solid arrows indicate relationships that are shared by the scientific community; dashed arrows indicate relationships that are not shared by the scientific community, and thus require further investigation.

Figure 2. Conceptual framework and key relationships between the four groups of urban features and energy consumption

At the right of the figure are the three geographical features – heating and cooling degree days, coastal location and urban topography – that affect household energy consumption. In particular, a solid arrow connects HDDs/CDDs and residential energy use, because it is widely argued that climate conditions significantly influence fuel consumption for heating and cooling. On the other hand, with regard to the other two geographical features, too little research has been done in order to assess the impacts of coastal location on residential energy use and of topography on either residential energy use or transport energy use. Thus, three dashed arrows associate these two variables and the two types of energy consumption.

At the bottom of the figure are the seven socio-economic features – income, fuel price, car ownership, population growth rate, household composition, education, and ethnicity – that are in part responsible of both transport and residential energy use, according to the reviewed literature. While there is wide consensus on the relationship between economic variables and energy consumption, there is less of a consensus on the impacts of social factors on energy use. In particular, it is widely demonstrated that income and fuel price are correlated – positively and negatively respectively – with energy consumption, from both transport and buildings, and that an increase in car ownership results in higher transport energy use. On the contrary, more complex are the influences of the four considered social features on energy use, which may explain the dissimilarity in findings among studies. Future research, indeed, should focus more on the influence of household composition, education and ethnicity on energy consumption. Furthermore, more scientific attention should be paid to measure the consequences of demographic growth on energy consumption, especially today that urbanization processes are extremely pervasive.

4.1 RELATIONSHIPS AMONGST DIFFERENT URBAN FEATURES

Using a holistic approach (as previously described in Section 2), the conceptual framework proposed above does not provide a comprehensive picture of the complexity of the relationship between cities and energy consumption. Indeed, another group of interaction exists and significantly contributes to such complex relationship. This group includes the interactions amongst the four different types of urban features (physical, functional, geographical, and socio-economic). Differently from the relationships described in the previous paragraphs, these interactions indirectly affect energy consumption. Nevertheless, these indirect effects can be significant and should not be ignored.

However, only a small part of the literature reviewed in this paper considers these secondary interactions, which are synthetize in Figure 3. In particular, Holden and Norland (2005) are the first to find a significant interaction between two physical features, i.e. house typology and house age. They find that the difference in energy consumption between single-family housing, row houses and multifamily housing is lower when considering housing units built after 1980. In other words, the energy efficiency of multifamily housing compared to single-family housing has decreased in recent years. This means that the direct effect of house typology on residential energy consumption becomes weaker when the indirect effect of house age is considered.

Similarly, Chen et al. (2008) find a positive interaction between population density and density of facilities (land use mix), which means that densely populated cities in China also have higher concentrations of activities. On the same page, Brownstone and Golob (2008) find that population density is negatively associated with car ownership, income and the number of family components, and that “households which are solely Black, solely Asian, solely Hispanic, or mixed White and Hispanic, all tend to reside in higher-density areas”. Population (weighted) density is also found to be inversely association with housing type (calculated as an ordinal variable: 0 = multi-family, 1 = single attached, and 2 = single detached) and housing size (using the number of rooms as proxy), according to the results obtained by Lee and Lee (2014) using a multilevel structural equation model (MSEM), which means that in denser populated areas there is a higher concentration of multi-family houses with a lower number of rooms.

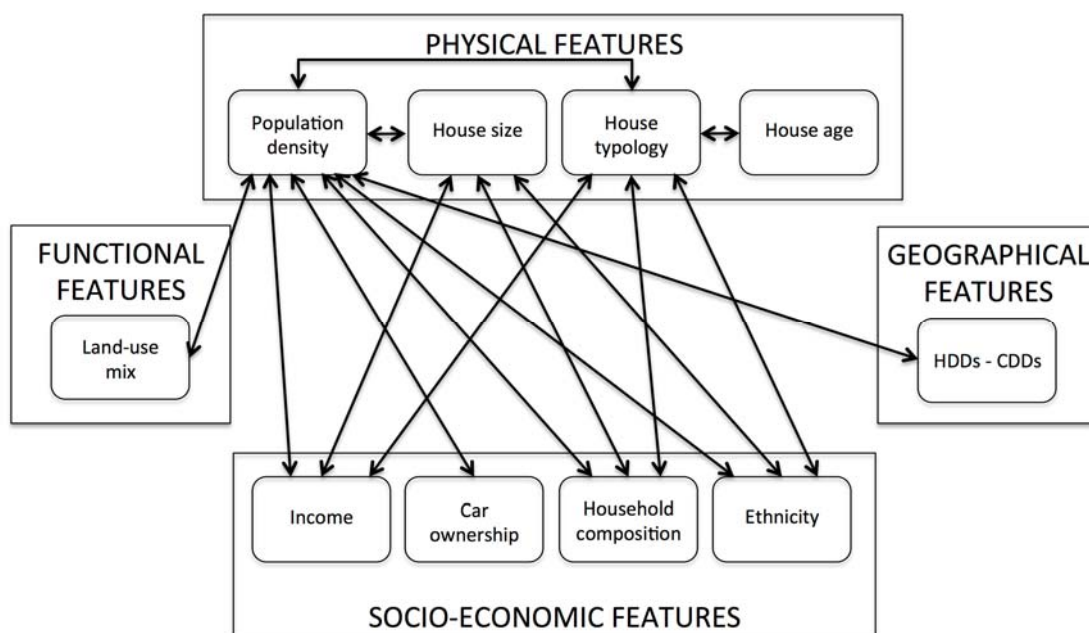


Figure 3. Key relationships amongst the four groups of urban features

Finally, Ewing & Rong (2008) devote much effort to analyze the way urban form can indirectly affect residential energy consumption through the housing stock and the formations of urban heat islands (UHIs). By using a hierarchical modeling, the authors find that house typology and house size are significantly associated with several socio-economic features. In particular, as the number of family members and income increase, both house size and the odds that the household will choose a single-family detached house increase. Analogously, also ethnicity is found to significantly affect the choice of both house typology and house size: White households are more likely to choose bigger single-detached homes than Black, Hispanic and Asian ones. Furthermore, Ewing and Rong also find that multifamily houses are associated with denser urban areas and that houses are significantly larger in sprawling counties than in compact ones. In addition to these results, the study shows that the effect of the urban heat island (UHI) is greater in compact developments, which implies that in denser areas “temperatures are higher than they would be otherwise”. Considered together, these results suggest that the indirect effects of these secondary interactions between physical, functional, geographical and socio-economic factors can significantly contribute to the increase and/or decrease of transport and residential energy consumption at urban scale. In other words, the correlations between different urban features and energy consumption found by the literature so far (and described in Section 3) cannot prove a causal relationship. Indeed, they may partially be the effect of secondary interactions between other variables. For example, a strong positive correlation between housing size and residential energy consumption may not be exclusively due to a direct link between these two variables, but it may also include the indirect effects of other physical (e.g. population density) and socio-economic (e.g. income and ethnicity) variables. However, it is very difficult to identify and untangle all the direct and indirect effects from different urban features on transport and residential energy consumption. Therefore, the task of establishing independent links between cities’ characteristics and their energy and carbon footprint remains very challenging (Rickwood et al., 2008) and requires further investigation.

5 DISCUSSION AND CONCLUSIONS

This paper puts together and compares the relevant literature on the relationship between cities and energy consumption over the last twenty years. Two main energy sectors have attracted the interest of the scientific community – transportation and residential sectors – and a large number of urban features have been analyzed. In particular, as we have distinguished between four different categories of urban features (physical, functional, geographical, and socio-economic), the review shows that a great body of the literature has focused on the relationship between urban form (i.e. physical features) and energy consumption, while fewer researches have also investigated the effects on energy use and CO₂ emissions of other urban characteristics, such as those describing the functional, geographical and socio-economic aspects of a city. Despite the great interest of the literature on this topic, a consistent number of interactions between urban features and energy use at urban scale still lacks of consensus. One of the main open questions is about the relationship between population density and energy consumption.

While it is widely argued that density is negatively correlated with both transport and residential energy use, there is less agreement about the scale (and significance) of this correlation and whether this inverse association can be generalized or whether it exists only for particular density ranges and specific clusters of cities. In addition to this open debate, the impact of social factors on energy use still requires further investigation. In particular, the effect of some social factors such as the level of education or the ethnicity on households’ travel behavior and residential energy use.

Furthermore, several studies previously reviewed (Baur et al., 2013; Creutzig et al., 2014; Mindali et al., 2004) show the importance of sample clustering when different cities from around the world are considered

together: some urban features, such as house typology, travel behavior and ethnicity, indeed, can significantly differ between countries, due to different historical background and socio-economic development; therefore, the impacts of such urban characteristics on energy consumption can hardly be generalized. Overall, three main limitations to the studies included in this review have emerged. The first issue concerns the approach used to analyze the relationship between cities and energy consumption. Many studies employ a sectorial approach rather than a holistic one. Consequently, they only consider direct effects of a number of urban factors on energy consumption or CO₂ emissions, without taking into consideration the possible indirect effects associated with the interactions that may exist amongst the different urban factors. As previously mentioned, these indirect effects may be significant and cannot be ignored if we want to explore the relationship between cities and energy consumption in its complexity and multidimensionality.

The second limitation concerns the methodology used by the different researches reported here and is strongly related to the first limitation previously described. The most frequent statistical techniques employed to study the type and significance of relationship between different urban features and energy consumption/CO₂ emissions are two: the analysis of correlation and the multiple regression analysis. Both methods do not allow the identification of a causal link between the variables considered. In other words, a strong correlation between two variables does not imply a direct link between these variables but it could be the results of an indirect interaction that involves other variables.

Finally, the third issue concerns the limited data availability. As highlighted in many of the reviewed studies, the lack of a comprehensive dataset about cities' energy consumption and CO₂ emissions by sector represents a significant limitation, which has been overcome by merging different data sources or by collecting data using questionnaires, whose reliability could be questionable. Similarly, many of the described researches report as a limit that they have considered just a restricted number of urban variables while others, which may be equally important, could not have been captured.

Given the findings of the studies presented above and taking into consideration the limitations previously described, this review proposes a conceptual framework to guide future research on the relationship between cities and energy consumption. The proposed framework presents the main urban factors influencing the energy and carbon footprint of a city and illustrates clearly the key relationships between these features and both transport and residential energy consumption, highlighting those relationships that are not straightforward and require therefore further research (Figure 2). Most importantly, this framework also illustrates a second group of relationships – i.e. those amongst the four categories of urban features (Figure 3) – which may significantly affect energy consumption but are often ignored by the scientific literature, thus providing a more comprehensive picture of the complex and interconnected interactions between cities and energy consumption. This wider picture could represent a new starting point for future research on this topic. Indeed, further research is needed in order to evaluate the extent to which urban characteristics influence transportation and residential energy consumption. Only if these impacts are clearly understood, urban planning policies can effectively improve energy saving in cities and reduce urban emissions.

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IMPLEMENTING ITI FOR URBAN DEVELOPMENT LOCALLY

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ABSTRACT

In the current Programming Period (2014-2020) the European Commission has introduced a new strategic instrument, the Integrated Territorial Investment (ITI), which shifts the decisions on allocation of funds to the local level and, most importantly, enables drawing of funds from several priority axes and from several European Structural and Investment Funds. Greece is one of EU member countries that has committed on using ITIs as a tool for urban development. In August 2016, in the Region of Central Macedonia, urban authorities with a population of over 10.000 inhabitants were invited by the Managing Authority of the Regional Operational Programme to submit a Strategy for Sustainable Urban Development (SUD), through the mandatory implementation of the ITI tool. The paper focuses on one of these municipalities, the city of Veria, where the ITI approach has been implemented for the design of an ITI of urban scale (ITI-SUD). The integrated approach prescribed by regional authorities forced Municipalities to adopt government approaches uncommon until now: to involve multiple stakeholders in the entire process, from strategy development to project selection and implementation. The paper describes the benefits and challenges of the new approach as applied in the local context, showing the vertical and horizontal connections of urban development strategies. Most importantly, in the context of 'procedural learning' happening in Europe in the field of territorial cohesion, it offers an insight on how European cohesion policy strategies and tools are tested at the local level.

KEYWORDS:

Sustainable Urban Development; Integrated Territorial Investment; European Cohesion Policy; Greek Cities; Veria

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实施ITI推进城市发展

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摘要

在当前的计划时期（2014-2020 年），欧盟委员会提出了一项新的战略工具，即综合领土投资（ITI），将资金分配决策转移到地方一级；最重要的是，通过该工具，可以从几个享有优先权的轴心国和几个欧盟结构基金和投资基金提取款项。希腊是曾致力于推行将 ITI 作为城市发展工具的欧盟成员国之一。2016 年 8 月，在马其顿中部地区，管辖内居民超过 1 万人的城市管理当局应区域行动计划的管理当局之邀，提交了一份关于通过强制执行 ITI 工具来实现可持续城市发展（SUD）的战略规划。本文重点讨论上述城市之一——维利亚，该市已经实施 ITI 方法来设计城市规模的 ITI（ITI-SUD）。由于区域当局所规定的综合办法，各市镇到目前为止必须采取不寻常的政府对策：从战略制定到项目选择和执行，让多个利益攸关者都参与到整个过程中来。本文介绍了新方法在地方环境中应用所体现的优点和面临的挑战，展示了城市发展战略的纵向和横向联系。最重要的是，在欧洲的领土凝聚力领域正在出现的“程序性学习”的背景下，这一方法为我们提供了关于如何将欧盟凝聚政策战略和工具在地方一级进行尝试的见解。

关键词：

可持续城市发展；综合领土投资；欧盟凝聚政策；希腊城市；维利亚

1 INTRODUCTION

In the current (2014 - 2020) Programming Period, a notable change is taking place in the financing of territorial development programmes across the European Union (EU). Actions on sustainable urban development co-financed by the European Structural and Investment Funds (ESIFs) are now channelled via the Regional Operational Programmes through the voluntary application of Integrated Territorial Investment (ITI). As its name implies, ITI is an instrument to implement territorial strategies in an integrated way. It is not an operation, nor a sub-priority of an Operational Programme. Instead, ITI allows Member States to implement Operational Programmes in a cross-cutting way and to draw funding from several priority axes of one or more Operational Programmes to ensure the implementation of an integrated strategy for a specific territory. As such, the existence of ITI both provides flexibility for Member States regarding the design of Operational Programmes, and enables the efficient implementation of integrated actions through simplified financing (European Commission, 2013).

The scope of this paper is to present a case study regarding the implementation of the ITI approach in an urban context, and specifically that of a town district: the design of the Sustainable Urban Development Strategy (ITI-SUD) of the city of Veria, a medium-sized urban agglomeration in the Region of Central Macedonia, Greece. Alongside other localised analyses of ITI use in various spatial and administrative scales (Gaman, 2015; Krukowska & Lackowska, 2017) and in parallel to systematic overviews of the process of ITI implementation across Europe (CEMR, 2014; CEMR, 2015; Van der Zwet. & Mendez, 2015; Van Der Zwet, 2015), the present paper is a 'report from the field,' based on first-hand experience, as the author was involved in the local ITI, as a city employee working for the Division of Planning and Development of the Municipality of Veria, i.e. the Division which handled the Veria ITI-SUD throughout the process of its design, and continues to supervise its implementation.

On one hand, therefore, there is a pragmatic aspect in this paper: to contribute to the body of documentation of how ITI, a new policy tool for territorial development, originally a theoretical and then a strategic concept, is applied in the urban scale, in the form of a 'user's guide' handed down to local authorities (Municipalities) as to how an urban renewal strategy is to be drawn and financed by ESIFs. On the other hand, the paper aims to also link this practical process to two more theoretical issues often intertwined with each other: a) the reformed urban agenda of the EU in the current Programming Period and b) the advances regarding urban renewal within the discourses of Urban Design and Spatial Planning. In regard to the first issue, it is significant to stress out that ITI was introduced in the Europe2020 Strategy as a reform towards place-based approaches (Barca, 2009; Barca, McCann & Rodríguez-Pose, 2012; McCann, 2015), as the opposite pole of spatially-blind approaches. Acknowledging this theoretical influence, what does the comparison of the local ITI process with previous models for urban renewal applied in the specific local and national context tell us? Can we discern beneficial changes in the current process, transformations that bear 'place-based' characteristics? Regarding the second issue, we first need to place the ITI process as an urban renewal strategy in the historical and social background of the specific city and of Greece in general, taking into account the reluctance to institutional change which characterises Greek political system (Diamandouros, 1994) and also the 'accommodation' model of adjustment to European policies (Börzel & Risse, 2002), which is an attribute of Greece's relation to the EU. Can we find indications in the 'local milieu' (Governa, 1997) that the implementation of the ITI process (at the beginning viewed as another, though much more complicated, form of getting funding from the EU), has produced incremental changes in the local government and/or local society towards a better understanding of the concept of integrated sustainable development? These questions will permeate the presentation of the Veria ITI-SUD itself, and hopefully will be answered partially through observations and reflections on the case study.

2 THE ITI TOOL FROM EU POLICY DOCUMENTS TO NATIONAL DIRECTIVES

As a tool for territorial policy, ITI was introduced in Article 36 of the Common Provision Regulation (CPR, 2013), which constitutes the legal basis for its use. The Article further prescribes that all details about how the ITI will be used and how it will correspond to the allocation of funds from each priority axis, will be in the hands of the relevant Operational Programme(s). The openness of the ITI is clear by the statement that Member States are to designate the specific bodies (local authorities, regional development bodies or non-governmental organisations) which will carry out the ITI (CPR, 2013). However, the final clause of the Article stresses out the intricate horizontal/vertical relationship between the territorial approach and EU-wide strategic goals: "The Member State or the relevant managing authorities shall ensure that the monitoring system for the programme or programmes provides for the identification of operations and outputs of a priority contributing to an ITI" (CPR, 2013). It is noteworthy in this text that, from its inception, the ITI approach is not legally-binding, but is offered as a general framework for each Member State to develop its own policy. As McCann & Varga (2015) point out, in the highly heterogeneous, both economically and institutionally, space of the EU, any policy that spans this complex arena needs to be sufficiently flexible in order to adapt to the local context, but also "it needs to maintain a solid core in terms of its logic, objectives and management systems so as to ensure that the policy is used for correct purposes and is targeted at the intended recipients" (McCann & Varga, 2015, p. 1255). That is much the case in how ITI was introduced in EU policy documents and is indicated in the many different ways ITIs have been used so far (Gaman, 2015; Krukowska & Lackowska, 2017).

To entertain this flexibility but also to ensure the true-to-purpose use of the ITI tool, in the years following its official adoption of the CPR in December 2013, several formal and informal guidance papers have been offering examples of practical implementation of ITIs. Such a document is the Directorate-General for Regional and Urban Policy report on "Scenarios for Integrated Territorial Investments" (De Bruijn & Zuber, 2015). This report provides a quite thorough understanding on how ITI is 'translated' from the theoretical and strategic spheres to the implementation level. De Bruijn & Zuber (2015) provide four 'scenarios' for the use of ITIs, in four different scales: Metropolis, Sub-region, District and Twin Cities. Despite the differences in these four contexts, differences not only in spatial scale, but also in administrative, macro- and micro-economic, social and even cultural and anthropological levels, the four scenarios developed in this report provide us with an important clarification of how the ITI instrument differs from other strategies for delivering funds:

- It is 'place-based,' meaning that it springs from a detailed analysis of local conditions, challenges and advantages, thus leading to a plan of actions and a funding scheme unique to the specific implementation area. A major setback of previous Programming Periods has been that distribution of funds was done in a 'spatially blind' or 'place neutral' manner (Barca, McCann & Rodríguez-Pose, 2012), meaning that decisions about prioritisation were made horizontally, frequently failing to address local problems;
- It addresses sustainability through all its three pillars – environment, economy, society. In the ITI Action Plan, it is highly advisable to include measures and actions drawing from multiple Thematic Objectives and more than one Structural Fund, and to target different categories of challenges, ranging from social inclusion to demographic decline to unemployment to climate change, in order to coordinate a truly sustainable Strategy for the implementation area;
- It involves the active participation of local stakeholders – such as community organizations, NGOs, local professional and entrepreneurial representatives, other public bodies – in all phases of the ITI, from the preliminary meetings to forming an overall Strategy to drawing up proposals for specific actions. In the urban scale, specifically, previous experience from this kind of local involvement has been gained across Europe in such EU pilot projects such as URBACT, where this local involvement has been secured in the form of Local Support Groups;

- Last but not least, the ITI tool emphasizes on the use of measurable data on the various characteristics of the implementation area, which support the Strategy and will be followed upon after the actions have been materialized, thus putting emphasis on results.

Admittedly few reports have come out in the course of the first three years of the current Programming Period regarding the progress of the implementation of ITIs across Europe (CEMR, 2014; CEMR, 2015; Van Der Zwet, 2015). By 2015, among the Member States using ITIs, some were significantly more advanced, as in the case of Poland, the Czech Republic, Finland, France and Italy (Gaman et.al., 2015; CEMR, 2015), primarily for areas already designated and foreseen in their Partnership Agreements. On the other hand, many countries such as Austria, Bulgaria, Denmark and Estonia have declined to use ITI tool altogether, while others have used the tool only partially (CEMR, 2015). As mentioned before, due to the vagueness of CPR mandates, the application of the ITI in the local level is actually a field of experimentation: none of these processes/activities are in fact streamlined. Only the mid-term (2017) report on EU Cohesion Policy will provide literature for substantial comparative analysis and drawing of conclusions. In the case of Greece, there was a significant delay in the offset of the 2014-2020 Programming Period due to political reasons and specifically because of the uncertainty caused by repeated national elections and changes of government. This delay also affected the adaptation of EU guidelines regarding the implementation of ITIs into state policies. The National Coordinating Authority for European Structural Funds, which is part of the Ministry of Economy and Development, issued the first Explanatory Circular on the design, implementation and monitoring of ITIs in July 2015 (Greek Ministry of Economy and Development, 2015), but the document contained few guidelines and emphasized on the general criteria for choosing an area for an ITI, albeit without clarifying how, and through what administrative schemes, ITIs would be formed and agreed upon. No real advancement was made until the following April (Greek Ministry of Economy and Development, 2016), when another Circular provided more detailed instructions about the choice of intermediate bodies and the delegation of functions among the national, regional and municipal levels of government. The 2016 Circular prescribed the use of ITIs as a mandatory tool for the distribution of funds on Sustainable Urban Development via the Regional Operational Programmes (ROPs) of the thirteen Regions of Greece. On the national level, no actual preparation or strategic regional analysis as to how and why ITIs were needed, and for which areas, preceded this regulation. Instead, there was an ad hoc decision on the mandatory implementation of the ITI tool specifically for urban development, a decision which in essence transferred all the 'burden' of its materialisation to the Managing Authorities of the Regional Operational Programmes and, from then on, to local authorities (Municipalities). Financially, the funds to be allocated for Urban Development via the ITI process represent only a fraction of the total European Regional Development Fund (ERDF) budget of each Region: they correspond to the minimum quota (5%) earmarked for Sustainable Urban Development according to Article 7 of the ERDF Regulation (European Commission, 2016). In the case of the Region of Central Macedonia (see Figure 1), the funds earmarked for all ITIs (5% of the Regional budget in the 2014-2020 Programming Period) equals to 99.081.645€. If we compare this amount to the funding for Sustainable Development prescribed in the 2007-2013 budget of the ROP, which was 1.079.000.000€ (Greek Ministry of Economy and Finance, 2007), it becomes clear that the intention has not been to adopt ITI on a wide scale for the scope of urban development financing, but rather to pass on only a small portion of EU funds to the discretion and responsibility of local authorities. On top of the general scarcity of ITI funds, Thessaloniki's metropolitan area was selected to be treated as an ITI on its own and a generous 79% of the total ITI budget (78.275.000€) was earmarked for urbanities in and around Thessaloniki. For the distribution of the remaining 20.805.645€ to the eight urban districts of the Region outside Thessaloniki, there was a decision of make the call to Municipalities competitive – which meant that each town or city in the Region had to design its own ITI and submit its own Sustainable Urban Development Strategy (ITI-SUD), in order to enter the evaluation process.



Fig. 1 Map showing the Region of Central Macedonia with its seven Prefectures. In-set map at the lower left shows the region's location in the map of Greece

The Managing Authority of the Regional Operational Programme of Central Macedonia issued this competitive call in August 2016, and addressed it to urban authorities (Municipalities) of urban districts with a population of 10.000 and over. Although the size of these towns may seem small for European standards (the biggest, Serres, has a population of 58.287, while the smallest, Alexandria, a population of 14.821), they are all important urban centres for their respective sub-regions, and most of them Prefecture capitals. Among these eight Municipalities, the case of our study is Veria, the capital of the Prefecture of Imathia, a medium-sized city for Greek standards, with a town population of 43.158, while the municipality population is 66.457 according to the 2011 census,¹ located about seventy kilometres to the west from the capital of the Region, Thessaloniki (see Map 1). However, before proceeding to the presentation of the ITI-SUD of Veria, it is important to place the specific process in a more general context, that of a) the theoretical concept of place-based policy and b) the local and national political culture, especially in relation to past experience of urban renewal projects funded by EU programmes. Both these issues become instrumental so as to allow us to reflect on the application of the ITI approach in the specific urban context.

3 THE ITI APPROACH AS BOTH AN URBAN RENEWAL STRATEGY AND A PLACE-BASED POLICY

With around three quarters of its population living in urban areas, Europe is the world's most urbanised continent; cities in Europe play a major role towards sustainability, in response to both the reality of climate

¹ Censuses in Greece are held every ten years, and the last one took place in 2011. Unfortunately, no more recent population data is available.

change and the pursuit of territorial cohesion. However, the same attributes that make urban living preferable (proximity to employment, vibrant and diverse everyday life, economic benefits) are the ones that put increasing challenges to environmental and social sustainability (Czischke et al., 2015). Therefore, it is precisely in urban areas that a holistic approach, dealing simultaneously with the physical, social and economic parameters of space is very much needed, in order to pursue the goals of the European Territorial Agenda (Böhme et al., 2011).

Urban renewal has been – for many years already – an extremely popular policy in many European and American cities and globally, and has its own history (Kafkalas et al., 2015). We can discern three generations of planned interventions in cities (Carmon, 1999): a) from the end of World War II until the end of 1960's the approach to urban regeneration was based on physical determinism and generally put emphasis on the demolition of old and degraded housing reserve; b) the 1970's was the decade that was characterised by a social turn, towards a more synthetic approach that aimed to regenerate neighbourhoods and took into account socioeconomic factors, too; and c) the entrepreneurial approach from 1980 onwards, in which the main issue at stake seems to have been how to attract investment in vacant urban districts. From the new millennium onwards, and under the prism of sustainability, urban regeneration as viewed in the EU is definitely a holistic concept and acknowledges the multiple factors related to urban renewal. As Roberts (2000) points out, four major changes contribute to urban regeneration: a) economic reconstruction and changes in employment; b) social and community issues; c) natural ageing and need in new land and buildings, and d) sustainable development.

As explained in the previous chapter, for the scope of Sustainable Urban Development, it was the Greek government's choice to make cities, both as physical spaces and as institutional and governance spheres, the testing field of the new ITI tool. This policy choice, conscious or not – given the limited funds earmarked and the lack of preparation in the introduction of the ITI as a tool for urban development, it seems like a rather half-hearted decision –, appears *a posteriori* to have been at the same time *appropriate* and *challenging*.

From the viewpoint of urban renewal, the integrated approach is *appropriate* for urban development, especially if we take into account Greece's situation after the 2008 global financial crisis and the impact this crisis had (and continues to have) on its urban economies. Philip McCann proposes that the geographical impacts of the 2008 global financial crisis is one of four issues shaping the debates regarding the reforms to European regional and urban policies – the other three being advances in academic thinking, the diversity and heterogeneity of the EU and shifts in European growth perspectives (McCann, 2015). In Greece, we can say that the factor of the 2008 crisis is influential on both accounts: both as an issue provoking changes in the European level of policy and as a pragmatic reality that shakes established notions and habitual ways of thinking, in search of new solutions to the 'urban crisis' it currently faces.

Greek urban centres have indeed been 'hit hard' by the financial crisis that has been evolving from 2008 onwards. Urban poverty has risen to the effect that an estimated 26.6% of children live in poverty conditions. The spatial effects of poverty and unemployment are also visible, especially in downtown areas, which by now are characterised by many abandoned buildings, closed shops and a decline of population. Energy poverty is also present, and already has put a toll on the environment, since, due to high prices of central heating, there is a very high percentage of use of polluting sources (individual heaters operating on wood, oil and even coal), affecting the air quality in cities.

All these circumstances create a situation of emergency for the environmental and social sustainability of Greek cities and towns. In the case of Greece, during the previous Programming Periods, although adequate funds were prescribed and distributed for urban regeneration projects, hardly any structural problems – such as unemployment, poverty, underdevelopment of local assets – were addressed. Urban renewal was restricted

to mere 'beautification' projects, handled solely by the local authorities,² and did not include any of the changes suggested by Roberts (2000) such as economic reconstruction, promotion of employment or resolve of local social problems. According to a recent analysis on the urban regeneration projects in western Thessaloniki from the 1980s onwards (Kourti, 2017), all too often the term 'integrated' was included in the title, but the projects themselves were downscaled to fragmentary interventions of a purely physical-spatial character. The social and economic parameters of urban development were left out, for reasons related also to the fact that immaterial, non-physical interventions have no immediate, visible and tangible results that can be used as leverage for re-election of local politicians.

Indeed, a major source of 'resistance' or 'disobedience' to EU philosophies, as exemplified in the case of urban renewal, has to be traced in the Greek ambivalent political culture, in which, as Diamandouros (1994) has claimed, two opposite ideologies strive for dominance: on one hand, the modernist, reformist one and, on the other, the 'underdog,' populist ideology, which is responsible for the backward practices of clientelism, individualism, lack of meritocracy and dysfunctionality. In the literature of Greek politics, the 'underdog' political culture is not only widely considered to be one of the main ideological entities of the modern Greek political system since its inception, but also the main source of resistance to the processes of modernization, Europeanization and globalization (Ntampoudi, 2014). According to Börzel & Risse (2002), Europeanization can cause three different degrees of domestic change: absorption, accommodation or transformation. 'Accommodation' is defined as the situation in which member states accommodate Europeanization pressure by adapting existing processes, policies and institutions without changing their essential features and the underlying collective understandings attached to them (Börzel & Risse, 2002). Significantly, from the 1990's onwards, many sociologists and political theorists have emphasized that the Greek model of adjustment to EU mandates falls into the category of 'accommodation' without a real transformation taking place (Kourti, 2017). Nonetheless, as Borzel & Risse point out, this is not necessarily a negative only aspect: whether we study policies, politics, or polities, a misfit between European-level and domestic processes, policies, or institutions constitutes the necessary condition for expecting any change.

It is exactly this ambition (intentional or not) that things can change that is underlying the current 'imposition' of the ITI approach as a prerequisite for the funding of urban renewal projects. The new approach indirectly aims to address the setbacks of past Regional Operational Programmes: the exclusively physical character of the intervention, the predominance of the Municipality as the only stakeholder and the lack of cooperation with other local agents. According to the August 2016 call for ITI-SUDs, the main novelties compared to past Programming Periods (presented as 'obligations' or 'evaluation criteria') were for the Municipalities to include social and economy-related actions in their Action Plans, to involve as many local stakeholders as possible and to form a Strategy following a consistent public consultation with the local community. These obligations were perceived by local authorities as a *true challenge* both for their technical experience and for their administrative capabilities.

From a technical point of view, the accompanying guide made it clear that the proposed cross-sectoral package of actions of the ITI-SUD had to be the outcome of a strategic analysis of the existing condition, taking into account the multiple characteristics of the area (demographic, economic, social, environmental, climate-change related), followed by a SWOT analysis and finally by the drawing up of a Strategy, a programmatic

² A telling example is that of the "urban renewal" project that was financed by the EU during the last Programming Period (2007-2013) in our case study, the city of Veria. The project, entitled "Regeneration of Urban Landscape," with a budget of almost ten million euros failed to connect to any developmental goal or strategy. To begin with, the choice of the area where this investment took place was in essence made without any strategic criteria: it was actually a residential district, with no developmental assets. The intervention on the physical landscape stood on its own, with no other actions of social, cultural or entrepreneurial character, adding nothing towards a long-term urban development. The urban 'regeneration' itself was downscaled to the replacement of pavement slabs and the provision of new urban furniture.

'vision' for the Implementation Area. Within this strategic vision, proposed actions had to address several sectors (physical, entrepreneurial, social), but also had to cooperate with each other towards achieving the strategic goal. Faced with such complexity, local authorities, characterised by a dependency on national policies, and so far accustomed to be a passive receiver of EU funds, were thus quite unprepared to draw up an ITI-SUD, especially the ones with no or little experience in the field of Strategic Planning.

From a governance point of view, ITI-SUD presented yet another problem. The process as proposed in the guidelines prescribed another novel role for the Municipalities, that of coordinators of local delegation. Civic authorities found themselves 'forced' to consult with local stakeholders, and act as mediators of opposing views and interests. These local agents ranged from other public bodies accountable to the central government – overseeing special fields such as education, culture, natural environment–, trade chambers, non-government organizations, citizens' initiatives, representative of local enterprises etc. Due to a highly centralized bureaucratic organization of the political affairs, Greek culture of local government is not particularly oriented towards cooperation; therefore, the consultation phase of the ITI-SUD was also a testing field for a more open dialogue of the Municipality with non-Municipal entities, as we will see in the case of Veria, and a search for a 'middle ground' between presumed 'opponents.'

4 THE ITI-SUD OF VERIA

4.1 BACKGROUND

One can definitely claim that the discerning characteristic of Veria [*Bέροια*, in Greek] is the impressively dense and imposing presence of historical traces in its urban tissue (Kalogirou, 1990). Its continuous habitation, from at least 6th century B.C. (Veria is mentioned by the ancient historian Thucydides) until our days, has left a series of monuments dating from Greek, Roman, Byzantine and Ottoman periods, dispersed in the historic centre of the town, thus creating a true palimpsest of history (see Figure 2).

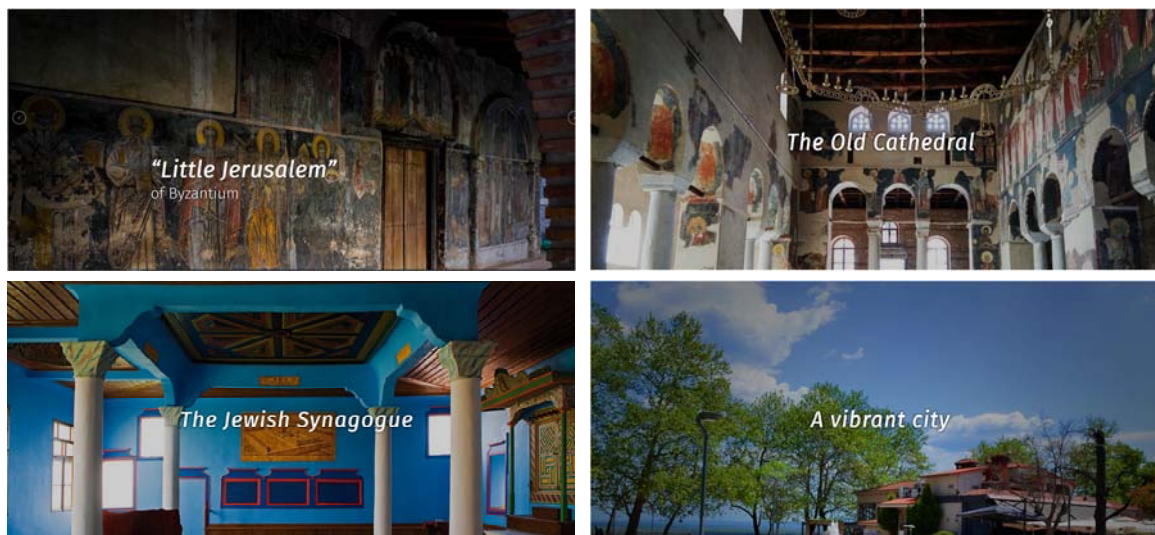


Fig. 2 Veria's monuments from Greek, Roman, Byzantine and Ottoman periods are dispersed in the vibrant centre of the city

Until recently, Veria was more known as a 'Byzantine town,' due to the fact that in 1912, the year of its annexation to the Greek state, no fewer than seventy-two byzantine and post-byzantine churches, adorned with impressive frescos, were surviving. In the following years, and especially in the first two post-World War II decades, the demolition of historic buildings, and even churches, in order to allow for new urban plans and modern rebuilding, destroyed the continuity of the urban fabric of this 'Little Jerusalem.' Nonetheless, four

listed neighbourhoods in the city centre still preserve much of their original character. A total of forty-eight, out of the seventy-two, churches are still standing; amongst them, stands out the monumental 11th century Old Cathedral, paradigmatically restored by the local Ephorate of Antiquities. The recently restored Jewish Synagogue and the proposed restoration and reuse of the Twin Ottoman Baths (see Figures 3, 4), are important signs of a shift towards acknowledging also the Ottoman and Jewish heritage of the city.



Fig. 3 Veria's Twin Baths, a 16th century monuments dating from the Ottoman period, surrounded by the contemporary urban tissue



Fig. 4 Typical house of the Jewish Quarter, dating from mid 19th century

According to Gospodini (2007) and the categorisation of European cities she offers in her discussion of how their spatial qualities relate to their developmental opportunities, Veria belongs to the sub-group of middle-

and small-sized cities of the periphery of Europe, which are endowed with endogenous natural and cultural developmental resources. In this sub-group, urban space in itself is the major attraction for visitors as well as residents; therefore the role of urban design is connected to the implementation of novel policies in issues of the protection of natural environment and the protection and promotion of cultural heritage (Gospodini, 2007). Alberto Magnaghi (2011) offers yet another interpretation of how heritage relates not simply to history but to the development of a territory. In his "Draft of the Territorialists' Society Manifesto," Principle 6, he writes: "Establishing the right balance between the opening and closure of a local system makes identity much more than a fixed construction whose inheritance is to be passed on unaltered. On the contrary, it should be seen as *a long-term dynamic reality which is projected into the future*. [...] Local identity which looks towards the future is more important than one which simply looks back in time [emphasis in the original]" (Magnaghi, 2011). Contrary to these theoretical models, the city of Veria has far from followed a pattern of development based on its unique local identity. The city seems to consider its cultural heritage more like a 'burden,' disproportionately heavy for its everyday happenings, than its most dynamic asset for future development. A walk around the centre reveals beautiful spots where the historic character blends with the natural environment (see Figure 5) but also exposes the degradation of the public space surrounding important monuments, a lack of quality infrastructure for pedestrians and the problematic state of the listed neighbourhoods, in terms of preservation (see Figures 6, 7).

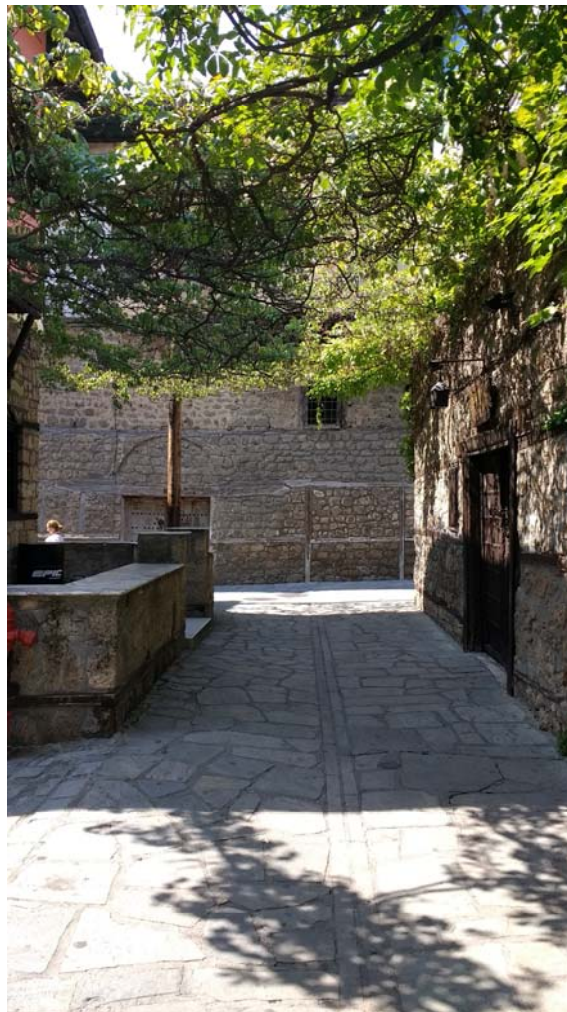


Fig. 5 View of a pedestrian street in the neighbourhood of Kyriotissa, one of the listed areas of Veria



Fig. 6 A street in the neighbourhood of Panagia Dexia

To add to this, the strict rules imposed on all construction and urban intervention because of the protected status of the areas around monuments and of the entire neighbourhoods, have created a negative image for the local Ephorate of Antiquities, which is the gate-keeper for the implementation of Greek Antiquities Law. A few months before the beginning of the ITI-SUD process, a group of local entities (including the Municipality and the Chamber of Commerce, as well as many trade unions) opposed the proposal of the Ephorate of Antiquities to declare the entire city a protected archaeological site. During the discussion of the issue in the Municipal Council, the President of the city council claimed that “no state entity can put handcuffs to the Municipality” (Smyrni, 2016a), implying that, if the proposal was approved, adhering to archaeological laws would halt municipal public works. Meanwhile, the Chief of the Ephorate of Antiquities maintained: “Veria is a sensitive area, with many archaeological traumas, an area where there has been a slaughtering of monuments. We cannot leave the monuments to the mercy of the bulldozer. It is an honour for a city to be saving its monuments” (Smyrni, 2016b). The opposition climaxed with harsh statements from both sides, as well as posters – sponsored by the Municipality and put up in prominent public spaces – that declared “NO to the plans of the Ephorate, NO to the decay of the city!”



Fig. 7 A pedestrian passage in the historic centre of Veria, in the Old Market area. Source: Irene Kampouroglou

4.2 THE SUSTAINABLE URBAN DEVELOPMENT STRATEGY OF VERIA

The August 2016 Call for the submission of ITI-SUDs found the city of Veria in the midst of this unresolved confrontation.³ The guidelines provided by the Managing Authority of the Regional Operational Programme (ROP) were clear enough: the Strategy had to be based on a strategic analysis that would conclude to a definition of a sub-district of the city (Implementation Area or IA), which had to meet a list of criteria for a 'degraded area.' Therefore, the model of ITI applied in the Region of Central Macedonia (for there are substantial differences among the 13 ROPs in Greece in the way ITIs were implemented) is an adaptation of the third 'scenario,' as described in the guidance provided by the Directorate-General for Regional and Urban Policy (De Bruijn & Zuber, 2015), that of the implementation in a "District: A Deprived Urban Area" within a city. For anyone, with even a little knowledge of the city, reading this list of criteria, the choice of the district would be quite easy: the historic centre of the city, lined with monuments and degraded neighbourhoods, together with the neighbourhood of Prometheus on the other side of the river that runs through Veria, met almost all of them (see Table 1).⁴

FORMAL CRITERIA (MINISTRY OF ECONOMY AND DEVELOPMENT, 2015)	CHARACTERISTICS OF THE SPECIFIC AREA
Presence of acute economic problems	The area includes the commercial centre and the historic Old Market, which, since the economic crisis, shows signs of major decline (1 out of 4 shops are vacant)
Presence of acute social problems	A) Very high ageing index in the historic neighbourhoods (2,65 compared to 1,17 median city index) B) High percentage of population in danger of social exclusion (several NGOs already in operation to support vulnerable groups)
Degradation of the natural and built environment	A) The infrastructure of public spaces in the listed neighbourhoods is in bad shape and does not provide quality for residents and visitors B) The district lacks organised green areas, despite the presence of the river
Lack in basic infrastructure for universal mobility	Lack of provisions for sustainable urban mobility, especially in the immediate proximity of schools in the area (absence of school zones and of infrastructure for pedestrians)
Lack of sufficient connection with the surrounding area	The neighbourhood of Prometheus, which is on the other side of the river from the historic centre, is not organically connected with it and shows signs of seclusion
Areas characterized by a noteworthy cultural aspect	The area includes three of the four listed neighbourhoods, and 180 of the 240 listed buildings of the city of Veria
Urban districts that were the field of study during previous programs, such RFSC and URBACT	The historic centre was an area of study in the URBACT II LINKS program ("Low tech Inherited from the old European city as a key for performance and Sustainability)

Tab. 1 Matching the characteristics of the district with the formal criteria for choosing an area as Implementation Area for the ITI-SUD. Source: Municipality of Veria (2017). Sustainable Urban Development Strategy of Veria

To support this choice, the analysis of the existing situation had to provide specific quantitative data on five major categories of characteristics: demographics, social, economic, environmental and related to climate change (see Figure 8). The SWOT analysis concluded that the specific area condenses the demographic,

³ The situation regarding the re-definition of Veria's archaeological sites is still (October 2017) unresolved, since the Ephorate's proposal is still being discussed at the Ministry of Culture and no official decision has been made.

⁴ The population of this specific area (16.674 people, according to the 2011 census) is about one third of the total population of Veria and it covers an area of 179 hectares, of which 34 hectares are protected environmentally as areas of "special natural beauty," namely the river and banks.

economic, societal and environmental challenges for Veria, while at the same time it includes the most dynamic elements for its future growth.

Following the definition of the IA and the detailed analysis of its present condition, the crucial phase was the formation of the overall Strategy, and, to this end, what proved to be instrumental was the involvement of local stakeholders and communities-of-interest. As it turned out, the publicity guidelines of the call and the mandatory public consultation 'forced' upon the Municipality, was not at all 'a waste of time,' as it is usually perceived locally, but made a great service into formulating an inclusive and effective Action Plan.

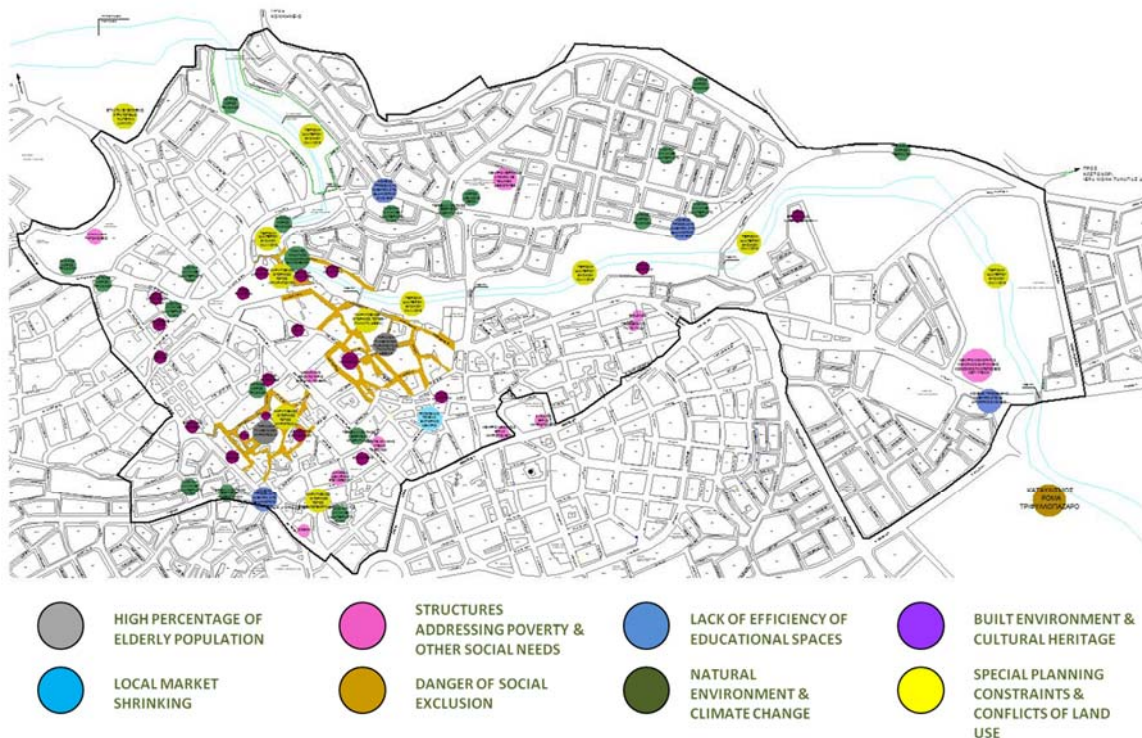


Fig. 8 Map of Veria showing the outline (continuous black line) of the Implementation Area and the concentration of various types of characteristics (colour dots). Source: Municipality of Veria (2017). Sustainable Urban Development Strategy of Veria

Apart from the digital forum, fourteen meetings were organized in a period of two months with many local entities, such as the Chamber of Commerce, the Veria Public Library, which was honoured with Bill & Melinda Gates Foundation's 2010 Access to Learning Award, non-governmental organizations operating in the social sector, community initiatives, and, most importantly, the local Ephorate of Antiquities. Precisely *in the course of the consultation phase*, it became clear that any proposal regarding the physical space of the listed neighbourhoods, intended to be included in the ITI-SUD plan, had to be discussed and agreed upon between the Municipality and the Ephorate of Antiquities. Urban design projects in the listed neighbourhoods had to have the approval of the Ephorate, and, on the other hand, the Ephorate could benefit from the ITI-SUD to get finance for works inside the IA, fostering the first Strategic Objective (SO1), that of promoting the cultural repository of the city.

The focus on heritage as developmental resource also meant that actions in other Strategic Objectives (such as SO3: support of local SMEs and advancement of employment through smart specialisation) had to have a cultural heritage orientation, too. For example, it was the Ephorate's idea to include in the ITI-SUD an action of adult education courses in the field of preservation of monuments and excavation techniques for unemployed individuals, since the Ephorate is always in search of specialised and skilled workers among local

residents. The final ITI-SUD of Veria focuses on the triptych “Nature – History – Hospitality.” It addresses all three pillars of Sustainability (Environment, Economy and Society) and is structured under four Strategic Objectives (SOs), which correspond to the Thematic Objectives (TOs) of the current Programming Period. The funding of the Action Plan is via ERDF (79%) and the rest through European Social Fund (ESF), as shown in Figure 9, corresponding to several investment priorities of the Regional Operational Programme. In detail, Strategic Objectives, Actions, Beneficiaries and funding of the ITI-SUD are shown in Table 2.

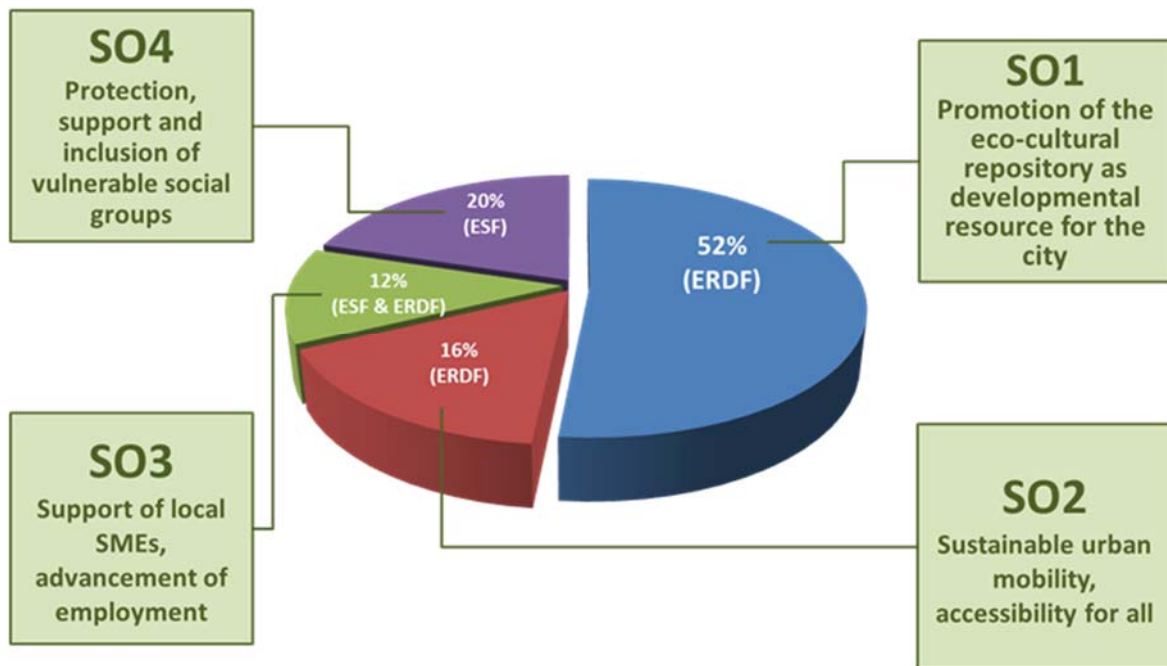


Fig. 9 Funding scheme of the Veria ITI-SUD: Distribution of the budget in the four Strategic Objectives (SOs) and ESIF funding

7 DISCUSSION

The case of the Veria ITI-SUD offers an opportunity to reflect on how a theoretical concept is applied in practice, especially in the constrained context of Greece, with its multiple problems regarding bureaucracy and resistance to transformation (Diamandouros, 1994). First of all, it is important to stress out the directive role of the Managing Authority of the Regional Operational Programme (OP) in the whole process. The guidelines given to Municipalities responsible for preparing the ITI-SUDs put emphasis on the integrated character of the Strategy, through all of its phases, following closely the relevant EU directives:

- In the documentation phase, data related to the demographic, social, economic and environmental challenges in the specific area had to be provided;
- In the analytical phase, challenges in the various sectors had to be interrelated with opportunities, based on local capital, to ensure that the revitalisation of the specific district has an overall developmental effect on the entire city;
- In the proposal phase, an integrated vision for the sustainable development of the specific area had to be presented, taking into account the cross-sectoral challenges, and setting specific strategic goals in accordance to the Priority Axes of the Regional OP preselected for the ITI-SUDs;
- Especially in the prioritisation of actions and distribution of funds, although the Municipality maintained its coordinating role, the consultation phase had to involve local stakeholders (NGOs, business consortia, other public bodies), which were also possible beneficiaries of actions included in the ITI-SUD;

We can notice several differences between the scenarios provided in the guidance paper of the Directorate-General for Regional and Urban Policy (De Bruijn & Zuber, 2015) and the process as it materialised in the local context.

- The Regional Managing Authority chose to pass the responsibility of defining areas for the ITI-SUDs on to the local Municipalities, without a concrete and detailed comparative analysis of its own about the entire Region; the eight Municipalities thus had to compete with neighbour cities, often sharing the same geographical characteristics, and also common problems;
- The ITI scenario presupposes a multiannual urban development strategy, springing from national legislation, but in the case of Greek cities such a development strategy is not compulsory.

STRATEGIC OBJECTIVE	ACTIONS INCLUDED	BENEFICIARIES	THEMATIC OBJECTIVES OF EUROPE2020	BUDGET
<i>SO1: Promotion of the eco-cultural repository as developmental resource for the city</i>	Creation of a network of "green paths" connecting places of interest in the historic neighbourhoods	Municipality of Veria	TO6: Preserving and protecting the environment and promoting resource efficiency (ERDF)	€2.401.000
	Creation of a new public square next to the Twin Ottoman Baths	Municipality of Veria		
	"Nature goes to school": Green infrastructure for schoolyards	Municipality of Veria		
	Restoration of the fortification walls and the tower of the Acropolis	Ephorate of Antiquities of Imathia		
<i>SO2: Sustainable urban mobility, accessibility for all</i>	Interventions in school zones to promote safe and sustainable urban mobility	Municipality of Veria	TO6: Preserving and protecting the environment and promoting resource efficiency (ERDF)	€617.000
	Public bike-hire system	Municipality of Veria	TO4: Supporting the shift towards a low-carbon economy (ERDF)	
<i>SO3: Support of local entrepreneurialism, advancement of occupation</i>	Creation of an "open mall" in the district of the historic Old Market	Local Merchants' Guild	TO3: Enhancing the competitiveness of SMEs (ERDF)	€489.000
	Training of technicians specialising in conservation of monuments	Local Adult Education Centres	TO8: Promoting sustainable employment and supporting labour mobility (ESF)	
	Training and consulting for increasing employment skills	Veria Public Library	TO8: Promoting sustainable employment and supporting labour mobility (ESF)	
	Training for young entrepreneurs in creative and cultural economies	Chamber of Commerce of Imathia	TO3: Enhancing the competitiveness of SMEs (ERDF)	
	Digital promotion of the city and City Branding	Municipality of Veria	TO2: Access to Information and communication technologies (ERDF)	
<i>SO4: Protection, support & inclusion of vulnerable social groups</i>	Protection and support of victims of family violence, individuals with special needs, , disadvantaged children etc.	Six NGOs of the social sector operating within the IA	TO9: Promoting social inclusion, combating poverty and any discrimination (ESF)	€697.000
Total budget of the ITI-SUD				€4.204.000

Tab. 2 Strategic Objectives, Main Actions and Financing of the ITI in Veria. Source: Municipality of Veria (2017). Sustainable Urban Development Strategy of Veria

- The ITI scenario also prescribes that, in the local Action Plan, the EU-financed actions are complimented by actions funded by other sources, such as national OPs, municipal budgets etc. This is not the case in the ITI-SUDs in Central Macedonia, where the local OP earmarked quite limited funds from ERDF and ESF for the ITIs, but no complimentary funds from horizontal OPs, or other sources. With the municipal budgets being very restrained, barely sufficing for operational costs and basic maintenance, the resulting very limited total budget of the ITI-SUD does not pragmatically correspond to the strategic aims set by it;
- No technical assistance was provided to the local authorities, despite the widely recognised complexity and novelty of the instrument.

Another way to view the Veria ITI-SUD is through the lens of 'procedural knowledge.' According to the report commissioned by the European Commission (De Bruijn & Zuber, 2015), the ITI has a so-called 'added value,' causing parallel effects in multiple scales. De Bruijn & Zuber's (2015) report follows on the steps of Barca's (2009) proposition that a place-based policy "promotes the supply of integrated goods and services tailored to contexts, and it triggers institutional changes" (Barca, 2009). Undoubtedly, the main scope of the ITI-SUD according to De Bruijn & Zuber (2015), that of preparing integrated strategies where they do not exist, was fulfilled, thus providing valuable knowledge and experience to the Municipality, which will be better prepared for future calls. Another aspect of the ITI, its mandatory coordination with other local, regional and national strategies, served towards a much better understanding of the rationale of EU funding. The ITI-induced promotion of partnerships was another strong element and the one most likely to open new platforms of dialogue for other projects, too. Especially the municipal authority, usually viewed as the handler of physical environment, was forced to see itself as one of many agents in the 'local milieu,' (Governa, 1997), this complex aggregate of actors.

An attempt to interpret the local ITI-SUD process from the perspective of political culture is perhaps the most difficult one. An important observation is that the 'underdog' culture (Diamandouros, 1994) still holds very strong in Greek society; while all this process was going on, many external partners, but also city officials, expressed a strong doubt whether the ITI-SUD Action Plan would actually be evaluated with objective criteria. Beliefs in clientelism continue to persist; even clear and diaphanous processes as this one, were judged as 'suspicious' for micro-political manipulation and interception.

Further research is needed regarding several issues of the Veria ITI-SUD, but probably the most important one is its comparison with ITIs of similar scale, within the Region, within Greece and across Europe, a comparison that could lead to an overview of what constitutes good practice and where Veria stands in that respect. Especially in regard to the distribution of roles between the Regional Managing Authority and the Municipality, a critical aspect of the local ITI implementation is becoming to come to surface: the high bureaucratic burden taken on by the local authority throughout the materialisation phase. Following the approval of the Action Plan of the ITI-SUD, the Municipality is now an 'intermediate body' (Region of Central Macedonia, 2017), a role attributed to it without taking into account the lack of expertise, personnel and resources that characterise most Municipalities of the Region.

Despite these shortcomings, the aims of the ITI approach have been, at least partially, met. The Action Plan for the Veria ITI-SUD was indeed produced by local stakeholders. It was based on a diagnosis and an analysis of local territorial assets, and shared with the public. As a place-based policy, it may have been 'imposed' upon the Municipality by exogenous powers (ranging from the Managing Authority to the Ministry of Economy & Development to the European Commission), however it was actualised by endogenous agents, who had to put their oppositions aside and agree upon a common strategy. One could say that the process adheres to the 'territorialist' approach, proposed in the mid 1980s by Italian geographers Dematteis, Turco and Quaini, socialist Bagmasco, economists Becattini and Latouche and urban planner Magnaghi (2011), who views the

territory as “a common good with its own historic[al], cultural, social, environmental and productive identity” of which the landscape is “its visible manifestation” (Magnaghi, 2011). Instead of conceptualising spatial problems as a multi-sectoral agglomeration of physical, social and economic characteristics, conventional definitions of ‘space’ are replaced by the Territorialists’ concept of SLoT, or Local Territorial System, defined as “an aggregate or a local network of agents that, according to their specific relation among them and with the specific territorial framework, act as a collective actor” (Berzi, 2017). Compared to urban renewal projects of previous Programming Periods, the ITI-SUD has been an optimistic change towards a more open-ended – and significantly, more effective – handling of EU funds. The up-to-now hegemonic, exclusive role of the Municipality has started to be replaced by a team of partners, all operating in the same territory. If, in the future, such a co-operation develops towards a sharing and contributing towards the same vision for the future development of the area, it would be a pragmatic concretisation of the SLoT concept.

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IMAGE SOURCES

Fig. 1: www.mapsofworld.com. Fig. 2: www.discoververia.gr. Figg. 3, 4, 5, 6, 9: Author. Fig. 7: Irene Kampouroglou. Fig. 8: Municipality of Veria (2017). Sustainable Urban Development Strategy of Veria.

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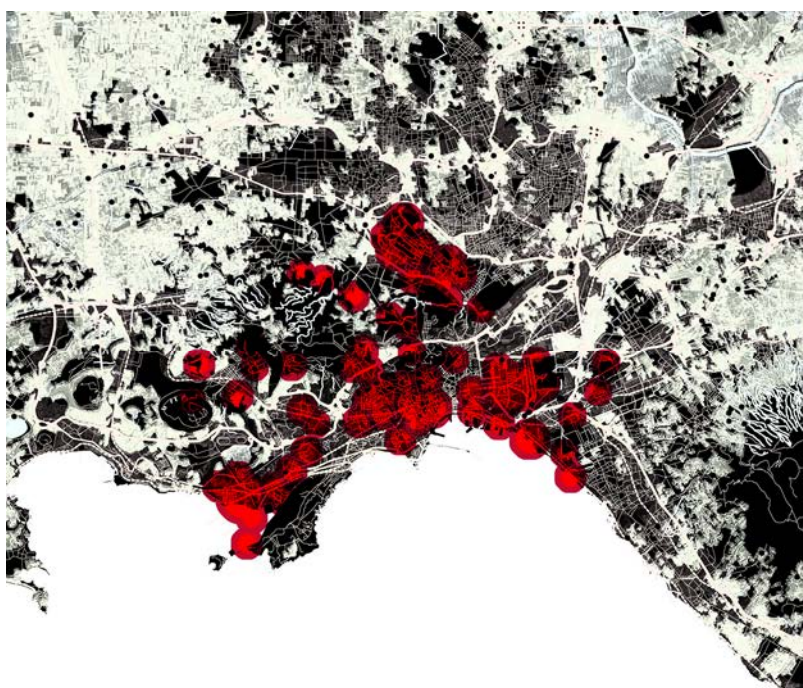
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URBAN VOIDS: RENEWAL AND REGENERATION EXPERIENCES IN NAPLES.

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ABSTRACT

City and society, by definition unstable, constantly redefine the relation between places and actors, generating frequently critical circumstances that are addressed by only temporary solutions. The unexpected and uncontrolled social conditions and lifestyles build new geographies and centres. The activities of dismantlement, degradation, reuse, abandonment, and land use, continuously blend materials and relationships and requires rethinking the methods of describing the city and defining a new grammar of representation closer to the contemporary space, materials, actors, and relationship.

Focusing on experiences of renewal, regeneration and recycle, the objective of this exploratory study is to investigate their different impacts in a well-known complex urban system as Naples. The study emphasizes on the urban and social dimensions, favouring a descriptive and visual perspective from those who experience life in the city, considering the processes implemented by local actors and the reactions of inhabitants to these processes. In fact in Naples, despite its critical conditions, it is possible to trace signals indicating small informal practices of reuse in vacant or ruined areas, as well as existing small-scale clustering processes to re-adapt single buildings or spaces for new uses. So, this study uses an innovative methodology to investigate this emerging implied writing as a set of latent questions and needs expressing renewal, regeneration and recycle phenomena. Through this technique, we will focus on the images of the city and its development trajectories.

KEYWORDS:

Regeneration; brown-field; social-field; city vision; implicit writing.

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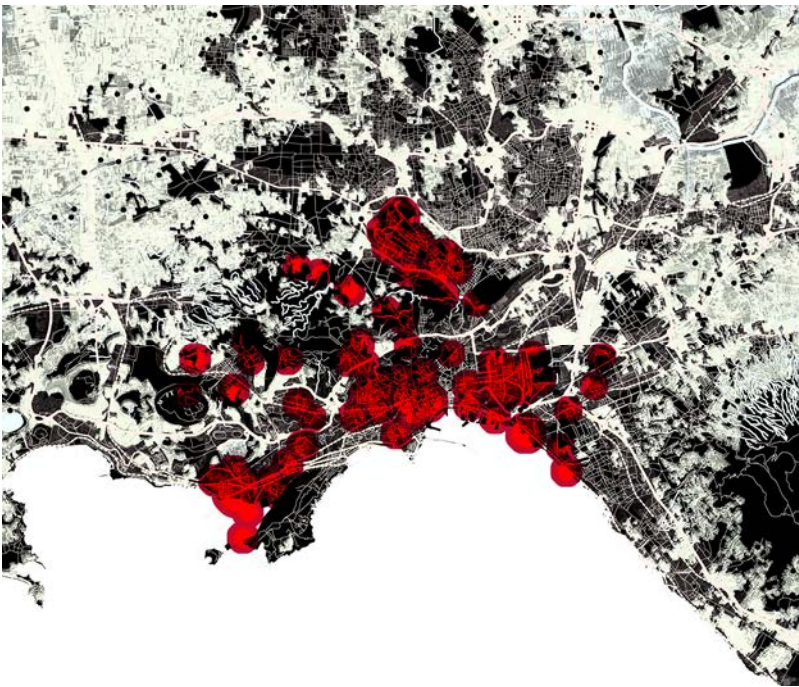
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城市空虚：

P那不勒斯（NAPLES）的复兴与重建经验

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摘要

城市和社会由于其定义上的不稳定性，不断重新定义地点与行动者之间的关系，经常会产生只能通过临时解决方案来解决的紧急情况。意外的和不受控制的社会条件和生活方式打造了新的地理和中心。拆迁、退化、再利用、废弃、以及土地利用等活动不断混合材料与关系，要求我们重新思考描述城市时使用的方法，并定义一种更接近于当代空间、材料、行动者、以及关系的表述语法。

这份探索性研究聚焦于复兴、重建和再循环经验，目的是在那不勒斯知名的复杂城市系统中研究它们的不同影响。研究重点是城市和社会层面，偏好那些经历城市生活的人提供的描述性和可视化视角，并考虑本地行动者实施的流程以及居民对这些流程的反应。实际上在那不勒斯，虽然这里情况严峻，但仍然能够追踪到信号，这表明空置或荒废区域中小型非正式重新利用实践，以及为了让单一的建筑或空间重新适应新用途而进行的现有小规模集群过程。因此，本研究使用一种创新方法，探究这种作为一组潜在问题和需求而出现的隐含写作，表述复兴、重建和再循环现象。通过这种技巧，我们将聚焦于城市图像及其发展轨迹。

关键词：

复兴；棕色地带；社会地带；城市愿景；隐含写作。

1 INTRODUCTION: CONCEPTS AND OBJECTS IN RENEWAL, REGENERATION AND RECYCLE PROCESSES

The debate on the *policies* and development trajectories for an urban system take on very different meanings in urban and social studies depending on the involved object and on the kind of recalled actions. Assuming that every metropolitan city has high levels of complexity and exception points (Mumford, 1961), the object here considered¹ takes into account the study of a particular urban system, *Naples as de facto city* (Calafati, 2013), this time invoking renewal and regeneration actions. In general, these actions are not easy for those who administer, live in, or study the city. Indeed, Ada Becchi (1989), in one of her famous articles, recalled the image of Naples as an *embarrassing mosaic*. On the one hand, the city evokes a sequence of problems; on the other hand, it intertwines identities, activities, spatial conformations, and changing/storage dynamics. In fact, Naples is a city that cannot be captured in a single city model but must be understood as both an economic and a social system (Cento Bull & Jones, 2006; Dines & Dines, 2012). Naples is not a structured city; it is not only an industrial city; it is not even just a market town; it is not the capital; it is not only the administrative, financial, or cultural center. Naples is the result of a contradictory multiplicity that justifies the most irreconcilable interpretations. It is the sum of several cities, one inside the other, and balance is found through the ability to capture the new identities while keeping the well-adjusted socially static nature. It has a sort of *pathological immutability* that reproduces itself in the ideal ambition to never fill the *useful void*² that can assume different meanings, depending on the situation in which it is recalled. In the same way, Luciano Brancaccio (2017) in a most recent online editorial, highlight this character of the city through what the scholar defines a binary representation: on the one side the apocalyptic vision of “the land of fires”, camorra, corruption, on the other side the oleographical silhouette of its culture, the *neapolitanity* with its folk connotation. Affected by problems such as tumultuous, speculative construction, sometimes implemented in the absence or against regulatory plans, that has extracted from economic value and social utility large areas of prestige - historical and archeological, agricultural and naturalistic - breaking the functional and structural continuity of the landscape by returning a territory saturated of urban life. And yet, the submerged economy, the organized criminal groups, the affirmation of pieces of political class with a low perception of the moral costs associated with corrupt exchange. A shaky labor market, the inevitable demand for rationalization of the territory’s productive factors, the structural shortages, degradation, abandonment, are just some of the many other problems that the city lives. To counterbalance this situation, the non-secondary role of the infrastructure could be highlight (Mazzeo, 2010). Transport in particular, although requiring a system-wide and not a few investment, is a good basis for restarts (Gargiulo, 2008). These may allow in a not too far future to break the percentage of private travel in the metropolitan area, benefiting the environment, quality of life and economic functions (Beguinot & Papa, 1995). Noteworthy are the sea links for cruising and goods handling, some manufacturing productions such as the fashion sector (footwear and textile industry), agro-food production, industrial manufacturing with leading companies with public participation. However, there are many knots, atavistic problems, inadequacies to be solved such as the cases of abandoned industrial areas in Bagnoli, to the west of the city, and Naples East (Brancaccio, 2017). In these areas, today under decommissioning processes, are currently being the most important challenges for the transformation of the city but the planning process are in very different phases. Bagnoli, abandoned for a long time due to the

¹ This paper result from the integration of two previous works of the authors in the project "Society, Economy and Space in Naples" whose preliminary results are already published in Punziano, G. (ed.). *Società, economia e spazio a Napoli. Esplorazioni e riflessioni* [Society, economy and space in Naples. Explorations and reflections]. L'Aquila: GSSI Social Sciences Working Papers n. 28

² The 'urban voids' are interpreted by the author as spaces of the city that remain empty of function and of meaning, but that if properly outfitted by identity and functional traits can return fully to be considered spaces that are inside, belonging, and useful for the city.

inefficient reclamation, have recently been the subject of a hard dispute between the central government and the local administration for territorial competence; while, the recovery and urban regeneration objectives within the perspective of integrating the area with the city and its geographical and landscape context, for Napoli Est, are regulated by the General Variant of the PRG (General Regulatory Plan) of the city of Naples and the Implementation Plan (or Masterplan) PUA "Ambito 13 – Ex refinery" (2009). Currently, in this area are ongoing a multiplicity of programs and projects, because the eastern area of Naples is strategically placed at the intersection of major mobility infrastructures that give access to the city, in fact next to the site, there are the Capodichino airport and the Naples central railroad station, which ensure the national and international connections, as well as the highway junctions connecting with the national road network (A1 Napoli-Milano, A3 Napoli-Pompei-Salerno, Tangenziale di Napoli), and the stations (Traccia and Stadera) of M3 and RFI lines of the metropolitan rail connections. This makes the area a fundamental logistic hub in the entire metropolitan area, and actually, the regeneration of its part will be done in the context of a larger urban regeneration project named "Urban Redevelopment of Napoli East port area" granted by the ERDF 2007-2013 - Priority VI "Urban development and quality of life" Operational Objective 6.2. This large project proposes to create a systematic and integrated public intervention on existing roads, as well as new functions at the east side the City of Naples. The project aims to gradually retrofit and redesign the urban infrastructure to improve basic services for a new development of the area, aiming to increase social inclusion, access and availability of green open spaces³.

Consider that, as well described by Mazzeo (2009), Naples is the third Italian city, the centre of a very wide metropolitan system, and the larger city in the South: it embraces great social, economic and cultural contradictions and it is an 'example of the contradictions between a superb geographical location and a widespread condition of social and economic crisis' (2009, 363). The city presents peculiar processes of social exclusion and polarization, living a restructuring of the economic base while fighting with some problems generated by its past and its previous development path (this in line with the situation that characterize many other cities of Southern Italy – Vicari, 2001). This is reinforced by the relevance of some negative factors that act on the city, such as factors related: to the environment, landscape and urban space; to the efficiency of administrative structure; to the self-image of Neapolitans (Mazzeo, 2009); to the socio-economic condition of disparity in the spreading of GDP per capita (12.755 , in view of a national mean of 18.000), in unemployment rate (27,76%), especially of the youth population (59,6%), in the presence of NEET⁴ (42%) or inactive population (33%), in the household relative poverty rate (44%)⁵; but also to the presence of criminality, degradation and the speedy growth of illegal constructions in the peripheral areas just surrounding the historic and ancient centre of the city.

However, Naples, for its characteristics, its shape and its history and, in particular, for its complexity and the clear coexistence of a variety of typical situations of degraded urban contexts, can be understood as a privileged laboratory in the study of urban development (Russo, 2012) and economic and social evolution. The particular blend between complexity of the urban and social fabric gives rise to the idea of giving a shape to the renewal and regeneration actions put in place in the city, re-conceptualised by the processes that are triggered and the responses to them. First of all, it is of fundamental importance to define the meaning of renewal, regeneration and recycle processes in the complex scenario of an urban system. These three concepts tend to be identified in the common language as synonyms, while their definition in the academic use is much

³ Data on all plans and projects mentioned can be found on site of Municipality of Naples in the Urban Planning Section www.comune.napoli.it

⁴ Not (engaged) in Education, Employment or Training people.

⁵ The data presented concern the elaboration of Prometeia on 'Scenari per le economie locali e previsioni', October 2016 and 'Rapporto Urbes', 2015, datasets on the city of Naples, the Regional and the Metropolitan area diffused by Istat, Svimez and Istituto Tagliacarne.

more complex and convoluted, so their evolution tends to tie them directly to urban and social transformations. As exposed by Evans & Shaw (2004), although in an embryonic manner with respect to the definitions of which the current literature is full, the concept of *renewal* can be understood as the transformation process of a place, usually with a residential, industrial or public destination, in which phenomena of environmental decline, and therefore of physical character, but also more strictly of social and/or economic nature, are evident. As a consequence of that, the transformation processes acts on the local quality of life and at the same time involves economic, social, and environmental systems. This could be understood as a multidimensional definition which shows a close connection between the concept of renewal and the development dynamics aimed at reducing economic and social differences in certain territorial units. The principles outlined in this definition end to substantiate the transition to the vision of urban *regeneration* proposed by Roberts, Sykes & Granger (2016) which is interpreted as a process that develops when public investment over a given area can trigger significant economic benefits in terms of scale economies. As a result, it will be possible to structure shared concerted and properly oriented regeneration procedures, in collaboration with the private investments. That means referring to a multitude of actions and actors involved in a common process of territorial growth. Esposito, De Vita, Trillo & Oppido (2013), instead, remark the prevalence of the social dimension in the regeneration processes of the city space with regard to those processes of revitalization of inner areas of the consolidated city, historically destined to productive functions and exchanges and now in decline and isolation, emptied of their traditional identity and local social capital, even after conversion operations and the reallocation of duties. These processes are conceived as integrated with public-private partnership tools in a participatory approach that involves also citizens, inhabitants, the third sector and urban and social movements. In the same direction, Bull & Jones (2006), defining regeneration processes, refer to guided and self-powered actions that point to integrated physical requalification of spaces, and a socio-economic revitalization of the urban and social fabric, able to outline shared visions, strategies, and actions (Leary & McCarthy, 2013). In this sense, *recycle* combines closely with the legacy of the past, but researching in such legacy or "tradition" seeds of the future, in favour of new evolutionary processes" (Bocchi, 2016) as, in the recent studies carried out by Unit of Naples within the 3-year national research project P.R.I.N. 2013/2016 "Re-cycle Italy. New life cycles for architecture and infrastructure of city and landscape", in which this research project has provided a theoretical framework, geo-mapping methods and meta-projects to re-define the case study sites (Litorale Domitio Flegreo, Napoli Est, Piana del fiume Sarno) in terms of "new life cycles"⁶.

According to these definitions, the concepts used in this study could be positioned along a *continuum* between a form of *renewal*, *regeneration* and *recycle*. The renewal is founded on territorial development, aiming to fill the *urban voids* or, at least, to reconvert pieces of the city (with interventions that lead to a spatial transformation from a physical prospective). The regeneration, however, absorbs the sense of relationship and the request for the improvement of life quality—intrinsic to the urban system dimension—aiming to an integrated and integral development process (with interventions that aim at fundamental change in ways of living in the space and into the space that involve a spatial transformation from a social perspective). The recycle, as a multi-scale project, stress the need to hold together in time and space, and through forms of multi-level and multi-stakeholders' governance, the local dimension of the tactics - fragmentary and diffuse - with the centrality of adaptive and resilient systemic strategies, for a wider development trajectory. This new

⁶ A first summary of the output of this research is readable in the publication Pavia R., Secchi R., Gasparri C. (eds) (2014), *Il territorio degli scarti e dei rifiuti* [The territory of waste and waste], Collana Re-Cycle Itlay, n. 8, Roma: Aracne Editrice, which collects the theoretical reflections, the interpretations and the first design explorations developed in the first two years of PRIN from University of Rome "La Sapienza", University of Naples "Federico II", University of Chieti-Pescara "G. D'Annunzio" and Polytechnic of Bari. The results of activities by research unit of Naples is readable in the publication Gasparri C., Terracciano A. (eds) (2016), *DROSSCITY. Metabolismo urbano, resilienza e progetto di riciclo dei drosscape* [DROSSCITY. Urban metabolism, resiliency and drosscape recycle project], Barcellona-Trento: ListLab

paradigm also urges the search for rules, addresses and updated forms of representation for the innovation of plans and projects, with reference to compatible uses, temporary or long-term, diagrammatic simulations, parameters to "measure" the effectiveness of project proposals, and the activation modes of direct and indirect resources (Gasparrini, 2016).

In these cases, despite an explicit reference to direct interventions in urban locations—whether intended in their physical, relational, or social sense—these concepts relate to the need to intervene on *urban voids*, understood as places in which the identity and functional connotation have gradually eroded, while these places are configured as public spaces (what Milun defined empty space – 2013). It is probably for this reason that the top-down urban renewal and regeneration actions are not free from particular resonances, often generating conflicts and oppositions, as they go beyond the effective range of a single policy and the individual interventions (Harvey, 2012). They bear a *strong symbolic value* that involves locations that are related to the sphere of the everyday life, and are thus incorporate ways of life and personal biographies.

This particular connotation of the space can be enhanced by a further distinction between different types of areas of renewal and regeneration processes, characterized by the emptying of functions, identity, property, and people, resulting in full-title *urban voids*:

- *Urban blight* in *brownfields land* is the result of an industrial past such as an old industrial site, or of specific functions with a great impact on the environmental quality of the urban system, such as a landfill. These locations need environmental 'de-contamination' and new functional destinations that can be 're-used' for generating new social and economic impacts.
- *Abandoned and derelict areas* are *social fields*⁷ that are socially and physically deprived, areas where social functions (local administrative offices) and gatherings (schools and parks) were formerly located, or sites with historical, economic, and cultural significance; these locations have persisted despite neglect, physical deterioration, and an altered identity. The link between the place and people is severed, resulting in a changed character. Together, these factors generate disaffection and rejection and can erase the place's symbolic importance.

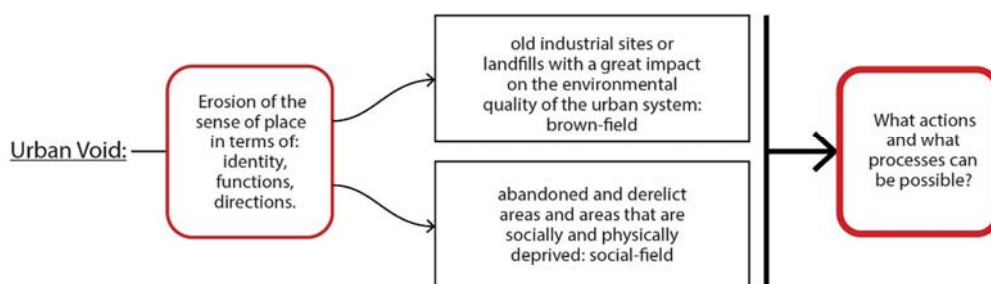


Fig. 1 Urban voids and different kinds of areas

Declining these definitions on the specific case of Naples ⁸, reconstructing the processes of *renewal, regeneration and recycle* means referring to both *top-down* and *bottom-up* interventions. The former, understood like *top-down* public or mixed public-private partnerships, refers to operations of *urban renewal*

7 While it is undeniable that the term social field refers to narrowly limited areas, they can be conceived as an aggregation of urban voids characterized by function with a mainly social character (former schools, hospitals, administration offices, etc.).

8 It is primarily for this reason that most of the references used follow come from Italian studies and authors who have worked on the urban and social question by holding the focus on the city of Naples.

that aim at changing territories by producing economic and productive impacts on *brownfield* land (for instance the port area, the ex-refinery, and the industrial-manufacturing areas in East Naples (Lucci & Russo, 2012; Galderisi & Ceudech, 2010; Amirante, 2009; Forte, Iannone & Maisto, 2009), the former steel factories in West Naples, the Bagnoli (Iaccarino, 2007; Cavola & Vicari, 2000), Pisani, or Chiaiano’s landfills in North-West Naples, and the physically deprived areas of the Old Town). However, these operations have frequently neglected the issues concerning their impact in terms of territorial and social development, leaving space for actions on the physical locations to others operations that are not guided by the local administration but are instead born out of the work of committees (of citizens and within the industrial sector) and neighbourhood organizations (from associations’ movements to coalitions – Vitale 2007). These *bottom-up* processes not necessarily politicized or funded, which clearly shows the wide margin of action that the city generates itself. In this paper these actions are called *urban regeneration*. *Social regeneration*, however, involves actions that are *bottom-up*, mostly self-organized and self-managed, such as actions implemented by grassroots urban and social movements through direct interventions to address social problems⁹ (La Trecchia, 2013).

It aims to change urban locations that are primarily identified as *social fields*. In this sense, in Naples it is possible to identified two mainly social fields: the Old Town, understood in a broad sense, is increasingly in trouble because of the degradation; the North Naples area—including the urban suburbs of Secondigliano, Scampia, and Miano—was affected by an undoubtable physical decay, but even more by a cultural degradation consisting of a lack of security and legality. However, because of the particular state of decay and degradation which constantly threatens, these two areas are also the subject of interventions designed and conducted by the local government and the private social sector in a more typical top-down style. The complexity of the local realities made it difficult to immediately perceive and understand the impacts related to territorial development that aimed to act primarily on the quality of life, not only in terms of economic and productive development but in a broad sense (Gentilini, 2007; De Vivo, 2007). Therefore, these types of actions assume the connotation of *social renewal*. The intervention strategies can be divided by priority (Transformative intervention on physical and spatial fabric and Transformative intervention on social fabric) and implementation styles (guided and top-down processes and self-managed bottom-up processes), as summarized in figure 2¹⁰.

<div style="border: 2px solid red; padding: 10px; text-align: center;"> <p>Intervention strategy: an emerging typology</p> </div>		Implementation	
		top-down processes	bottom-up processes
Priority	Transformative intervention on physical and spatial texture	Urban renewal	Urban regeneration
	Transformative intervention on social texture	Social renewal	Social regeneration

Fig. 2 Intervention Strategy: an emerging typology

⁹ Like housing, social exclusion, integration, education, culture, but also legality, safety, and socio-spatial degradation

¹⁰ For a more detailed explanation see Punziano, 2016.

This paper is devoted to the exploration of the way in which the multiplicity of existent dynamics (the expression of a different meaning and use of the open and public space) is able to indicate possible development trajectories for these territories. The drawing becomes both the instrument and method by which we try to represent the questions that are posed by the city in its current form. The objective is therefore to trace the implicit writing in the places that reassemble new configurations, giving new information to new images. The composition mode involves the decomposition and re-composition of places in order to re-compose other content and new meaning.

2 THE IMPLICIT WRITING OF A CITY

Our reflections try to read the relationship between the spatial forms and the generated phenomena in the renewal and regeneration processes occurring in the city of Naples. A duality between the morphology of the spaces and the urban processes produces an increasingly elusive metabolism that inevitably interacts with other issues; this brings our discourse to a more general urban question (Secchi, 2009 a, b; 2011): how it could be possible to design a coherent representation of a city by definition pervaded by changeable phenomena and dynamic and interactive processes that products new forms and materials in the city space? The Western world's economic, social, and moral crisis of the last decade has produced a condition in which globalization is offset by the growth of new inequalities: development produces a huge amount of waste, growth damages the environment, and emerging metropolitan cities have a multiplicity of localism, sustained by new identities, lifestyles, and economies (Amendola, 2000).

The themes mentioned, and many more, can return to us many endless configurations of the city space. The contribution proposed here is basically methodological; it explores how *possible trajectories* for contemporary territories can be traced among the multitude of uses and roles that the space of the city (public or of public use) assumes for the effect of the actual dynamic. The complexity of contemporary territories also requires a change in the ways in which knowledge is acquired. The construction of a problematic background—in which it is possible to bring out not discounted or not immediately perceptible information—inevitably involves the intersection of different survey methods. The observation of the places, the interviews, and the acquisition of data through computer platforms and digital tools, all help to provide substantive responses to the research objectives. Changing the forms of knowledge acquirable from different tools returns different points of view that are, at the same time, synergistic and not interchangeable.

It is, therefore, important to exploit the different relationships between the methods, tools, data, and land forms in order to build a collection of updated, shared, and transferable knowledge. The design becomes a tool and a method of investigation and narration. In this way, it is possible to trace the seemingly indecipherable writing, which still exists and is *implicit* in the structure of the places (Boeri, 2010; Koolhaas & Foster, 2016). A sort of *latent design* is created by the spaces and the required use of the space as they are reconciled in new configurations; this suggests fertile areas for future projects. It is in this process of crossing all the spatial, social, and economic scales of the city that it is possible to experience the modes of production and transformation of its spaces that are involved in renewal and regeneration processes.

The first step was to build designs capable of expressing the character and configurations that the renewal and regeneration actions (being they urban or social, of top-down or bottom-up type) assume in the city of Naples. At first glance, the metropolitan area of Naples appears to be a shaded spots landscape, whose figure is constructed from the addition and combination of a reduced range of solitaire products (Terracciano, 2016). The extraordinary objectivity of an overhead perspective allows us to see, with great clarity, a hardly knowable territory; data mappings from different databases also allow us to view a remarkable quantity and diversity of information. However, this does not necessarily equate to a good understanding of the area. Forms of mimetic representation, including the mapping data, are not enough; a different *strategy of attention* is needed (Secchi,

1992). The intent of this process (fig. 3) is to bring out certain characteristics that guide the search for interpretative forms of representation. These forms are able to condense urban phenomena from a spatial and social point of view around dense and proposal images, just because some images of reality are conceptualized as they have the ability to influence the world.

Referring to the renewal and regeneration processes, in a sort of *elementarist abstraction* (Viganò, 1999), we tried to recognize, qualify, and name these processes. These have been superimposed on the consolidated physical space of the city, composed of both settlement points and locations that have become *urban void*. The former can be connected to the shapes of *filaments*, *chessboards*, and *villages*; widespread creep leads to a sprawl that consumes places, including the *old town*, which is still recognizable as a dense and compact core, an outpost of a past that resists. The second consists of production and commerce fences, former systems of production, buildings or public spaces in a state of abandonment or degradation, and even greenhouses, quarries, and landfills; these locations are fully included in the city plan, and they map signs and footprints of new morphologies, producing etchings and alterations in the spatial structure and continuity of the places. The urban explosion, while consuming space and soil, builds generic and equivalent landscapes. These landscapes are homologous, because the explosion reduces the area to an elementary grammar of *enclaves* built next to others. This is a condition that reflects a society in which individualism forgets the collective space and fragments very different territories, making everyone equal (Boeri, 2010). The design reconciled the forms, grasping the shape of the city in its essential trajectory, and re-calling its condition through synthetic images.

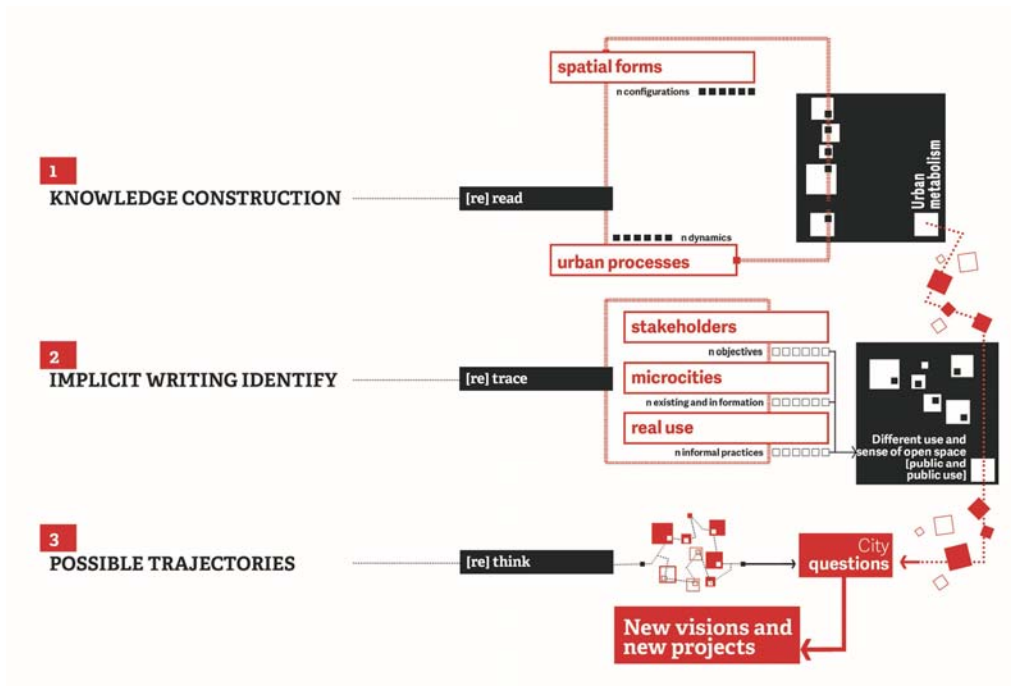


Fig. 3 Methodological research scheme

A theory of space that passes through different visions and is pervaded by processes that leave tangible manifestations is suggested in Naples (consider, for example, the occupations of space for various purposes or projects that invade the enormous brownfields located at the extremes of the city).

Contemporary urban dynamics have invested in the cities, both large and small, breaking the positional value system and the traditional relation of opposition between town and periphery, while generating a variety of

physical forms, substantiated from new economies and new use practices and lifestyles (fig. 4)¹¹. A different community geography has embryos of new cities in which the habitability can have many possible variations. The phenomena must be observed from a variety of perspectives in order to recognize actual, daily, identifiable, and experienced cities or places (Gabellini, 2010). Today more than ever, in most Italian urban areas, people coexist together despite different ideas, stories, needs, and ways of life that result in different and conflicting practices of production, use, and appropriation of spaces and places (Amin, Thrift, 2002). This was recognized through the information retrieved in interviews and the direct mapping of the locations, which was done to reconstruct the collection of actors and uses of the space.

In addition to the physical space of the city, there is the virtual space. This space allows for the development of participatory practices and real processes with direct impacts on the city. Cities today are complex environments that stimulate the activities of the informal actors starting from the new possibilities offered by *social networks*. Modern cities also constitute a political space for excluded people by the logic of national political power and lobbying (Sassen, 2005). It means delimiting the spatial density of these relations in the city according to its narrations (Calafati, 2009). A multiplicity of social actors (including those that are more or less institutional and more or less collective) act on the places which, at the same time, are increasingly the subject of informal appropriation and reuse practices. The legality of some of these reuse practices is questionable. The complexity and variety of conditions require drawing another city, almost comparable to the physical one, but perhaps more real.

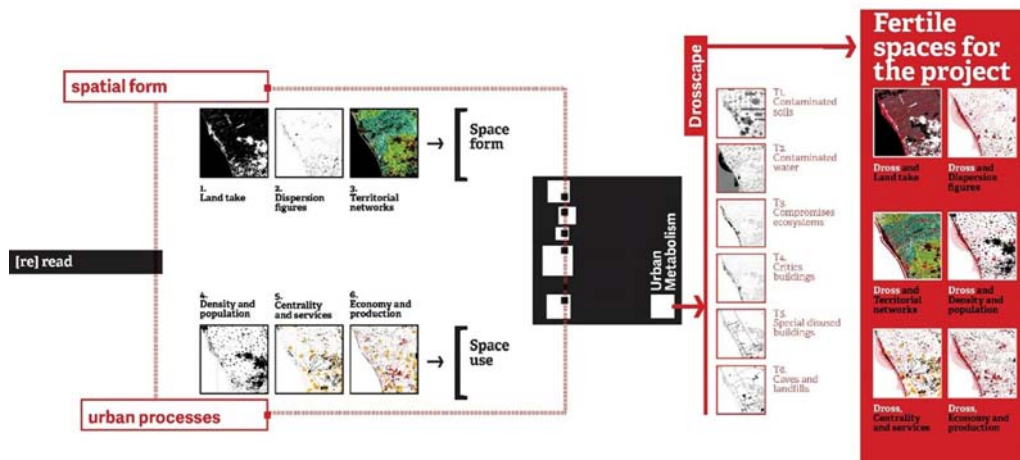


Fig. 4 Knowledge construction scheme

In a society where differences are increasing, research on the city space and its use cannot be limited to the appropriation or claims of the existing city. Very often the city space is the result of overlapping social statuses and stratifications, diverse backgrounds and identities that demarcate the material or symbolic border. Thus, new tracks, signs, and symbols from every perspective populate the city. Places in which *insurgent planning practices* (Sandercock & Lysiottis, 1998) and *resistance practices* to imposed models are used demonstrate the existence of unresolved urban policies and indicate that the city is still far from the profound social and spatial transformation that it needs. The goal is therefore to represent the contemporary condition of Naples, in all its complexity. In addition to building a method of looking at the city, this contribution gives a dimension and a representation to otherwise unexpressed questions regarding new policies and a new urban vision.

¹¹ Cfr *Atelier International du Grand Paris* at <http://www.ateliergrandparis.fr/12clefs/>

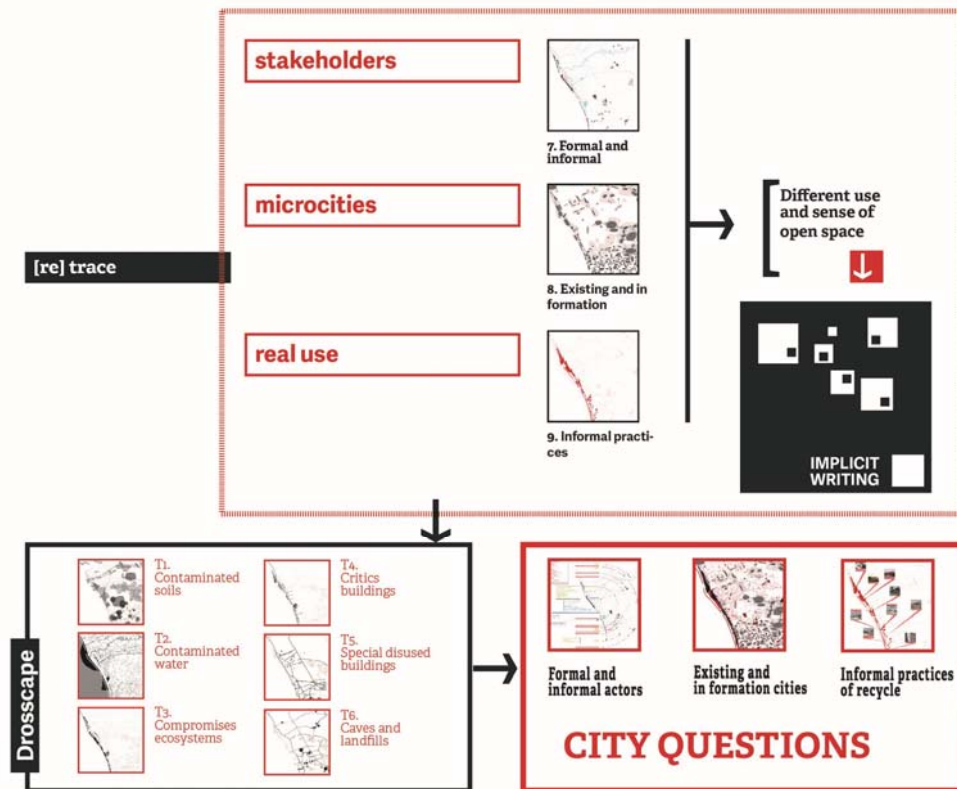


Fig. 5 Implicit writing construction structure

3 METHOD AND TOOLS

In order to trace the *implicit writing* of the city, a first operation was conducted on the city space. It was divided in five different sections. That have to be understood as homogeneous areas for the set of phenomena that pervade them, both for the types of spaces on which it insists deterioration and abandon then for the types of responses given to the existence of these urban and social voids¹². In terms of types of design that insist on the city, taking up the PRG (Master Plan) of the city of Naples, and in particular the General Variant of the PRG (June, 2004) and the Western Variant, it is possible to highlight a sectorial division of the general city with its western part (hereinafter referred to as Western Naples), and a further breakdown by area of intervention in a section dedicated to parks (hereinafter referred to as the Landfills and the Urban Parks Areas), one dedicated to the Old Town, one dedicated to the eastern zone (hereinafter referred to as Eastern Naples), and one dedicated to the vast peripheral area (in this study identified with the area of Northern Naples)¹³. For each of the sections the information about renewal and regeneration experiences was collected through:

- *Participant and pro-active observations* in collective discussion events about the city¹⁴;

¹² See the distinctions between brown and social fields and the intervention strategies described in paragraph 1.

¹³ See paragraph "Napoli rifiuta i piani [Naples rejects plans]" inside essay of Piscopo C. (2012), *Aree dismesse e architetture* [Abandoned areas and architecture]. In M. Russo, R. Lucci (Eds.), *Napoli verso Oriente* [Naples to the East] (pp. 235-250). Napoli: Clean Edizioni, in which we can find a critical reconstruction of the relationship between the complexity of Naples city and planning processes during the 20th century.

¹⁴ Among others: 'Critical Mass: get the hands on the city', a series of group discussion events on cities that have taken place during 2016, as well as the open assemblies of municipalities as 2 (Avvocata, Montecalvario, Mercato, Pendino, Porto, San Giuseppe), 9 (Pianiura, Soccavo), 10 (Bagnoli, Fuorigrotta).

- *Unstructured and in-depth interviews with key informers* involved in both urban and social renewal and regeneration processes. These sources were from the local administration (top-down processes), urban and social movements, citizens and inhabitants, associations, organizations, and third sector cooperatives (bottom-up processes)¹⁵.

Due to the complexity of the involved issues and the fact that often we had to deal with experiences at the limits of legality (think for example of to the squatting public buildings and spaces as well as of existing planning projects never started in the practice), it was not possible record interviews or produce field notes during the observation. The only tool, which distinguishes the collection of information in both methodological moments, approved by the parties involved was the use of sectorial maps of the city (a total of five maps, one for each identified field). These maps were originally made for previous projects and have gradually been enriched with the information collected from the field until they were saturated with indications on renewal and regeneration processes and on the actors involved. Key informers were asked to draw their own vision, reasoning in a spatial and visual way, of what happens in the city; this was made possible through the use of the elaborated sectorial maps. It is for this reason that the article does not refer to canonical urban planning instruments for the institutional government of the territory to illustrate the interventions involved in the top-down and bottom-up processes of renewal and regeneration. In fact, following an “urban and social” address, the conducted research establishes a similar relationship between the various initiatives, in particular by highlighting the social component and the fact that the interventions recalled by the interviewers derive from the vision that they have in mind when they are called to draw on our maps the “latent text” of the city and the deriving implicit writing we are looking for. This result was reached by asking the interviewers to reasoning about a specific element of the consolidated city, the urban voids. In turn, these voids become the unifying elements of the interventions that are reversed in the mappings with the aim of giving conceptual and physical consistency to the plurality of data collected, also providing implicitly an aid to the non-simple reading of the urban phenomena in Naples. In achieving this goal, surely it is possible to confuse the boundaries among centre and peripheries perceiving them as somewhat homologated. This is not true, in fact, what result homologated are the representation elements as spaces free of particular connotations. Similarly, it is possible to say about the ownership of these spaces defined as urban voids, a feature which is of little importance in this phase of the research carried out, since what matters is that these spaces are visible in the perceptions of those who live and who administers the territory in order to become possible objects for top-down or bottom-up actions. Therefore, what will be presented below are not just results accompanied by interview excerpts or ethnographic notes, but rather a reasoning on how the information collected on a spatial and visual perspective can be integrated with the vision emerging through this information.

4 THE MAPS OF THE CITY BETWEEN RENEWAL AND REGENERATION EXPERIENCES

Using the four intervention strategies defined above (urban renewal, social renewal, urban regeneration, and social regeneration), the areas subject to these strategies (*brownfields* and *social fields*), and the methods discussed for uncovering implicit writings of the city, it is possible to classify the findings in the context of

¹⁵ Specifically, they were interviewed for the top-down processes: some of the responsables for urban planning at the City of Naples (three in total); prominent members of project as ‘Bagnoli Futura’, ‘Urban Renewal of Naples East Sea Port Area’, ‘Old Town UNESCO World Heritage Site’, ‘Naplest’ (one interviewer for each project, four in total); exponents of municipalities as 7 (Miano, Secondigliano, San Pietro a Patierno), 8 (Piscinola, Marianella, Chiaiano, Scampia) and 9 (Pianura, Soccavo) (for a total of three interviewers). For bottom-up experiences, however, it have been interviewed: representatives of the major groups of pressure and collective action that have led to squatting actions of public spaces and buildings (for a total of ten interviewers, two for each section of the city detected and belonging to different action groups or movements), representatives of neighbourhood committees of the landfill and urban parks area (three interviewers). All the interviews were conducted between January and May 2016 and in neutral places with respect to membership of the persons interviewed so as to guarantee anonymity, privacy and freedom of expression.

Naples. This not only highlights what happens in specific sections or contexts of the city, but also overlaps the different strategies. Two general maps of the city were produced. The first laid out the areas of interest where the renewal and regeneration initiatives promoted by the public administration were focused. These included abandoned and degraded areas, in a socio-spatial sense, and sites of historical, economic, and cultural interest. The following five areas were particularly important:

- *Western Naples* (fig. 9) is a typical example of *brownfield*, where the main redevelopment projects are located, such as the ex-Italsider of Bagnoli and the area that hosted the offices of NATO and Mostra D’Oltre Mare (a site of economic and cultural interest). Many projects promoted by the local government and interventions by the public sector (framed as *urban renewal strategies*) are focused in this area. These projects include reclamation, conversion, and re-functionalization of these pieces of the city.
- The *landfills and the natural and urban parks areas* (fig. 10), also these identified as *brownfields*, stretch from Pianura to Chiaiano, passing through the natural reserve of the Crater of Astroni and the Urban Park of Camaldoli. The local government has planned few renewal actions here, although this area is problematic due to environmental quality issues and to a strong urbanization linked especially to the never evaded phenomenon of unauthorised development. These areas require a strategy halfway between the *urban renewal and regeneration strategies*
- *Northern Naples* (fig. 12) is a *social field* that includes the areas most affected by neglect and physical and social degradation. Scampia, Secondigliano, and Miano are such areas. The local government has several projects in these areas related to legality, security, mobility, infrastructures, housing, and renewal actions on the physical and social sides. These are framed as *urban regeneration strategies*
- The *Old Town* (fig. 13) is a *social field* (which is understood in this context in an enlarged way as a site of historical, economic, and cultural interest). The local government is working on renewal projects that involve several lenders, such as the Old Town UNESCO World Heritage Site, historic building (Sirena) recovery projects, and the redevelopment of specific pieces of the city (the Cardarelli area, the Hospital of the Poor, Piazza Mercato, etc.). These are framed as *urban renewal strategies*.
- *Eastern Naples* (fig. 11) is another *brownfield*, on which the focus returns to being that of ex-industrial diminished areas, but unlike Western Naples, the intervention of the private sector and business associations is more marked. The interventions planned for this area include reclamation, conversion, and re-functionalization mainly through Implementaion Plans. There are also projects promoted by the local government, such as the Urban Renewal Naples East Sea Port Area. These are framed as *urban renewal strategies*, according with PUA “Ambito 13 – Ex refinery” (2009) that adopts these structural choices: (1.) the construction of dense road network and the integration with the subway network in order to overtake the area’s isolation; (2.) The design of streets and open spaces as means for the progressive constructions of the park; (3.) The central role of water and energy in the urban regeneration process.

ut, how will the city react to these top-down methods? To answer this question, a second map was drawn to include the spontaneous *bottom-up* regeneration interventions. Overlapping the previously highlighted five areas with the responses given by the social substrate, three macro classes emerge:

- (1) In the two areas classified as former industrial areas, or brownfields, the focus is on the actions developed by two coalitions that locally improves actions of squatting with socio-cultural purposes, sometimes in a position of open opposition to local government. In Western Naples, these are strongly linked to problematic territorial conversion; in Eastern Naples these are more linked to the general

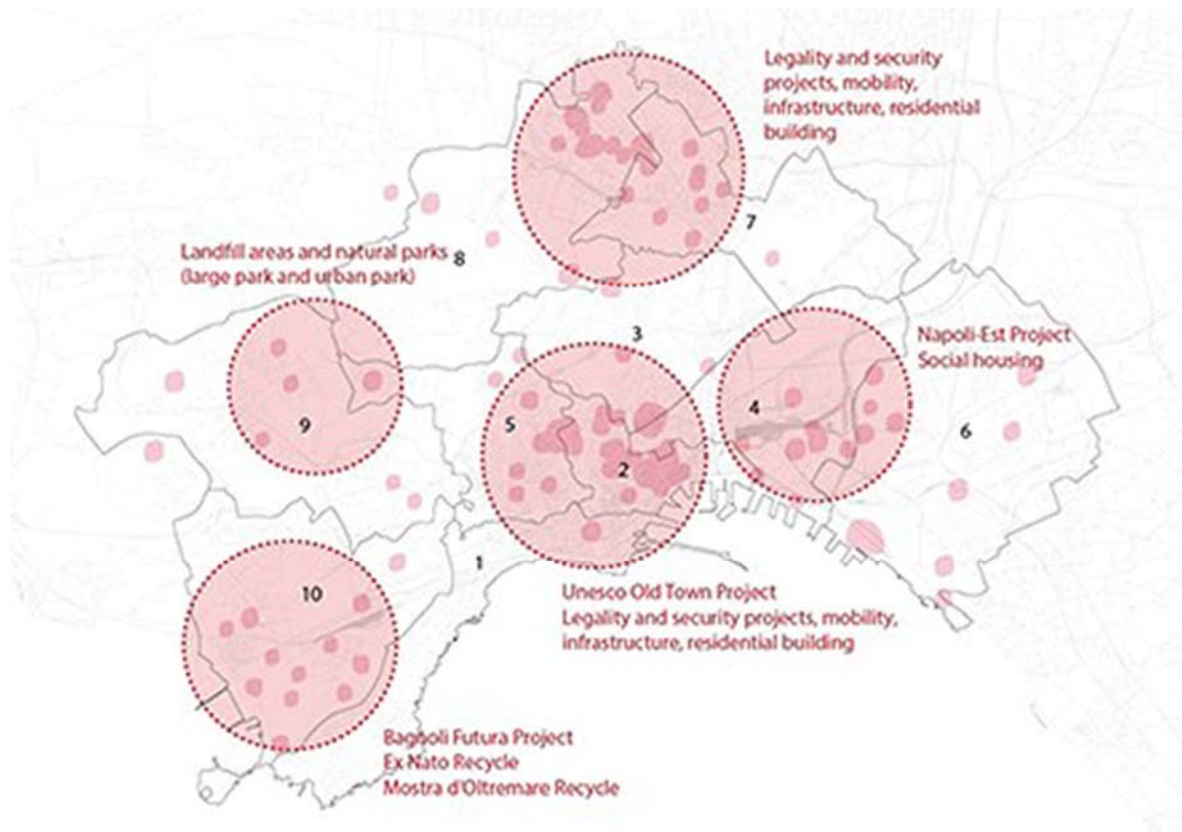


Fig. 6 Renewal and regeneration initiatives promoted (or co-participated) by the public administration. The little-red points on the map indicate the various mapped experiences giving an indication on its spread in the city space. The big-red circles indicate an homogeneous area. The numbers identify, instead, the ten Neapolitan Municipalities

- problem of neglect and physical and social degradation. Moreover, in this area it can be identified the actions of entrepreneurial committees that are at the heart of the design in Eastern Naples, because they determine the development direction much more than public actors. In Western Naples, instead, these private committees operate in cooperation with the public administrative project and do not replace it. (This is framed as a strategy between social renewal and regeneration.)
- (2) In the area of Northern Naples and in the landfills and the natural and urban parks areas (the first identified as a social field and the second as brownfield), regeneration actions are promoted and carried out by citizens' committees, cultural associations, social promotion organizations, and other third sector actors. Projects often combine the volunteer work of committees with the more structured work of associations and are often funded with public funds. This action mode consolidates the relationship of these actors with the territory on which they operate. It involves wide and shared participation projects that are not only devoted to the improvement of the city, but also to determining the measures that are most appropriate for it. (This is framed as a strategy of social renewal.)
- (3) In the Old Town area (a social field) the actions of regeneration are very different from those in the rest of the city. Here the focus is on disused, neglected, and degraded spaces. Urban and social movements are therefore the main actors in the implementation of regeneration actions that on the release of these spaces based a good part of their struggle (framed as a social regeneration strategy). However, these movements conduct squatting with socio-residential, socio-cultural, and artistic purposes, claiming the right to the city and various other social rights which a large part of the city's inhabitants were gradually deprived (households, income, common goods, the quality of the spaces, etc.).

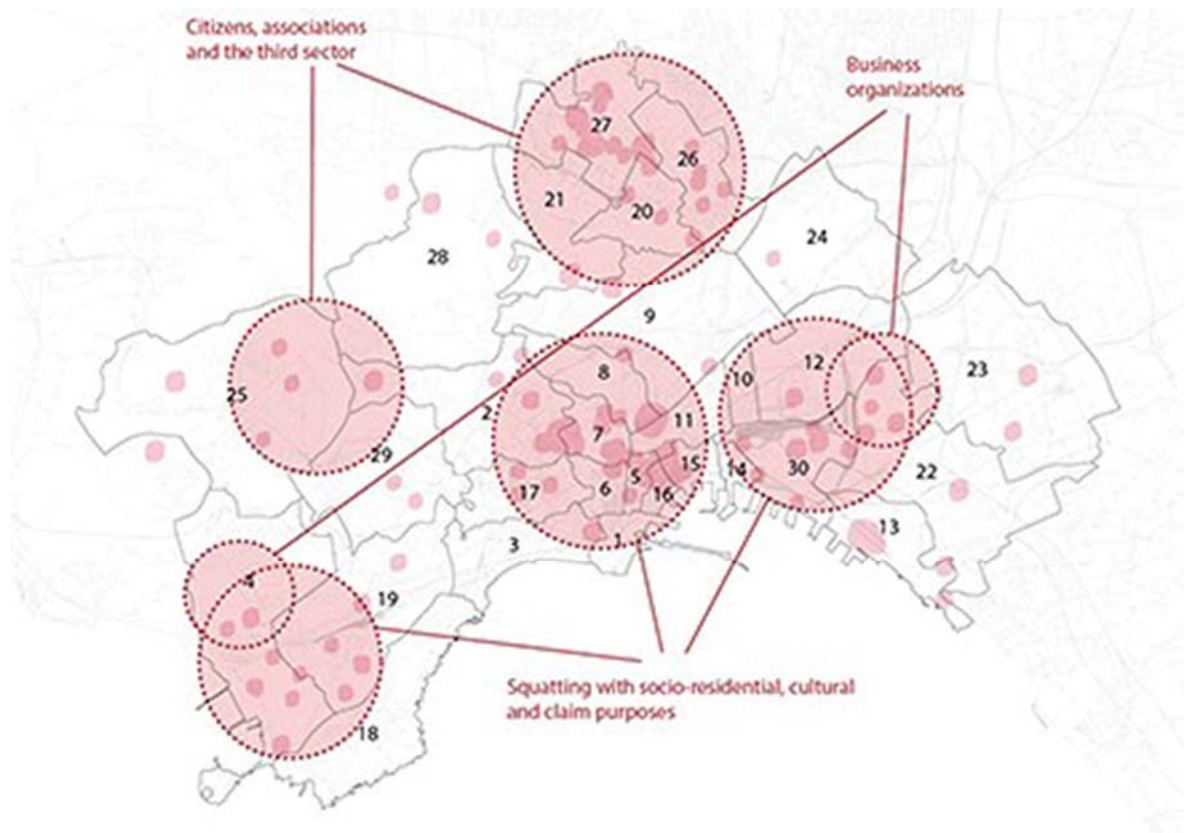


Fig. 7 Bottom-up and spontaneous regeneration processes. The little-red points on the map indicate the various mapped experiences giving an indication on its spread in the city space. The big-red circles indicate an homogeneous area. The numbers identify, instead, the 30 Neapolitan Neighbourhoods

When the representations of future directions for the city are all considered—including top-down and bottom-up processes, actors, areas of interest, and interventions—it is possible to see differences in the deployment of *renewal* and *regeneration* operations. While cities change, they simultaneously create in themselves new spaces and places that do not arise from large urban projects, but arise from the folds of everyday life. The purpose of this research is to investigate the existing conditions in order to identify possible development trajectories and thus orient the direction of progressive and inevitable change. Therefore, these representations are the *travel maps* and the *routes* that *introduce different geographies from the past* (Viganò, 2013), because they demonstrate the direction of larger changes that go beyond the immediately observable and perceptible spatial conditions.

In addition to the map of the city of Naples, five sectorial maps of the investigated areas (which also correspond to the maps used in data collection) were elaborated in order to trace the pictures of emerging city and its possible future trajectories.

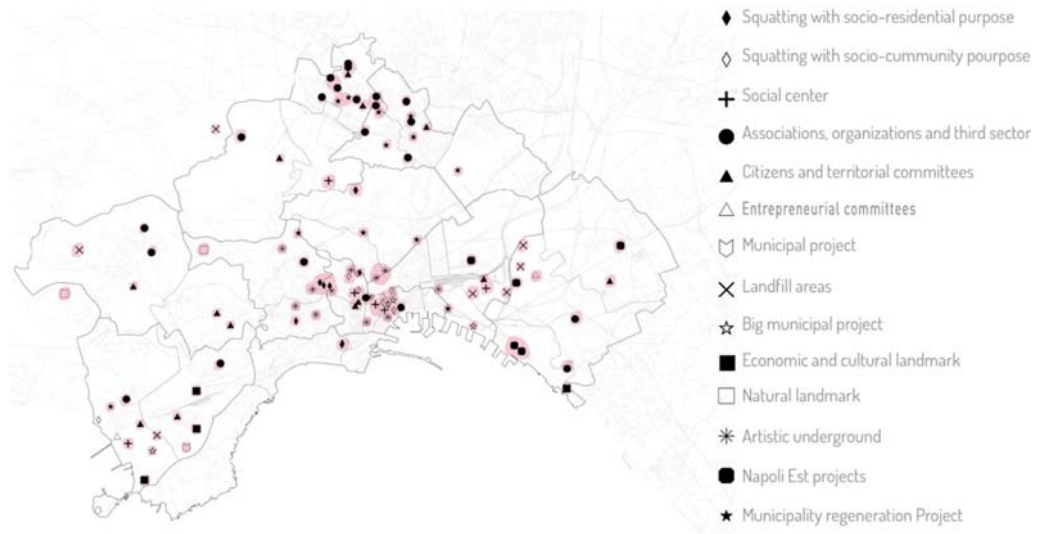


Fig. 8 Overlapping between renewal and regeneration intervention maps of the interested urban areas

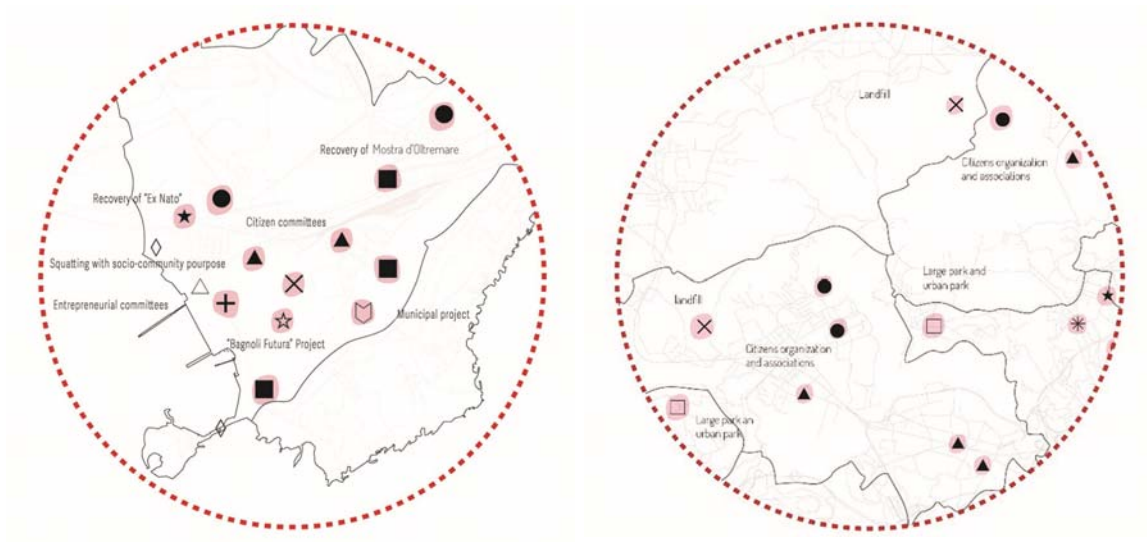


Fig. 9 - 10 Overlapping between renewal and regeneration intervention maps with zooms of the Western Naples area (on the left) and landfills, the natural and urban parks areas (on the right)

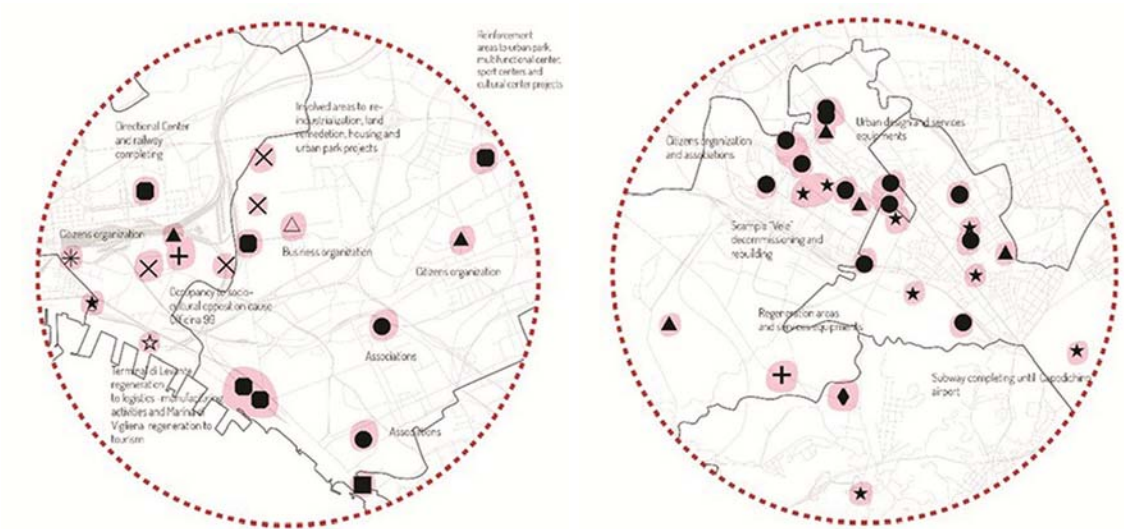


Fig. 11 – 12 Overlapping between renewal and regeneration intervention maps with zooms of the Eastern Naples area (on the left) and Northern Naples areas (on the right)

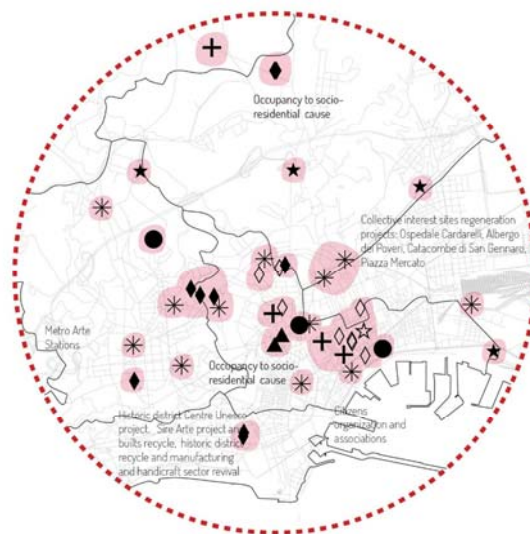


Fig. 13 Overlapping between renewal and regeneration intervention maps with zooms of the Old Town

5 DISCUSSION: WHAT PATHS OF DEVELOPMENT ARE THERE FOR THE FUTURE OF NAPLES?

This study suggests the need to develop a wider policy discourse on *Naples*. In the processes implemented by local actors, in the citizens' responses to these processes, and in the local governance structure of renewal and regeneration processes it is possible to trace elements that will be useful in understanding the trajectories and emerging strategies for each identified area. In fact, in the analysis of the interactions between renewal and regeneration processes, five trajectories emerge:

- Urban and Social Revitalization for Western Naples requires a concerted and shared growth that is led by the public actors but that also listens to inhabitants, citizens, coalitions, and urban and social movements. A new social narrative that can enhance the identity of the area must be constructed.

Such an identity must include not only productive vocations, linked to the former industrial sites, but also those related to a culture of the sea (which has been removed from the memory of the city), and those related to the exhibition and artistic culture. The emerging sophisticated strategy is that of a participatory and integrated local development, where the private sector can accompany and contribute to the public projects and address the demands expressed by the social substrate, since what this piece of city need is above all a strengthening and, only after, a raise strategy;

- Territorial regeneration and social re-activation for the landfills and the natural and urban parks areas need an identity and physical redefinition that can create a sense of affection among the people who live there and will motivate a community of sharing. The absence of public programming, the persistence of illegal activities, the lack of services, and the predominant activation of the third sector, suggest that the strategy for this part of the city should be linked to relational development and to a general reactivation of institutions and inhabitants to build a local critical vision;
- Awakening and social and institutional empowerment for Northern Naples can be used in designing the future image of this area to link forms of empowerment and moral duty. The public design, which is markedly territorial and lacks a proper focus on recipients, must also listen to the local volunteer sector that works to build forms of active citizenship. The long history of difficult situations, degradation, and entrapment in that part of the city has all resulted in a situation that needs significant social recovery. A strategy of development and social transformation may make it possible to remove the causes of disaffection due to the physicality of this area for who live there, working also on the recovery of places identity and openness to new possibilities for both places and people;
- Re-spatial-attention and urban empowerment should be used in Eastern Naples, where the development projects will most likely be controlled by private interests. The interventions are aimed at the transformation of the physical nature of the sites in order to increase competitiveness and attractiveness, making a vast and progressively depersonalized space the new growth engine of the city. This economic and territorial development strategy would be driven by the private sector and attended by the public sector. Here, regeneration and renewal have to contend with complex integration and social problems that remain closed in places and that still don't have adequate forms of expression in the city;
- Re-appropriation, claim, and social innovation are suggested for the Old Town. Here the focus is split between the construction of an attracting shop window, with an essentially physical recovery and re-appropriation by those who live there. The inseparability of urban and social renewal and regeneration processes is obvious in this part of the city. Cooperation between public and private, civil society and politics, is necessary here and it is shown in the some implemented interventions. The strategy that emerges is that of a multi-directional and multi-actor development in which each actor has their own share of responsibility, leading to growth and exchange paths that are also collective, synergistic, and inclusive, open to different interests and ideas.

These five trajectories reveal five ideas of the city which it could be associated five ideas of general recipients of renewal and regeneration actions. These are, respectively: a City of Inhabitants for Western Naples; a City of the Associations for Landfills and urban and natural parks areas; a City of the Citizens for Northern Naples; a City of the Entrepreneurs for Eastern Naples; and a City of the City for the Old Town.

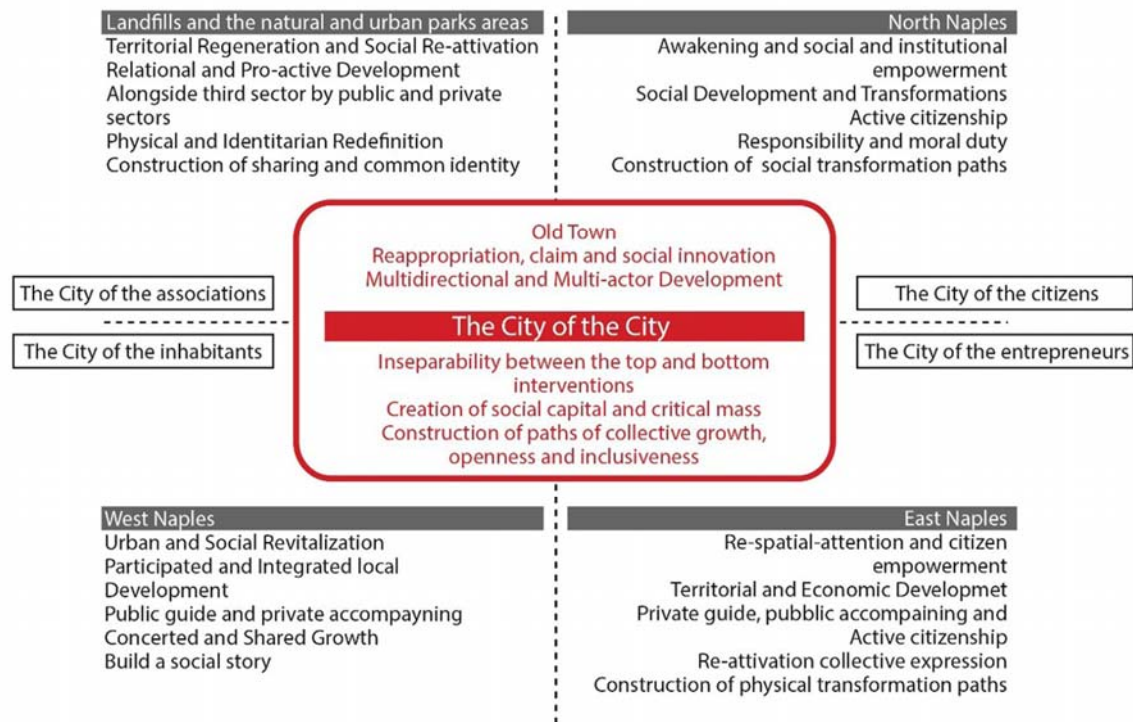


Fig. 14 Development models for the city

6 CONCLUSION

Naples was an emblematic case in order to highlight differences between the possible types of renewal, regeneration and recycle interventions on specific problematic areas (whether brown or social fields), as well as to test the explanatory power of territorial maps as tools used both for collecting and constructing the analysed data. However, a non-organic response grows from the analysis of the city space and confirms the impossibility of reasoning on a single trajectory of development. Naples has been—and remains—elusive and changeable, but perhaps it is precisely these characteristics that will shape its future. The people in the analysed territories have expressed their needs. It is clear that although these areas are currently urban voids, they cannot be considered empty. *Brown* and *social fields* require different interventions, but what matters is not how these interventions start, but rather the projected destination. Therefore, to return the voids to the urban system they must be filled with objects, bodies, meanings, identities, people, actions, and experiences of life. They must be used as public and physical spaces. Urban transformation must be intertwined with social transformation, each influencing the other to create experiences of daily life that slowly settle and grow in memory. A collective identity and ideas that substantiate the possible trajectories of development will eventually emerge. It is clear that a single unique image of the investigated urban system is impossible, as well as impossible to trace it in every metropolitan city. Furthermore, there is a substantial overlap and integration of brownfields and social fields. Think out interventions in only one direction are, therefore, inadmissible. Actors and actions of renewal and regeneration that are focused on the physical transformation of either the urban dimension or the social one must work together. A successful effort requires synergy and a system that shifts the attention from individual objects or areas to the more inclusive concept of development declined on the total urban system.

There remains fundamental open questions to which only a part of the answer can be found in this research with whom, instead, we have been tried to providing a guide to the knowledge of a complicated urban scenario

as the Neapolitan one. The questions are: how would it be possible to “twist and merge” the social to the urban aspects in renewal, regeneration and recycle processes that pervade the city? What is the potential role that the presented research results could have as a decisive tool for public administrators and local government? Outlining five city images with its various models of urban and social renewal and regeneration trajectories, as well as with its recipients, has undoubtedly heuristic value as well as a high explanatory feature to answer the questions just formulated. East and West Naples recall that season of urban renewal policies, typically business led, of neoliberal matrix from the early 1990s. North Naples and the area of landfills and parks recall the need to give relevance to the social aspects of local regeneration as it did in the early twentieth century by European policies, putting social cohesion as a key objective of urban politics. The Old Town, however, carries the densest meanings of the concept of “territorialization” as a local, participated and integrated development process (Battaglini, 2014). It cannot ignore a perfect combination between territorial capital and social capital as well as among emerging forms of degradation and their embankment through forms of conflict. Here is the multidimensional character of urban problems that intertwine economic, environmental, spatial and social aspects of decline and that require new policies to be addressed: “to respond to this complexity, regeneration calls into question an integrated approach of intervention, or propose it, as a fundamental objective of simultaneously intervening along the different dimensions of the problems that are at the origin of the deprivation situations on which they intend to operate” (Fioretti, 2015: 65). More often, the concept of renewal continues to be linked to a purely urban type of operation in which the physical component is predominant. The peripheries are generally the places of intervention and the social aspect is confined in building spaces for sociality, creating containers without attention to content, actors and processes within them; containers destined to a new process of transmigration to new urban voids. So, what really leads to social and urban interweaving? Most likely, the actors, those we have highlighted as recipients or agents in renewal and regeneration processes, with their progressive trend towards local governance, with the emergence of the third sector (such as in the landfill area or in North Naples) and of a conflicting component of civil society and its inhabitants’ active participation (such as in the Old Town or in the East and West areas of the city), in line with the current social policy trend. Despite meeting a few limitations, these two trends have been the real engine of the intertwining between urban renewal and social regeneration processes in Naples. It is in the combination of the local dynamics between actors and actions that a new urban planning season can know new life. A season that does not disabuse but activates the public actor as the private one, the third sector as the citizens. A season in which the change of paradigm is evident and can be seen from the exploitation of undervalued public assets and the social redistribution of the surplus value generated by the transformation efforts aimed at creating new centralities in the consolidated city. Also in the national and international contexts, this change of paradigm is evident as result of the urgency of addressing the common problems across all contemporary cities (affected by contamination, urban decline, inequality, etc.). It appears clear in the exemplary references from local and global Good Practices and in the implementation of EU environmental policies¹⁶ that confirm that there is an intention to re-think the relation between community and city, overcoming the sector-specific limitation toward a multi-disciplinary approach for the urban planning. Therefore, the reading provided through the trajectories of the five pieces of the city in this paper, in order to give a response to the questions asked, require bringing all five systems to convergence, because it is in each of them that a possible answer is elaborated, and in each of them a way to stem the limits is developed. This makes the same process of regeneration a way of intervening on urban situations with projects that aim at an economic and social result as well as a physical transformation of the city, promoting a dynamic balance

¹⁶ Cfr. Regione Campania (2011), *Relazione sui Grandi Progetti del POR Campania FESR 2007-2013* [Relations on Big Projects of POR Campania FESR 2007-2013], Napoli. More informations about POR Campania FESR 2014-2020 are available on web site: <http://porfesr.regione.campania.it/it/por-in-sintesi/programma-operativo-b8q8/grandi-progetti-6pcg?page=1>

between its components and the profound transformations that have taken place in it: the economic crisis, the changing of demographic conditions and a different demand for sociality, the need to curb soil consumption with an increasing focus on environmental sustainability of interventions. This makes the traditionally intended urban planning tools limited and to be overcome in order to define a hierarchical system of urban tissues, centralities and territorial features referred to it, measuring the new sustainability budgets in relation to the entire urban system that the actual city determined (Fioretti, 2015). This hierarchical system can be deduced through the provided territorial representations aimed at putting into communication top-down and bottom-up interventions by providing a different grammar of representation, or the implicit writing, that does not reside in the projects but in the process. The basic elements of this new grammar of representation, the urban voids, become the elementary units from which restart and, as configurable elements—taken individually and in their aggregate form—provide to the elaborated maps—understood as representation tools but also as tools for reasoning and planning—the ability to adapt to the dynamic and complex, but also contradictory, Neapolitan urban reality as well as the one of complex urban systems in general. Indeed, on the urban voids it is possible to directly intervene by enhancing them both from the point of view of urban standards as for their recovery, reuse and the realization of open spaces for new urban centralities, thus changing their character, identity and function also in the social sense. This is because implicit writing is by definition dynamic and non-static as well as the processes it intends to represent and it offers a way to think about how information collected on the field in a spatial and visual perspective can be integrated together with emerging development trajectories in different parts of the city. Therefore, reasoning about the contribution of this spatial representation tool to the decision-making functions of the public administration and the local government, it is impossible to deny the importance to move from the policy-design to the logic of 'doing' and 'done' (and therefore the renewal and regeneration processes) on defined elements (such as urban voids). This can give a different picture of the city, in some ways more complex and complete, on which local actors are required to planning and to implement territorial government actions.

More generally, this paper reflects about a perspective in social and urban research aim to be integrated in urban planning instrument and governance, providing with these innovative methodologies and experiences, a set of tools, models and procedures to support and act incremental, cohesive and place-based processes for renewal, regeneration and recycle cities and derelict sites through the possibility of new flexible agreements and cooperation between the large institutional and economic players and the new social and economic actors also associated to the innovative sectors as cohesive commitment to urban regeneration. This is, in fact, the most significant and interesting field of work for the inclusive urban regeneration of degraded spaces, even through alliances and new pacts that reveal and give strength to the informal or bottom-up potentials, connecting them with the economic, financial and social parties.

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IMAGE SOURCES

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Gabriella Punziano

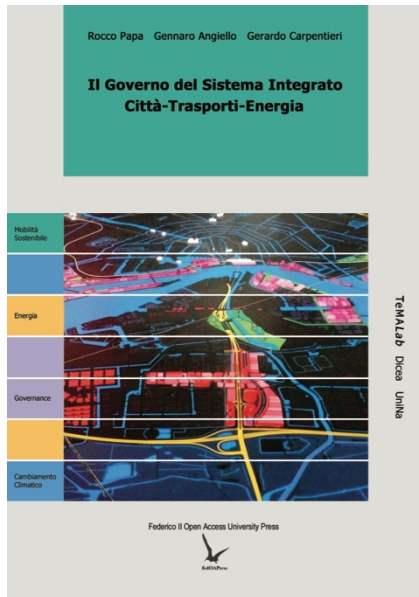
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Rocco Papa, Gennaro Angiello e Gerardo Carpentieri

Il Governo del Sistema Integrato Città – Trasporti – Energia

Smart City, Urban Planning for a Sustainable Future

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Abstract

Theories about the origins and developments of modern cities seem to agree, without exception, to a point: the city is the place of maximum concentration of exchange. Activities, in fact, are located into urban and metropolitan agglomerations to minimize the resources needed to meet the growing need for relationships and exchanges with other activities. In recent years, the concentration and specialization of these activities have led to an extraordinary increase in intensity and quality of exchange needs, with the obvious consequence of congestion in most metropolitan areas with predictable consequences on the sustainability of urban areas, on the quality of life of its inhabitants and on the energy consumption associated with the growing demand for mobility. As a result, in recent years, several authors have argued for greater integration between urban planning policies, mobility management and energy efficiency. In this context, this volume aims to provide a contribution in this direction and presents the results of a research project aimed at the development of an integrated city-mobility-energy governance model.

Abstract

Le teorie sulla nascita e lo sviluppo della città moderna sembrano concordare, senza eccezioni, su un punto: la città è il luogo di massima concentrazione dello scambio. Le attività, infatti, si insediano all'interno degli agglomerati urbani e metropolitani per minimizzare le risorse necessarie a soddisfare le crescenti necessità di relazione e di scambio con le altre attività localizzate sul territorio. Negli ultimi anni la concentrazione e la specializzazione di queste attività hanno comportato un aumento straordinario, per intensità e qualità, delle necessità di scambio, con la ovvia conseguenza di avviare alla congestione la maggior parte delle aree metropolitane con prevedibili conseguenze sulla sostenibilità delle aree urbane, sulla qualità della vita dei suoi abitanti e sui consumi energetici associati alla crescente domanda di mobilità. Come conseguenza, negli ultimi anni, diversi autori hanno sostenuto la necessità di una maggiore integrazione tra politiche di assetto urbano, gestione della mobilità ed efficientamento energetico. In tale contesto, il presente volume intende offrire un contributo in tale direzione e presenta i risultati di un progetto di ricerca, finalizzato alla messa a punto di un modello di governance integrato città-mobilità-energia.

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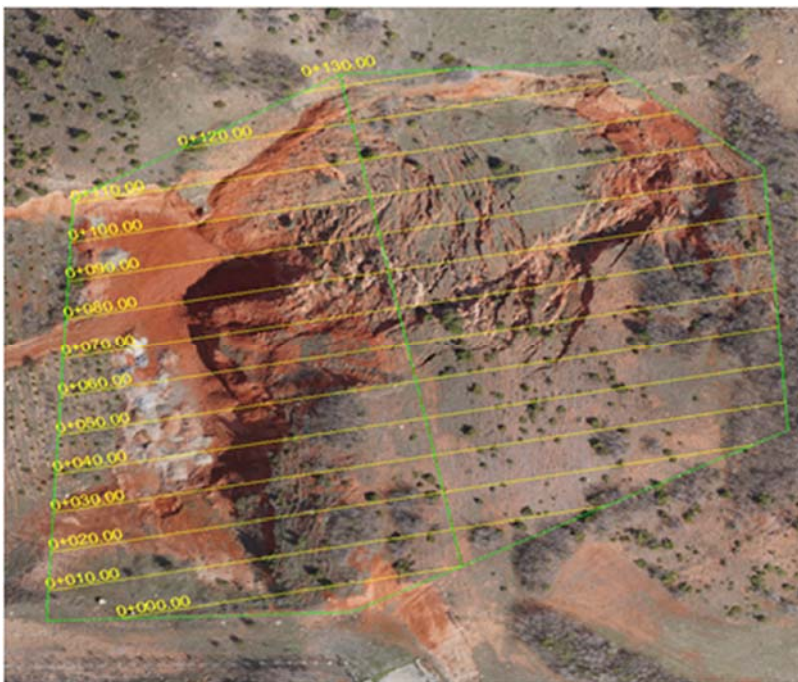
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UAV BASED LANDSLIDE MONITORING

ABSTRACT

Unmanned Aerial Vehicle (UAV) is finding a wide application field in areas such as map production, land survey, landslide, erosion, agricultural activities, and forest fires monitoring. In this study, an UAV equipped with SONY 6000 camera was used. The flight plan was prepared from 100 m height, and having 80% overlap and 60% sidelap rates. GNSS geodetic receivers and Ground Control Points (GCPs) were observed. GNSS signals were processed with LGO V.8.4 software to receive precise location information. 291 photographs for 50 hectares of landslide area were taken by UAV. All photos were processed by PIX4D software. In the field of the landslide area, 8 GCPs were included in the evaluation.

3D model were produced with pixel matching algorithms. Six period flights in different months were made for the landslide area and ground movements between the periods were observed. During this time interval, the volume of moving soil was determined. At the end of the study, RMSE for soil movement was obtained ± 1.79 cm for landslide area. This study demonstrates that UAV-based high resolution orthophoto, 3D terrain model and point cloud data sets can be used to monitor the landslide, especially in micro small areas. It also was revealed that this method has some advantages over other traditional geomatics methods.

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KEYWORDS:

UAV Remote Sensing, Pix4D, image processing, orthomosaic and landslide monitoring.

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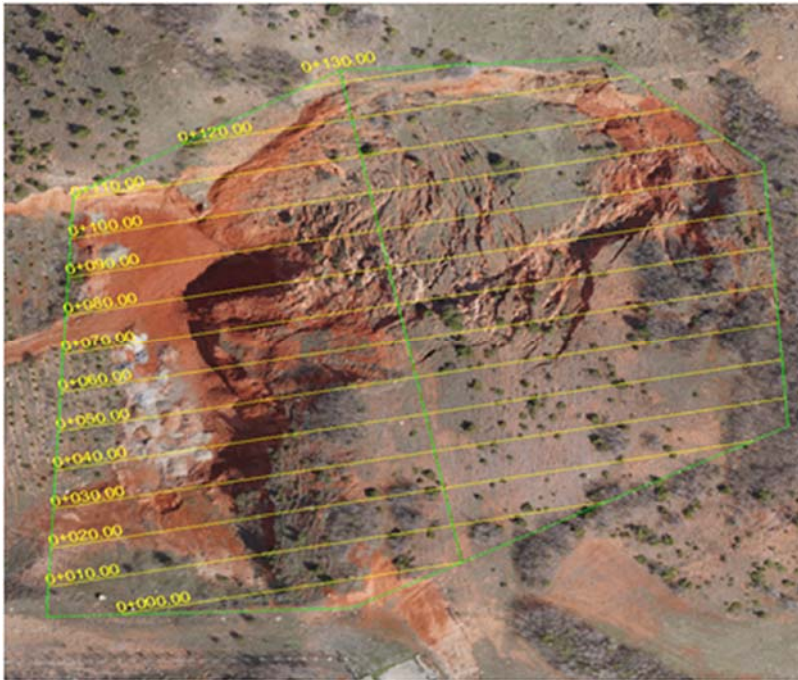
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基于无人机的农业规划和滑坡监测

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摘要

无人机 (UAV) 正在地图制作、土地测量、滑坡、土壤侵蚀、农业活动、以及森林火灾监控等领域中有着广泛的应用范围。本研究使用了一台配备索尼 A6000 相机的无人机。准备的飞行计划起点是 100 米高，并有 80% 的重叠以及 60% 的侧向重叠率。GNSS 大地测量接收器和地面控制点 (GCP)。GNSS 信号用 LGO V. 8.4 软件进行处理，从而接收精确的位置信息。无人机为 344 公顷农业土地拍摄了 985 张照片，为 50 公顷滑坡区域拍摄了 291 张照片。所有照片都经由 PIX4D 软件进行处理。在农业领域，评估包含了用于滑坡区域的 25 个 GCP 和 8 个 GCP。

利用像素匹配算法制作了 3D 模型。为滑坡区域进行了 5 个周期的飞行，并且在周期之间可以观察到地面运动。在这个过程中，确定了活动土壤的量。在另一个研究区域中，根据土地模型和横截面确定了是否有灌溉农业，并为农业区域准备了最优利用规划。在坡度和过敏性方面不合适的区域则被规划用于其他目的。在评估结束时，滑坡区域获得了 ± 1.8 米的 RMS 评估，农业区域是 ± 5.4 米。本研究展示出，基于无人机的高清晰度数字照片、3D 地形模型和点可以用于监控滑坡，尤其是在较小的区域中。它还揭示出，与其他测绘方法相比，这种方法拥有一定优势。

关键词:

无人机、遥感、农业土地规划、图像处理、滑坡监控。

1 INTRODUCTION

Landslides are one of the most widespread natural disasters in the world, which not only threaten human life but also cause economic losses (Davies, 2015; Regmi et al., 2015). Landslides usually appear in the spring after long rains or after snowfall. Landslides cause major changes in the landscape; causing great damage to settlements and infrastructure, and can cause huge economic losses. It is impossible to estimate the timing and speed of the soil flow caused by the ground clearance. Tracking changes on the surface and in the topography is very important. For this reason, it is of great importance to monitor landslide risky areas, to develop monitoring systems and to study landslide behavior. Landslide monitoring and analysis involves both spatial and temporal measurements and requires continual assessment of landslide conditions, including changes in surface topography, as well as the extent and speed of resettlement.

Landslide and ground motion movements are monitored by ground based and geomatics measurement techniques. Ground based landslide monitoring approaches are usually performed using geotechnical or geophysical techniques such as piezometers, pore pressure sensors, inclinometers and electrical resistance tomography (Chidburee et al., 2016). Ground-based techniques consist of the placement of sensors in the landslide area and the entire technical spectrum, which requires the use of locations to be measured at different times. These techniques have proven to be sensitive (0.2 - 2 cm) to track ground movements, but these techniques have some disadvantages such as installation and maintenance costs (Tofani et al. 2013; Rossi, 2016). Geomatics techniques can be examined in two groups as aerospace and ground based approaches. The most important advantage of airborne approaches is that it requires less labor and time. Remote Sensing has been an important method for landslide investigations. Remote Sensing, Interferometric Synthetic Aperture Radar (InSAR) and Light Detection and Ranging (LIDAR) techniques have been applied to investigate and monitor the flowing behavior of landslide and mapping (Riedel & Walther 2008; Mazzanti et al., 2014; Jaboyedoff et al., 2010; Jones, 2006; Lindner et al., 2016). Differential InSAR (Interferometric Synthetic Aperture Radar) has been used for detailed displacement analysis on active landslide surfaces (Belardinelli et al., 2003), although it may block the signal from the vegetation cover. With relatively high cost, air laser scanning (ALS) and terrestrial laser scanning (TLS) techniques enable the production of high quality digital elevation models (Ackermann, 1999; Pirotti et al., 2013).

Panchromatic QuickBird satellite images can provide data with a floor resolution of 0.61 m (Niebergall et al., 2007). Air and terrestrial geodetic LIDAR scans (Light Detection and Interference) are techniques that give high density fine and high resolution 3D surface coordinates. The quality of the point clouds is affected by the roughness of the surface, its reflection, the measuring angle and the observation interval (Cheok et al., 2002; Lichti et al., 2005). Digital terrain models (DTM) can be derived from point clouds with sub-meter accuracy (Carter et al., 2007; Van Den Eeckhaut et al., 2007). Airborne images can provide significant surface textural data, but photogrammetric DTMs are generally not as accurate as airborne LIDAR-based DTMs (Baltsavias, 1999). Conventional air and satellite based remote sensing techniques are suitable for landslide detection in a few square kilometers (Henry et al., 2002). However, these techniques cannot provide data for the landslides and displacements that occur in smaller areas and the high resolution digital image below the decimeter and the desired period (Neithammer et al., 2012).

Nowadays, UAVs equipped with suitable compact cameras offer fast and cost-effective solutions for many photogrammetric applications compared to conventional aerial photometric studies Peppia et al., 2016). UAV System and Peripheral Units: UAV systems have been used extensively in agriculture, environment, mining, and disaster monitoring, archeology and land follow-up activities with various purposes. UAV applications generate significant alternative solutions in these areas (Nex & Remondino, 2015). There are only a few studies in the literature regarding with the use of UAVs for monitoring of landslides. Rau et al. (2011) in Taiwan; Neithammer et al. (2012) and Stumpf et al. (2013) in France and Lindner et al. (2013) used a quadrotor

system and a The biggest advantage of UAV remote sensing is the ability to collect risk-free information in real-time, flexible, high-resolution, low-cost, and hazardous environments. (Chang Chun et al., 2011; Rossi et al., 2016). Terrestrial approaches to landscape monitoring work are risky approaches because they require direct contact with risky areas and require longer time for measurement and evaluation.

Unmanned Aerial Vehicle (UAV) is a very useful system that has begun to be used for solving a wide range of problems (Tahar et al., 2011). In parallel with the developing technology, UAVs have begun to be used in recent years by integrating with Global Positioning System (GPS), Inertial Measurement Units (IMU) and high-resolution cameras.

Remote Sensing (RS) is also being used in commercial and scientific research such as digital map production, landslide and disaster monitoring, as well as agricultural land monitoring and planning. Although high resolution positional data can be obtained in 20-50 cm/pixel band with satellite and manned air vehicles, it is possible to obtain 1 cm/pixel high resolution data thanks to fly at lower altitudes with UAV systems (Hunt et al., 2010). Various monitoring techniques such as GPS, PS-INSAR, total station and leveling instruments are used to monitor the movements in the landslide area and to carry out planning in agricultural areas (Turk et al., 2015). However, these techniques may not be in the desired availability/suitability in terms of time and cost. Although the above-mentioned methods have the capacity to provide sufficient positional accuracy, they cannot always be preferred because of the disadvantages such as the necessity to obtain data for a longer time and the risk of measuring in the landslide area. As a result of the downsizing of sensors and the developments in sensor technology, the cameras integrated into UAVs, and the structural developments of IMU systems have enabled the creation of precise 3D terrain model, point cloud and orthomosaic production. For this reason, it has become an alternative to aerial photogrammetry (Remondino et al., 2011). In this case, the UAVs allow achieving the results with sufficient sensitivity, pursuant to appropriate camera selection and short-term field measurement. Especially in recent years, close range photogrammetry and image based measurement systems have been widely used in such researches (Tschari et al., 2015).

This study consists of two parts; the availability of UAV photogrammetry in agricultural planning and landslide monitoring has been researched.

a) UAV flights were carried out at Gaziosmanpaşa University (GOU) Agricultural Application Area (approximately 344 hectares) to test the utility of UAV systems in agricultural planning. The obtained digital surface model (DSM) and orthophoto are used to produce orthomosaic map and cross sections. The optimal use plan of the area is prepared by using slope, view, irrigability and soil properties of the land.

b) The study area of the landslide area (about 50 hectares) in the Organized Industrial Zone was selected to examine the monitoring of the landslide motion with UAV systems. The study area was observed with UAV at five different times to determine the speed, direction and characteristic of the landslide motion. In addition, the amount of displaced soil was calculated for a period of five months.

2 MATERIALS AND METHODS

GEO_2 UAV was used for this study. In addition, GNSS/IMU integrated into UAV, Sony a6000 camera, and the peripheral units consisting of moving platforms were used as well. Four geodetic GNSS receivers were used to observe eight Ground Control Points (GCP). GCPs were evaluated by using Leica LGO V.8.3 software with static GNSS observations. As a result of the process, the coordinates of the GCPs in ITRF96 Datum were determined. The GEO_2 UAV and peripheral units used in this study was given in Figure 1. Peripheral units consist of multi-copter carrier bag, conveyor platform, control unit (IMU, GPS, mainboard) and camera systems in Table 1.



Fig. 1 GEO_2 UAV and environmental equipment

In both studies, in order to take pictures in RAW format, the Sony A6000 16mm - 6000 x 4000 camera was used for collecting visible imagery.

Env. Specification	Environmental Detail
Weight with environment	4.30 kg
Edge to edge Wing Span	0.74 m
Effective Payload	4.00 kg
Height from bottom to up	0.34 m
Max. Range	4000 m
UAV Endurance	0.5 hour
Duty Speed	14 m/sec
Maximum flying Speed	70 km - 30 mm /sec
Frequency(Radio Control)	433 MHz
First Person Video (FPV)	2.4 GHz
Frequency(Telemetry Radio)	868 MHz
GPS	5 Hz – 72 channels
Kind of Battery	6S li-po 25C 1600 Mah
Monitor	40 Channels 5.8 GHz DVR 7 inch LED system
Kind of gimbal	Gimbal for mapping
UAV motors	35 x 15 Brushless Motor
Kind of frame	22 mm 3K Carbon
Elect. Speed Control(ESC)	60 Ampere 400 Hz
Size/kind of Prop	15 x 55 inch Carbon
Camera	Sony A6000
Camera dimension	4.72x2.63x1.778 in
Camera weight	12.13 oz
Magapixels	12 MP
Type of camera sensor	23.5x15.6 mm(APS-C)
Size of camera sensor	24.3 MP
Camera ISO sensitivity	100-25600
Zoom(Digital)	L:4x, R:5.7, S:8
Speed of shutter	0.00025 to 30 sec
Speed of flash sync.	0.00625 sec.

Tab.1 GEO_UAV and peripheral unit features

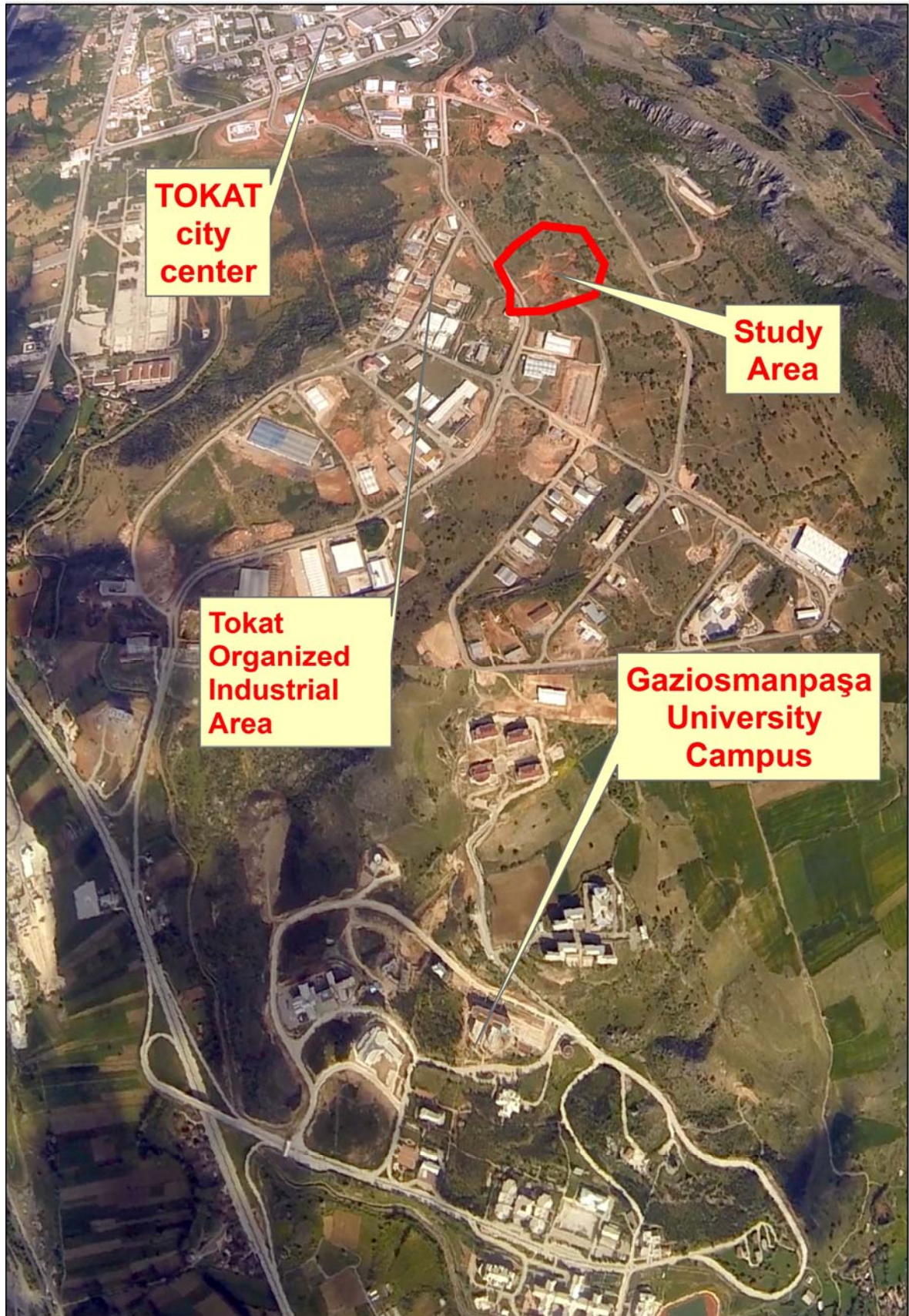


Fig.2 Study Area is in the Tokat Organized Industrial Zone

The study area is on the southwest side of the Gaziosmanpaşa University (GOU) campus and having an approximate coordinates of 40°19'21.03"K, 36°30'6.25"D (Figure 2). This area is located in the factories area of Tokat Organized Industrial Zone. The continuation of the landscape movement will create a great risk for the factories in the region. Raw images were taken, having 80% overlap and 60% sidelap rates from 100 meters height relative to ground. A total of 6 flights were carried out for the same area at different times. Flight planning was carried out in accordance with the weather conditions and the conditions in which the light was most appropriate. In order to orient pictures, eight GCP points were staked out in the field. GCP points were observed with precise GNSS instruments with two hours of static observation mod and processed by using Leica LGO V.8.3 software. RMS value calculated as ± 2.4 mm.

The absolute accuracy obtained depends on the difference between the position of the features on the model and the accuracy and distribution of the number of measured GCPs. By using pictures taken at each flights and GCPs, dense point clouds, digital surface models and orthomosaic were produced by using Pix4d photogrammetry software.

The characteristics of the landslide movement (direction, speed and volume changes) were determined by taking advantages of these outputs. The displacement volumes (fill and excavation volumes) between 1st and 6th periods were also calculated by cross section method.

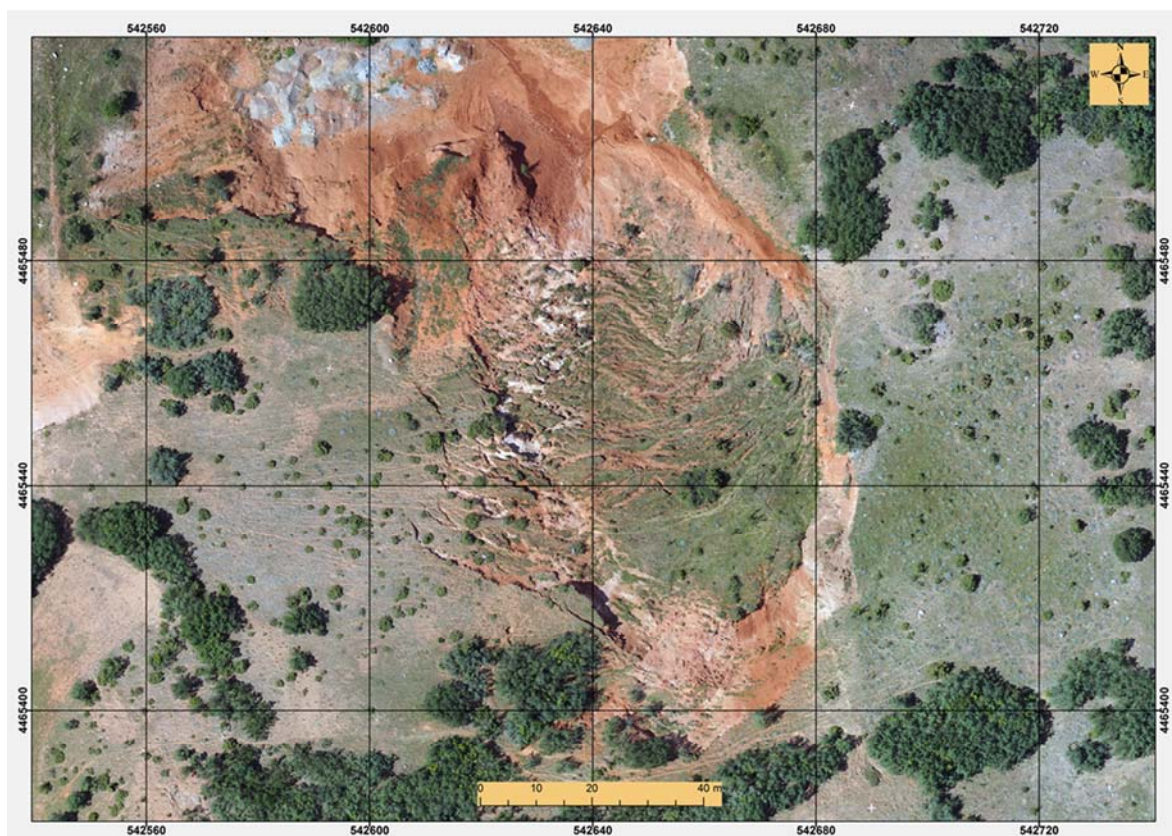


Fig.3 Landslide area orthomosaic map

3 RESULTS

The main purpose of this research is to analyze the usability of UAV monitoring landslide movements. Ground Sampling Distance (GSD) for the study area were calculated as ± 3.56 cm, GSD is the distance between two following pixel centers measured on the ground. The bigger the value of the image GSD, the lower the

spatial resolution of the image and the less visible details. The spatial data results of the generated orthomosaic were determined on TUREF / TM36 in ITRF datum. The amount of earth movement in the study area (excavation/fill) was calculated by using the section method shown in Fig. 4 and calculated from the numerical data obtained from the dense point cloud, DSM and orthomosaic produced at the beginning and end of the period. Between sixth and first observation, 2.976 m³ excavation volume and 978 m³ fill volume difference were calculated.

In addition, pixel comparisons have been made in the DSMs for the determination of surface movements. For this, the following function was defined and the pixel ratios between the periods were examined.

$$\Delta = f(H_6) / f(H_1) \quad (1)$$

In the function;

Δ : criterion of benchmark,

$f(H_6)$, Orthometric height function in period 6,

$f(H_1)$, Orthometric height function in period 1.

H_i : Orthometric height of object points at period I,

If $\Delta > 1$, then there is an increase in height

If $\Delta < 1$, then there is a decrease in height

If $\Delta = 1$, then no change observed.

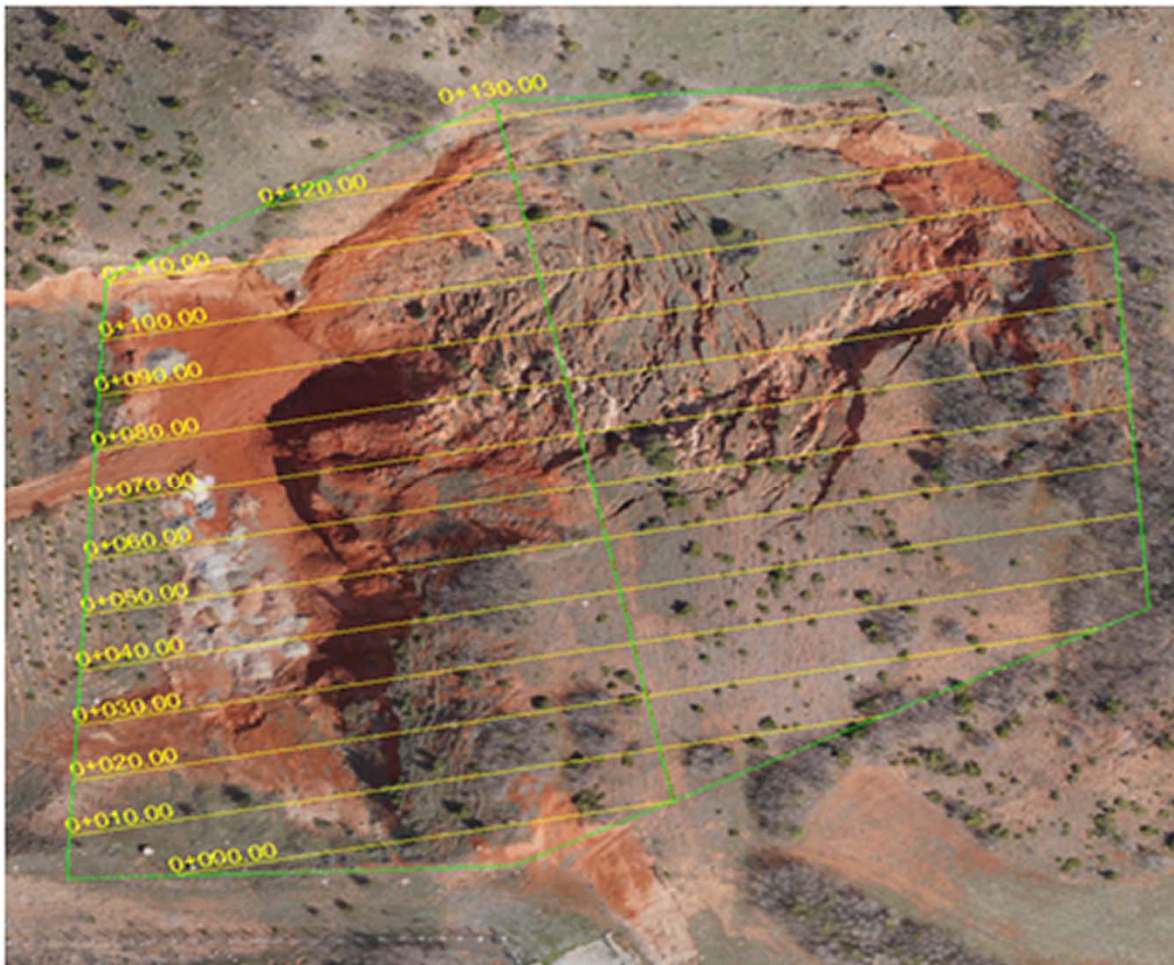


Fig.4 Base lines that were used for all six periods

According to the relation given above, pixel comparisons between periods were presented in Figure 5. The dots with increasing height are shown in brown color and the points with decreasing height are shown with dark-yellow color.

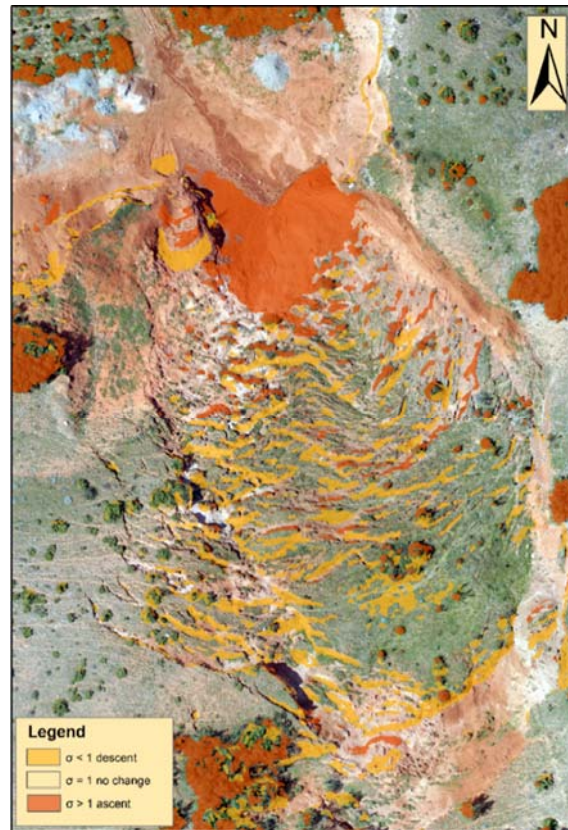


Fig.5 Pixel matching map of landslide area

4 DISCUSSION

Recent developments in UAV technology offer significant new advances that allow high resolution (1 - 20 cm) mapping and monitoring. UAV displays have indisputable contributions to the management of disasters such as landslides, avalanches, sellers and earthquakes, and have many advantages when compared to other methods. Over the last decade, the use of remote sensing technology and UAV photogrammetry has been increased to map and track landslides. Nowadays, UAVs equipped with suitable compact cameras offer fast and cost-effective solutions for many photogrammetric applications compared to conventional aerial photometric studies (Peppas et al., 2016). There are only a few studies in the literature regarding with the use of UAVs for monitoring of landslides. Rau et al. (2011) in Taiwan; Niethammer et al. (2012); Stumpf et al. (2013) in France and Lindner et al. (2013) used a quadrotor system and a fixed-wing system for monitoring a large landslides.

The biggest advantage of UAV remote sensing is the ability to collect risk-free information in real-time, flexible, high-resolution, low-cost, and hazardous environments. (Chang Chun et al., 2011; Rossi et al., 2016). Terrestrial approaches to landscape monitoring work are risky approaches because they require direct contact with risky areas and require longer time for measurement and evaluation. One of the advantages of UAV systems is its ability to deliver fast, high temporal and spatial resolution image information in critical situations where instant access to 3D location information is required. First of all, it is impossible to make local measurements in areas

where disaster impact continues. Second, obtaining a satellite image or photogrammetric image is difficult and expensive. In fact, UAV has real-time capabilities such as fast data acquisition, transmission and image processing (Mazzanti et al., 2014). In addition, UAVs do not only record disaster-affected regions, but also assist in the coordination and communication of disaster management. (Kauai et al., 2016). The main advantage of the UAV photogrammetry is that it can provide information about the moving speed using image correlation algorithms using orthophoto images and digital surface models (DSMs). (Leprince et al., 2008). Another significant advantage of UAV-based remote sensing applications for hazardous environments such as landslides and rocks is the ability to acquire information in very dangerous areas with minimal risk. Direct measurements in such areas are usually not possible (Neithammer, 2012). Orthomosaics obtained by UAV allow detailed analysis of landslide materials and fissure structures (Walter et al., 2009). In addition, high resolution textural information in orthophotos obtained by the UAV may allow for soil moisture analysis of the landslide surface (Neithammer et al., 2009). Extremely sensitive DSMs were used to detect surface fissures and measure the mass movements of the landslide. Alternatively, it is known that providing satellite images is expensive and difficult when satellite images are used. It is also impossible to obtain this sensitivity from satellite images. Panchromatic QuickBird satellite images can provide data with a floor resolution of 0.61 m (Niebergall et al., 2007). Conventional air and satellite based remote sensing techniques are suitable for landslide detection in a few square kilometers (Henry et al., 2002). However, these techniques cannot provide data for the landslides and displacements that occur in smaller areas and the high resolution digital image below the decimeter and the desired period (Neithammer et al., 2012).

5 CONCLUSION

In this study, 985 raw pictures were taken for the landslide area with UAV and Sony a6000 digital CMOS camera. All images were taken from 100 meters high with 80% overlap and 60% sidelap rates. Pix4D software was used to process images to create 3D dense point cloud and orthophoto.

As a result of evaluating the images the horizontal position accuracy of GCPs were calculated as ± 1.79 cm. A total of 12 months have elapsed between the first period and the last period of the measurements. At the end of 6 periods it was calculated that 2976 m³ of soil was displaced in the landslide area. In addition, the speed and direction of the motion of the landslide was determined. It has also been found that ground motion accelerates after rainy weather events.

Flight altitude and RMSE show a linear relationship with a correlation coefficient greater than 0.9 independently of the forward and side turn settings (Javier et al., 2016). It is a known fact that more precise position accuracy can be achieved by increasing the number of GCPs and decreasing flight altitude as well as increasing camera resolution. For the landslide movements, more sensitive results can be obtained by changing these parameters when requested. However, the results obtained from this study show that 3D surfaces obtained by processing UAV-based images, DEMs and orthophoto can be used for monitoring landslide movements.

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IMAGE SOURCES

Fig. 1, 2, 3, 4, 5: created by the author

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WHAT IS A LEARNING TOWN? REFLECTIONS ON THE EXPERIENCE AT WIRKSWORTH

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ABSTRACT

This paper explores the legacy of regeneration project work and knowledge management and transfer. A university intervention was undertaken with a regeneration charity designed to support new business opportunities, specifically in arts and entertainment, tourism, skills development and training. As part of the University of Derby's own work-related learning and problem-based learning, a project team was assigned to work alongside the charity 'New Opportunities in Wirksworth!' (NOW!). The knowledge exchange, the new learning acquired at Wirksworth is viewed from the perspective of the public sector organisations, the private sector organisations engaged at the destination and the university. The results of the knowledge transfer (KT) are analysed from these three perspectives; the businesses, local government and educators. A participant observation, action research approach has been used to elicit and analyse the knowledge transfer, both explicit and implicit. Staff and students from the University of Derby have been contracted to research development specifically in festival supply and visitor demand, the attractiveness of the destination and its key features the market, mining heritage and volunteer railway. Staff and students also committed to an events strategy, marketing the destination and finance for start-ups. Key stakeholders have reflected on a decade of achievements and both fails and success stories. Through the KT process agendas for the future have been identified and the project NOW! Has a legacy of both tacit and explicit knowledge for the benefit of other communities. There is an ongoing desire to explore how both public and private sectors can benefit from knowledge sharing and to benefit ongoing problem-based learning in education and training through university based open-access library resources.

KEYWORDS:

knowledge transfer, repository, university, learning, stakeholder, tourism.

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什么是学习型城市？关于威克斯沃斯经验的思考

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摘要

本文探讨了再生项目工作和知识管理与迁移的遗留问题。

我们进行了一次大学实验，设计了一个再生慈善机构，旨在为艺术和娱乐、旅游、技能发展和培训方面提供新的商业机会。我们还指定了一个项目小组，与名为“威克斯沃斯的新机遇！（NOW!）”的慈善机构一同工作，作为德比大学自己的工作相关学习和以问题为本的学习的一部分。从公共部门组织、从事的私营部门组织和大学的不同角度，对知识交流和在威克斯沃斯学到的新东西这两方面进行观察。从三个角度分析了知识转移（KT）的结果：企业、地方政府和教育工作者。

采用了参与者观察法和行动研究方法来引出和分析知识的转移，包括显性和隐性的。

德比大学的工作人员和学生已签约该研究开发项目，具体而言包括以下方面：节日供应和游客需求，目的地吸引力及其在市场上的关键特点，矿业遗迹和铁路志愿者。工作人员和学生们也都努力推行活动战略，推广目的地，为初创企业提供资金。

利益攸关者们回顾了十年来的成就，同时也追忆了失败和成功的故事。通过 KT 流程，确定了前景计划议程和 NOW! 项目。保持具有隐性和显性知识的传统，能造福于其他社区。人们总是希望探讨公共和私营部门如何能从分享知识中获益，并能通过以大学为基础的开放式图书馆资源，为教育和培训方面的持续的问题提供支持。

关键词：

知识转移，知识库，大学，学习，利益攸关者，旅游

1 INTRODUCTION

This paper aims to clarify the explicit and tacit benefits of knowledge transfer in a small rural market-town community in England. Specifically it undertakes, through a reflective research process with eight key informants, to establish the residual value to the community of knowledge transfers through research tasks assigned by stakeholders to students and staff of the University. The report is structured to reflect the core literature on networks, structure, legacy of learning and knowledge transfer using current academic perspectives, research approach and method. The paper reflect on the findings for the three key stakeholder groups and develops an emergent model with a framework for further exploration.

Wirksworth has been an important market town and centre for mining and extractive industries from medieval times. In the eighteenth century lead mining was at a peak. In the twentieth century quarrying for feldspar, lime came to a conclusion as the easily mined raw materials became hard to extract and a rejuvenation in the 1970s saw Wirksworth change direction as a centre towards services, arts, crafts and a dormitory town for workers from Derby, Nottingham and Sheffield. At this time the town was awarded a grant for sympathetic renovation of Georgian houses and there was a growing awareness that Wirksworth's future was going to be marked by innovation and enterprise in services, the creative industries, education and tourism.

So, the story that unfolds here relates to the formation of a government funded charity, New Opportunities Wirksworth (or NOW!) established in 2001 to take advantage of an inflow of skilled, creative, energetic and like-minded residents who saw that the small town of 5000 people could become a magnet for specialists in creative arts, education, services and tourism. Tourism is almost an afterthought. Many residents, even a decade ago, perceived increased visitor numbers as contrary to community wishes, based on values and beliefs largely accruing to a mining town, a market town, and a rather depressed economic destination at least defined by the boom era of the mid twentieth century.

Considerable funding was made available to have NOW! Co-ordinated by a project manager based in the Town Hall and various research tasks undertaken with the collaboration of the Business School at the University of Derby as well as privately commissioned contract workers right through to 2008. A period of energetic optimism pervaded the Wirksworth community. Far from feeling constrained by limited economic growth, the people of the town anticipated an even greater, government subsidised Arts Festival and Trail annually in September to accompany a long-standing Carnival earlier in each summer that was locally well patronised.

Community groups, public servants, retailers, schools, the University of Derby, various jobbing contractors all work cooperatively during the 2000s to secure a future based upon the creative industries and other ancillary services as earlier described. There was no sense of concern for the expenditure and resources thrown at the project NOW! By late 2008 the community was still keen to espouse a future predicated on several pillars of development. During 2009 with two major factors, NOW! Came to a head. Firstly funding of the co-ordinator's role ceased and the person contracted for the tasks was dismissed. This was not exactly unexpected as the project had a project shelf-life of seven years. At the same time the economic recession ended enthusiasm and sapped energy for volunteers to continue their roles in these diverse silos.

The project continues in the second decade of the century. There is a project manager and some of the original silos still exist. Tourism has not really fared well since 2009 (see for example Coles et al., 2014). The destination struggled to secure support from devolved local economic partnership (D2N2) in Derby/Nottingham (shires) at the same time as regional development agencies, centrally funded, ceased to exist in 2010. Champions for tourism development emerged from various areas, a volunteer railway that predates NOW! and several retailers including the champion of the monthly market. Unfortunately, even with the energy of these champions and their earnest intentions to provoke demand for visitor services the lack of research, co-operation and co-ordination had an unfortunate and divisive effect on the tourism cluster. Several champions wanted to co-locate the visitor service centre in either the Heritage Centre of the Railway, even a bakery that

was vacant. This research reflects on those experiences and provides some insights into the knowledge management and transfer that occurred at Wirksworth since 2001. At the same time notions of community development through regeneration projects and volunteers and suggest a blueprint for KT and Knowledge repository at, and facilitated by the University of Derby are discussed.

2 LITERATURE REVIEW

A plan-check-do-see-act approach to resolving difficulties with embedding new knowledge for stakeholders is central to success as has been recognised in the health and wellbeing research and just-in-time innovations in engineering (see for example, WHO, 2000; Srivannaboon, 2009; Nakamura and Ashton, 2017). At the heart of this research is the imperative for small market towns, tourist destinations in their own right and centres for inward investment as distinctive regeneration projects for some forty years (Garcia, 2004; Richards & Wilson, 2007; Knox & Mayer, 2013; La Rocca, 2014). Since 1979 Wirksworth has been a typical destination struggling to create a vitality for stakeholders and enthusiasm with local government and business as a service centre after having been a failed mining and quarrying centre. In the neo-liberal environment of Margaret Thatcher and the conservative government at the time there was considerable emphasis placed on such towns to re-align their resources and productive strategy around the emerging service economy (Coles et al., 2014). A compelling story has now emerged within the town as a rejuvenated historic market town and centre with notable architecture dating back 2000 years (personal communication, Wirksworth Heritage Association, 01/10/2017). Perhaps we are now fortunate to have reflections on the 'Bowling-alone' phenomenon so described by Putnam in the United States with the parallel rise of neo-liberal market-forces economy issues in small town USA under Ronald Regan (Putnam, 1995; Swyngedouw et al., 2002). The key for knowledge management is securing skills, capacity and associated resources to ensure regeneration action does not go un-documented and that the processes and structures associated with this are transferred explicitly and tacitly to the knowledge required for continuing adaptation to the changing external and by inference, internal, environment (Jessop, 2002; Geddes, 2006).

Additionally in responding to the structural changes needed in the market town economy the commitment required to a legacy of learning for key stakeholders is acknowledged (Raivola et al., 2001; Robinson et al., 2013). It is insufficient to emulate projects conducted elsewhere to embed new learning. It is imperative to embed learning and new knowledge within this community to ensure continuity and to align structure with strategy and forecasting to ensure that these processes are stored, retrieved and added to over time (Clarke et al., 2012; Coles et al., 2014). The University was asked by the local town council to provide support for various regeneration projects in tourism and small business, education and skills development, arts and performance (see for example, Midmore & Thomas, 2006; Selada, Cunha & Tomaz, 2011; Robinson et al., 2013). The project entitled 'New Opportunities for Wirksworth' or 'NOW!' which was established at the beginning of the twenty first century with a charter as a charity and with human resources to manage and review projects sourced from European Union regional development funding and from the University of Derby. A third key issue which has been the centre of higher education activity working with the private sector over the past decade is encouraging stakeholders to publish, store and access developmental materials for destinations in open-source forms (Atkins et al., 2007). Open source is an innovation from this decade to allow possibly deprived stakeholders from benefiting from state of the art resources to inform and empower communities to take key problems and establish a priori solutions from benchmarking and the use of appropriate case studies (Cooper, 2006; Clarke et al., 2012). The gift of research conducted by project workers is often overlooked as the repository offered is seldom transparently provided by institutions to communities to the same degree of ease of access that is provided to enrolled students and researchers of the institution (Atkins et al., 2007; Geuna & Muscio, 2009; Finch, 2012).

Useful outputs and feedback from this work-related learning can inform future student-led research. The knowledge transfer and repository aspects of this research are secondary objectives but by no means of lesser importance (Moscardo, 2014; Arnaboldi & Spiller, 2011; Geuna & Muscio, 2009; Agrawal, 2001; Raivola et al., 2001).

A further focus is skills acquisition to manage new knowledge and extract maximum shared benefit with new social capital held in trust for future generations (Raivola et al., 2001; Moscardo, 2014; Shone et al., 2016). Universities play a key and critical role in furnishing studies that allow communities such as Wirksworth to become enthused and excited over empowerment and devolved responsibility for a shared common future (Fishbourne & Derounian, 2009). To illustrate the opportunities, successes and challenges to knowledge transfer and repository we have interviewed key informants within the community of Wirksworth using unstructured questions. These questions drive answers to specific issues such as the external and internal environment in 2014 and comparisons and contrasts in 2004. The focus is on skills required for regeneration, again using the respondents' reflections as a lens. Suggestions that lessons learned through the knowledge transfer and repository are considered as benchmarking opportunities to be shared with other communities. Finally respondents were asked to clarify the aim and objectives of NOW in 2014 to compare with those explicitly explored in 2004.

Lastly, the report identifies whether stakeholders actually can agree on shared agendas within the community (for example see Henderson et al., 2007 for a UK example; Flowers & Waddell, 2004 using an Australian example). There are metaphors and algorithms for measuring outcomes that can be shared (for example see Kania & Kramer, 2011). The establishment of a regeneration body within the community has reinforced the development of Wirksworth. The various sections of the regeneration board have enjoyed and celebrated the successes and reflected on the opportunities for the future.

A community-led leadership and development role is a conceptual start point to reviewing the outcomes (Flowers & Waddell, 2004). In a political climate of devolved responsibility for policy, planning and management the Wirksworth community needed strength in local government, not just 'liberation from central policy control' (Rossiter & Price; 2013). Critically the increased devolution of responsibility to local council and community from regional government with the demise of the region East Midlands was not accompanied by resources for upskilling the community nor policy directions from central government in the face of increased demand for public sector funding cuts and transfer of knowledge and skills to private sector community stakeholders (Bentley & Pugalis, 2013; Shone et al., 2016).

The opportunity to identify champions in leadership roles as opposed to management teams and project co-ordinators as a further issue in this community (Lemetyinen & Go, 2009; Gibson, Lynch & Morrison, 2005). Without doubt the critical factor in successful planning, implementation and review of learning destinations revolves around the presence of inspirational and motivational stakeholders. Our present review focused our attention on such champions and we identified the conceptual presence of a champion as reality through this process (Della Lucia & Franch, 2014).

The ability to inspire, influence and direct proceedings that actually reflected the values, beliefs and intent of the entire community was central to success and has been demonstrated to be important to lead on regeneration and redevelopment projects in other locations (Manidis, 1997). Globally some of the more successful tourism projects have been constructed around culture and heritage tourism (see a Romanian example Dumitrescu & Baltalunga, 2014). Therefore, through the lenses of regeneration, business championship, the importance of innovation, creativity, the industries and performances at the heart of the projects cannot be underestimated (Richards, 2014). The articulation of shared values and a common agenda that reflects the over-arching aim of NOW! also seemed to be absent from the extant materials. Too many of the project objectives were not mirrored in political structures so alignment of political roles, co-ordination of

actors and networks was similarly missing as has been indicated as central to many other success stories (Della Lucia & Franch, 2014). Resourcing projects for change is another core area that needs reflecting in the lens of a learning destination (Robinson et al., 2013). The small town has a core of intellectuals, artisans, creative enterprising people which, on the face of it, bodes very well for development and new directions. This has not so far occurred and we should reflect on the literature to identify why resources were not easily mobilised and consider internal as well as external factors that have had an impact.

3 RESEARCH METHOD

As has been mentioned over the past ten years the University provided additional resources to NOW! in the form of both undergraduate and postgraduate enrolled students. The students worked with the NOW! team on specific research projects for which students earned academic credits towards their respective programmes. Key stakeholders at the University and within the town agreed to manage the research experience and outcomes. The earlier research activity consisted of consumer satisfaction surveys with visitors and townspeople in regard to events, attractions and tourist sites. In addition reviews of these events, attractions and sites were incorporated in the research activity by stakeholders that had committed time to the projects in NOW! and who were self-selected to become mentors to students and maintained oversight of the aim and objectives of specific projects. These mentors and townspeople were not required to participate in the academic outcome or performance and management of the student experience. These stakeholders were encouraged to reflect on the experiences and were brought together to review and discuss the regeneration of Wirksworth in light of the established charitable organisation NOW!

Two of the University's staff have worked together since 2009 on the research projects that linked the objectives of NOW! to the town's regeneration strategy. The research projects involved both undergraduate and postgraduate students from tourism management, events management, marketing and business management. The outcomes of these projects have formed the basis of several academic research publications (Clarke & Raffay, 2002; Clarke, Raffay & Wiltshier, 2012; Wiltshier & Edwards, 2013). The publications were designed to analyse the delivery of outcomes and outputs from regeneration and project work to be stored in the University's research repository UDORA (University of Derby Online Research Archive). The aim of UDORA is to inform all stakeholders of the University's research activity and holds copies of peer-reviewed research and defended research theses. The existence of UDORA is not unique. What is important is that the gift of research conducted on and bestowed upon a local community is hosted as open-source and online and is available for the benefit of current and future project managers and community leaders to interrogate as needed. By adoption of an inductive and exploratory research approach key stakeholders were identified that have been engaged in the KT and empowerment and devolution arguments for the past decade (see for example Wakefield & Poland, 2005). These identified respondents have been dealing with expectations of greater accumulations of social as well as economic capital. However, there has been little research to elicit how lessons learned from devolution, regeneration and the attracting of inward investment to this small community have been viewed and analysed by either the community of the university.

Interviews were conducted with eight key public and private sector stakeholders from NOW! The interviews were largely unstructured. Respondent stakeholders were asked to comment on the success and failures from the regeneration projects with special emphasis on enablers and barriers as they were perceived somewhat subjectively. The focus was to identify responsibility for these factors and to consider capacity building and nurturing from the teams engaged with the projects over the decade. Several respondents felt quite comfortable with this approach and were prepared for informal interviews lasting an hour or more. All topics were presented and respondents questioned until the discussions were exhausted. Access through action research and participant observation were deemed appropriate approaches owing to previous engagement by

the author with the projects in tourism and arts/culture regeneration. In future such a subjective and inductive approach might be supported by metrics to build a series of hypotheses testing the relationships between skills, aptitude and attitude of key stakeholders and specific outcomes such as jobs created, business opportunities supported and informatics relating to visibility and ongoing provision of regeneration under the project works umbrella (Phillimore & Goodson, 2004; Crang, 2003). Key algorithms for measuring success of tacit and explicit knowledge management and sharing can be driven by best-practice case study (Huysman & Wulf, 2006). The model presented here identifies the framework proposed for future enquiry as to the legacy of new knowledge and learning assigned to responsible stakeholders within the community who will share agendas, attempt to resolve problems arising from skills shortages in decision-making and outcomes that can improve capacity for local communities to take development and KT forward for shared benefit.

4 FINDINGS

Of the eight respondents almost all credited themselves, as would naturally be expected, with successes and failures under the umbrella of regeneration practices. As was explained the focus was on expectations and conditions for capacity building and antecedents to nurturing (Shaw & Williams, 2009). Discussions along the lines of pride in achievement and humbled by the outcome were common. Respondents were seldom shy about their successes and quite matter-of-fact about their role, and that of other partner workers, in the outputs and outcomes. In general these concur with the working discussion on knowledge management (see Shaw & Williams, 2009; Cooper, 2006). A reflexive individual adjusting to the changing needs of their host community can demonstrate the skills and capacity available and the opportunity to reinforce the devolved, private sector supportive approach needed for future growth in all dimensions of regeneration; the economic underpinning social and environmental (Fishbourne & Derounian, 2009; Midmore & Thomas, 2006). A framework is proposed that reflects the shared agenda across a range of roles, skills and knowledge transfer enablers. In tab. 1 the issues relating to successful incorporation of KM in the destination community are outlined. Following the figure are details of specific initiatives undertaken that reflect developing capacity and the nexus of knowledge sharing and outcomes for all three key stakeholder groups; the public and private sectors and educators.

Specific successes mentioned: (Acting, Checking, Seeing, Planning and Doing)

- NOW achieved the skate park for kids. We managed to get broadband into Wirksworth. The monthly Farmers Market has been hugely successful. I'm proud of my involvement with the community fair. Everything I wanted introduced has come to the fore. Inference; stakeholder has engaged with wider community and used resources appropriately;
- The Northern Lights independent cinema is very successful. The owner brings in people from miles around. He is committed to Wirksworth. There are expensive holiday homes sleeping up to 14 people adjacent to the site at £383 per night and people are using it. Inference; supportive and nurturing approach connecting past to present;
- Open gardens in June is successful and contributes to charity;
- The Railway draws people in and enterprising schemes exist. We have got younger people moving in. New blood is coming through. The NOW AGM was attended by 20+ people and enthusiasm is evident - we have a new secretary who is a friend of mine. Inference; engaged the wider community and demonstrates a participatory approach;
- Our community quiz is magnificent;
- Our publications are great; Community Fayre is immensely successful and been going for 35 years. An ex-teacher is the chief editor. There are new people in Community Fayre; a journalist; a

psychology lecturer; a retired Guardian journalist. Inference; has engaged the values and beliefs espoused to develop storytelling that demonstrates power-sharing.

- Heritage is doing well. For example the Pilsley Pit has been done well. Chesterfield Canal also done well despite some hiccups with the route of HS2. We've had a decade of developing skills and much research has been done and obtaining the local community's buy in. Inference; adopts a mediation role with skills to the fore in resourcing and planning.
- We are adapting to a different climate and pulling in European money couched in terms of developing confidence and work ready outcomes. There is mission drift but caring people can navigate streams of funding. It's harder for small groups that are passionate but not wise.
- I feel a 'rosy glow' personally. If you make a successful application for funds then everyone's behind you and support a great idea and people want it (the Centre).
- The trauma of sorting out a brilliant idea was worth it. However no one now has any money.

ISSUE	RESOLUTION	IMPACT	OUTCOME	SPECIFIC DETAIL
Difficulty accessing regeneration funding for projects and community development (shared socio-economic capital, Putam,1195)	Skills and capacity capability within destination (Acting)	Targeting structures and infrastructure for business and new inward investment	Local capacity to manage various silo projects	An Independent cinema. A Heritage Railway
Enduring lifelong learning (Gibson, Lynch & Morrison, 2005)	Acknowledges contracted staff for special regeneration projects are truly mobile yet their legacy is embedded within the destination (Checking, Seeing)	Agile in the face of competing destinations and a rapidly changing external environment	On site expertise with evidence of prior experience	Wirksworth Heritage Association. Printed media and online resources to promote the destination
Resources (Finch,2012)	Open Access (Planning)	Improved benchmarking capacity and managing in a chaotic, complex and uncertain environment	Just in time solutions	Heritage projects. Improving experience of applications for funding.
New networks (Della Lucia & Franch,2014)	Created external partnerships (Doing)	Improved benchmarking capacity and managing in a chaotic, complex and uncertain environment	Better use of public funding at both destination and at the university	Heritage projects. Consumer expectations and perceptions research
Permanence of enduring skills acquisition community (Lemmetynen & Go, 2009)	Supportive University both academic staff and students (Doing)	Minimising budget overrun	Better use of government funding for both destination and university	Heritage projects. Emerging new business ventures; Farmers' Market, Skate Park for young people.

Tab.1 Shared Agenda Framework for the Learning Destination

Specific hurdles and interim failures: (Not yet Acting, Checking, Seeing, Planning or Doing)

- NOW tried to invigorate the Tuesday market. We got some flags and bunting and councillors had an opening ceremony and the following week it was dead again; it struggled. Inference; working to eradicate imbalance in power;
- A Literary Festival is planned. This will occur at a different time of the year (not September, June). NOW is not dead; it's the structure that has changed. We have a new person learning and featured a lot with festival. Contact has been made with schools. Inference; change management taken aboard and prepared to manage change;
- Priorities for the future include maintenance of what we already have. I accept that we are disparate and there are 'unders and over's';
- We need to bridge the gap. In past years the Festival didn't know and didn't care. There was inequality and now we are coming up with some ideas around the Literary Festival. More thinking and possible action relates to doing things for the whole town. We are not just addressing the needs of the underprivileged or the privileged. Inference; sharing power awareness;
- How difficult it is to involve younger people and what steps might be needed to get them into the Heritage Centre and volunteering. Difficult working with schools' timetables and not everyone wants to be involved;
- We never had support in the past other than the Town Council;
- We are 'nose diving' in tourism as no one wants to pay for it. The government is at fault as no one ways to pay for up skilling. People do not want a certificate they want to run a business. It is desperately sad that different governments come and go and say tourism is important but they would not support tourism unless it fits into local area and that's maybe only certain areas (where there's nothing to promote). I've seen this over and over again. Inference; engaging formal and informal ties within community and working with people before trying to change institutions;
- A broadband policy as an example working for rural areas. They would give advice not a grant. Needed for funding connections. First into on-line booking was excellent and a successful project which was expensive. Outcome driven with training sessions and visits to properties (were good);
- We don't get people into the town as we used. The post office has closed and people prefer to go out of town at the weekends. With the introduction of the Coop other retail struggles as a result. People park at the Coop to get petrol and don't used the Independent shops. I have no real answer to solving that problem. Inference; we can share power;
- There is evidence of poverty everywhere and I feel we are worse off now than a decade ago. London's making the laws and doesn't see the inequality. We have some nice Independent shops but those shops relate the struggles they're having;
- We have seen a rise in the number of second homes and holiday cottages and many opposed them. I prefer that young people occupy those homes and get onto the housing ladder. What did you learn from these?;
- There's still a big division between the haves and the have not's. Old and new (carnival versus festival). Nothing's really been achieved. Inference; we can leverage off incoming investors;
- Creative Futures were asked as consultants to undertake a private study with lots of suggestions but nothing was taken up and only the Town Hall improved;

- Festival no longer receives Art Council funding. 150 artists over 2 days, No one knows who will pay and doesn't help that a division exists between the haves and the have not's;
- Maybe there will be fewer artists and fewer displays. According to the Festival Chair they have done okay;
- One former project worker is currently working in the voluntary sector with caring services for older people;
- 'People don't want to learn lessons from the past' Wirksworth was never good at managing impact or the social return on investment practices. Inference; we can work co-operatively to break down barriers.

5 DISCUSSION AND CONCLUSION

There is a diverse range of perspectives on learning achieved through this case study. As has been demonstrated there are multiple angles to establishing the a priori conditions and a framework for a well-developed learning destination. The communitarian approach much espoused since Reaganomics and post Thatcher years (Putnam, 19905) can be used through the observation of structures needed to espouse and enable social capital. That has been well demonstrated in Wirksworth. The legacy of learning is embedded by the community project lobby group, New Opportunities Wirksworth and reflects the focus on inequalities and access to resources (again Putnam with elements of Bourdieu, 1986). The final route to becoming a true learning destination is represented through the articulation of resources, values and action using students and staff to provide repositories of new information derived from on-site research and embedded in open-source and on-line resources (Finch, 2012). European Union regional development funding is difficult to obtain and the learning from the project needs reviewing and then embedding in the public and private sector for future reference. Project leaders and contract workers in these funded projects are also difficult to obtain and to retain. The legacy in explicit and tacit knowledge is often lost. Concurrence on values and beliefs is essential prior to adoption and circulation of any development plans (Manidis, 1997). The reflections on equality of opportunity; the "haves and have not's"; divisions between groups within this community help reinforce the need for detailed plans built around shared values, practices and culture. Although Wirksworth's residents reflect above-average socio-economic and education scores compared to English averages there is very little evidence of capacity building, skills development and embedding new knowledge as part of the original plan (Cooper, 2015; Wiltshier & Edwards, 2014). Skills and training necessary for regeneration are assumed to be in plentiful supply. The evidence was that skills and training was fragmented, some sectors or silos were competing for skills and some residents were opposed to regeneration in principle (see Clark & Kippenberg, 2014). This reflected in the successes and failures indicated here. Community well-being and intangible benefits from regeneration are also important outcomes and often seen but not explicitly measured (Knox & Mayer, 2013). External political and economic drivers became important towards the end of the project. The literature indicates that externalities can and will jeopardise positive outcomes from centrally funded projects as risk cannot be mitigated in the case of the economic recession and global banking crisis (Coles et al., 2014). Perhaps a level of contingency could have been expected to be part of the original specifications to acknowledge risk areas where some projects within NOW! would inevitably suffer from public sector funding and inherently never be protected by private sector investment. What should be measured though regeneration projects in the learning are good governance, institutional organisation, quality of life, levels of enterprise and emergent and growing networks (Selada, Cunha & Tomaz, 2011). Social capital is infrequently discussed by stakeholders; the underpinning for shared social capital must surely derive from shared economic gains but this is implied and not explicit in this research. Many authors identified the relative strength of a

destination through the quality and effectiveness of collaboration, partnership and networking. The relationships established are across disciplines, in the vertical and horizontal supply chain and evidenced through the perceptions of quality and return on investment at the destination (see an example measured longitudinally, in Alberti & Giusti, 2012). The ability to achieve a measure of sustainability through collaboration is a strategic intent and plan in many rural location in Europe (see Hall et al., 2011). Unfortunately there are also examples where collaboration has not occurred and relationships have been fragmented and counter-intuitive to a learning destination (see an example from Portugal in Fonseca & Ramos, 2012). The supply chain in collaboration has occasionally also missed festivals and events as the cornerstone of bringing communities together using long existing beliefs and values (see Clifton et al., 2012). Special relationships over projects have triumphed where influential stakeholders can rise to support activity (Bordeaux wine centre, Cusin & Passebois-Ducros, 2015). A commitment to growing skills and a destination's capacity to improve business opportunities through regeneration was also evident in a further Scottish example (McCarthy & Doyle, 2011). In conclusion the need from the outset was for an agreed and shared agenda for all three groups of stakeholders that is driven by research-informed values and beliefs. We can see that the project utilised a myriad of objectives in different economic sectors. The actions planned were differentiated but the key was to acknowledge that difference and to mutually agree and support the diverse range of outcomes anticipated in 2001 (see for example Kania & Kramer, 2011). The framework conceived for future development is predicated on a focus on strongly reinforced outcomes for key stakeholders. The final significant area of concern and ongoing interest concerns the strength of networks, partnerships and opportunities missed for collaboration. These can include spatial, scalar, network, supply-chain collaborations (Lemmetynen & Go, 2009). Systems thinking would indicate that a failure to study and model developments from other locations has impacted network development (Checkland, 1981). A cyclical process based on the agreed values and beliefs, the capacity to adapt to change and skills base to enact change coupled to infrastructure and man-made and natural endowments are pre-conditions to the learning town (Figure1). Decisions on informed action accompanied by learning resources enable development through regeneration. Throughout the reflections in recognition of the need to reinforce new networks, both formal and informal learning, is evident. Learning from a plan-check-do-see-act approach in education is insufficiently embedded in the terms and conditions of the responsible charitable body NOW! Embedding into the regulations of the organisation this wonderful skills-set and enthusiasm is critical to the success of the learning town.



Fig.1 The Plan Check See Do Act Approach to Embedding Learning (after Srivannaboon, 2009)



Fig.2 Garden party



Fig.3 Wirksworth's Heritage

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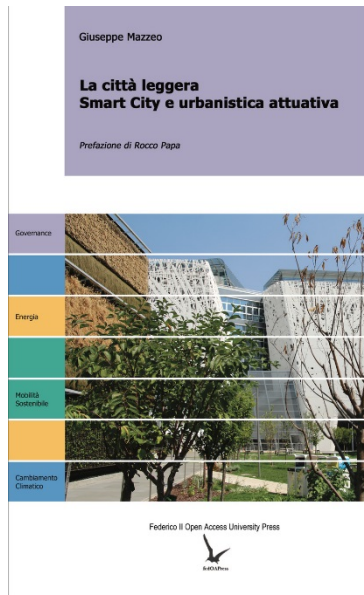
IMAGE SOURCES

Fig. 1,2, 3: created by the author

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Giuseppe Mazzeo

La città leggera Smart City e urbanistiche attuative

Smart City, Urban Planning for a Sustainable Future

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Abstract

Cities are in a state in which two opposing forces are acting on them: on the one hand the unabated urbanization process, on the other the evergrowing demand for real sustainability. The book proposes an urban planning response focused on the transformations of urban sectors to be achieved using innovative operative tools; for this aim the book defines the main features of this operative tools. The goal is to include in the cities innovative actions that can provoke a domino effect with repercussions on the entire urban structure. The book is divided in 5 sections. The first one addresses the issue of urbanization and the development of the urban systems, with the related implications in terms of resource consumption and concentration of people and functions. The second part discusses some models that explain the mechanisms of urban sprawl and the derived scenarios. The third part deals with one of the key nodes of the relationship between urban systems and environmental resources, namely the energy. The fourth part analyzes some international case studies to extrapolate recurring characteristics that can affect the operative planning. The fifth section focuses on the features of this new type of plan. fuel economy savings and incentives for the use of renewable energy sources and, on the other hand, to meet the new needs of transporting people and goods safely and efficiently.

Abstract

Le città sono in una fase nella quale due forze contrastanti agiscono su di esse: da un lato il processo di urbanizzazione che procede senza sosta, dall'altro la domanda di reale sostenibilità. Il volume propone una risposta in chiave urbanistica incentrata sulle trasformazioni di ambiti urbani da realizzare mediante strumenti operativi innovativi e ne definisce le caratteristiche principali. L'obiettivo è inserire nelle città azioni innovative che possano provocare un effetto a cascata con ricadute sull'intera struttura urbana. Il saggio si struttura in cinque parti. Nella prima si affronta il tema della urbanizzazione e dello sviluppo dei sistemi urbani, con le relative implicazioni in termini di consumo di risorse e di concentrazione di persone e di funzioni. Nella seconda parte si discutono alcuni modelli che spiegano i meccanismi di diffusione urbana e gli scenari che ne derivano. La terza parte affronta uno dei nodi cardine del rapporto tra sistemi urbani e risorse ambientali, ossia quello dell'energia. La quarta parte analizza alcuni casi studio internazionali per estrapolarne caratteristiche ricorrenti che possono influenzare la pianificazione operativa. Nella quinta parte si approfondiscono i caratteri di questo nuovo tipo di piano.

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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 3(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.

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03_URBAN PRACTICES

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

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04_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开，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_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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04_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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METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 3(2017)

REVIEW PAGES: WEB RESOURCES

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In this number

NEW PRACTICES AND EXPERIENCES FOR PLANNING THE RESILIENT CITY

Nowadays cities have to face several challenges, not only connected to potential shocks like floodings, heatwaves and earthquakes, but also related to daily stresses such economic and social inequality, crime, inefficiencies of public transportation, noise and environmental pollution, and so on. Hence, cities need to change their structures and design in order to improve their capacities to deal with those issues. In the last thirty years, urban planning has adopted concepts like Sustainable Development and Smart City (Morelli et al., 2013), aimed at defining solutions for solving the main urban issues and in order to plan more efficient and livable cities. More recently, a new reference concept is arisen, namely the Resilient City. Even if it has been defined in different ways, the Resilient City concept has several overlapping elements with the Sustainable Development and the Smart City, starting from its purpose that can include the purposes of the other two concepts (Arafah and Winarso, 2017; Hudec, 2017). Indeed, the Resilient City concept aims at growing the capacity of an urban system to deal with social, economic and physical challenges of the 21st century (100 Resilient Cities, 2017). In operational terms, the urban practices and experiences for developing resilient cities are fragmentary (Papa et al., 2015). Indeed, cities are investing in urban strategy for improving their resilience. Moreover, in the last year, several governance networks for making cities more resilient have been developed, mainly with the aim of addressing cities in the definition of resilience strategies. Since each city presents its own urban issues, each city defines a specific resilience strategy. This is due also to the lack of a shared definition of “resilience”. In accordance with this perspective, resilience could become a label to use in urban planning for defining an all-inclusive approach for facing the several challenges of the contemporary cities. Therefore, this section will illustrate websites of three cities - New Orleans, New York and Ho Chi Minh - that are investing in the enhancing of their urban resilience. In particular, those websites were created to illustrate strategies and actions that those cities are implementing to enhance their capacities not only to deal with climate change impacts but also with economic and social urban issues. The first website is RESILIENT NEW ORLEANS, developed by the City of New Orleans. It aims at illustrating and disseminating the ‘Resilient New Orleans’ strategy and its results. The second one is OneNYC that is the website of the strategic plan of New York City, called ‘OneNYC - Plan for a Strong and Just City’. The last website is developed by the Vietnam Climate Adaptation Partnership (VCAPS) and it illustrates all the results achieved by this partnership, such as also the Ho Chi Minh City’s Climate Adaptation Strategy.



RESILIENT NEW ORLEANS is the website developed by the City of New Orleans in order to illustrate the urban strategy adopted by New Orleans in August 2015, named *Resilient New Orleans*.

The *Resilient New Orleans* strategy is one of the last steps of the City of New Orleans adopted for improving its capacity to deal with current challenges, such as climate change. Indeed, after the Hurricane Katrina that in 2005 devastated the Gulf Coast of the city, New Orleans started to invest in several initiatives among which there is the definition of the Greater New Orleans Urban Water Plan (2013) for a more resilient urban development of the city.

Through the *Resilient New Orleans* the city is proposing pragmatic actions to set forth aspirations for the city that are:

- (i) adapting the city to changing natural environment;
- (ii) investing in equity;
- (iii) creating flexible and reliable systems;
- (iv) preparing for future shocks.

This strategy is the results of the combination of local expertise with global best practices, also the participation of the City of New Orleans to the network “100 Resilient Cities”.

Finally, the strategy will be implemented through the coordination of the Mayor’s Office of Resilience and Sustainability and the Chief Resilience Officer among partners and agencies and for integrating resilience in regulations, policies and practices, the Resilience Office will collaborate with the City Planning Commission and Hazard Mitigation Office to develop Master Plan and Hazard Mitigation Plan.

In relation to the contents of the strategy, the website is organized into five sections: *Intro*, *Visions*, *About*, *Get Involved* and *Voices*.

The *Intro* section corresponds to the website’s homepage and illustrates the three visions for 2050 of New Orleans that are:

- Adapt to Thrive,
- Connect to Opportunity and
- Transform City Systems.

Indeed, these three visions are better illustrated in the *Visions* section. In detail, each vision is synthetically described in a specific webpage through the definition of the main initiatives to implement.

In the *About* webpage, a description of the strategy and its implementation are reported. Moreover, in the page partners involved in the strategy and in the 100 Resilient Cities network are reported.

In the *Get Involved* section users’ website can put their own information - first name, last name, email and ZIP code – in order to receive information on the strategy. Moreover, for downloading the strategy, users can access the 100 Resilient Cities website in order to find out about other cities like New Orleans, involved in the 100 Resilient Cities network.

The *Voices* section illustrated ‘Stories of Resilience’ that tell about initiatives and actions implemented in New Orleans and oriented to a resilient development.

In all the sections at the bottom of the page, it is possible to link to the *About* section clicking on *About Resilient New Orleans*, to *Get Involved* through *Contact* and, to *Download the Strategy*, and finally to connect to social media such as YouTube, Facebook and Instagram.

Furthermore, under the section board, there is a string that permits to visualize videos on YouTube.

OneNYC ONENYC – THE PLAN FOR A STRONG AND JUST CITY <https://onenyc.cityofnewyork.us/>

OneNYC is the website of the strategic plan, developed by New York City and named Plan for a Strong and Just City. This plan is followed to *PlaNYC*, realised in 2007, and take into account some events like the economic recession and the Hurricane Sandy that interested New York. In particular, the plan aims at developing the future New York in relation with four principles that are Growth, Equity, Sustainability and Resiliency and it was developed with cross-cutting interagency collaboration, public engagement and consultation with leading experts of different fields. *OneNYC* is coordinated by the Mayor's Office of Sustainability in collaboration with the Mayor's Office of Recovery and Resiliency for its implementation.

The plan is organized into four visions that are:

- Our Growing, Thriving City;
- Our Just and Equitable City;
- Our Sustainable City;
- Our Resilient City.

The website is articulated into seven sections: *The Plan*, *Visions*, *Progress*, *About #OneNYC*, *Downloads*, *Speak Up* and *Contact*. The OneNYC's homepage contains frames of all these sections. In particular, through the top banner users can download reports on the progress of the plan and access to other documents (among the OneNYC plan), suggest improvements to the plan (linking to the *Speak Up* webpage), share the website through social media and access to all the contents of OneNYC website.

In particular, through the first section, it is possible to visit a page with a generic description of the plan. In such description issues, actions and ways of their implementation are defined. For reaching this webpage, it is possible also to select *About #OneNYC* from the menu. The *Visions* section is composed of four pages, each of them illustrates a vision of the plan. In particular, each vision's webpage is structured in further parts. Indeed, for each vision, there are different goals and they are deeply illustrated by their definition, the description of challenges and opportunities and initiatives already implemented or to implement in order to reach the goal. In the *Progress* section, all the initiatives implemented for each vision are reported. In particular, it is possible to select them both for all the visions and for each vision. Moreover, users can click on the initiative frame and a description appears.

The *Download* section permits to download five documents. The first one, *1.5°C: Aligning New York City with the Paris Climate*, illustrates how OneNYC is aligned with the Paris Climate Agreement in order to not exceed 1.5 degrees Celsius in 2050 while the second one is the *OneNYC plan*. Furthermore, it is possible to consult two reports on signs of progress recorded in relation to the plan in 2016 and 2017. Finally, the last document, *New York City's Roadmap to 80 x 50*, contains the New York's roadmap to achieve the reduction of greenhouse gas emissions by at least 80% by 2050.

Through *Speak Up*, users can contact the Office of the Mayor and express through a contact form their ideas for the future of New York. Indeed, there is a space in this form where the user can suggest 'one way to create a better New York City'.

The *Contact* section links to a webpage of the official website of New York City where all the 338 NYC's official social media channels are reported. In particular, all the social media channels can be selected by topic (e.g. Business, Civic Services, etc.), by type (e.g. Facebook, Flickr, Instagram, etc.) and by Office and Department.



The Vietnam Climate Adaptation Partnership (VCAPS)'s website illustrates the results of the VCPA consortium that assisted Ho Chi Minh City in developing their Climate Adaptation Strategy to develop the city and harbour towards the sea. It is interesting to note that the City of Rotterdam is a member of the VCAPS and it is sharing its knowledge and experience through the Rotterdam Climate Initiative for helping Ho Chi Minh City.

The website is composed of ten sections that are: *Home, Project, Products, Events, Project meetings, Working groups, VCAPS Members, Office Ho Chi Minh City, Contact and Links.*

While the *Home* describes, in general terms, the VCAPS consortium and its results, the *Project* webpage specifies its goal, illustrating in the climate conditions of Ho Chi Minh City, which is the approach and the methodology adopted and which are the project phases. In *Products*, users can find and download two of the main results of VCAPS consortium, the *Atlas* and the *Adaptation strategy*, and the project-presentation.

In the *Events* section, all the media events and news on the project are reported while in the *Project meetings* all the working group meetings organized to develop the Atlas and the Adaptation Strategy and the Action plan are described. The *Working groups* section illustrates all the groups involved in the development of the project. In particular, considering their interests' topics, the working groups are divided into four types: the Institutional one, the Spatial Environment one, the Infrastructure one and the Socio-economic one. For each working group, the aim and their components are indicated.

In the *VCAPS Members* section, it is illustrated the partners of the consortium that are composed mainly of Dutch consultant societies and institutions that are described as their role in the consortium in specific webpages. In the *Office Ho Chi Minh City* page VCAPS references (address, phone, etc.) are reported, while through the *Contact* pages users can contact consortium for questions or for having additional information.

Finally, in the last section there are some links to webpages connected to the VCAPS project, including the partners one.

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IMAGE SOURCES

The images are from: <https://www.orbitz.com/blog/2015/05/worlds-futuristic-cities/>; <http://resilientnola.org/>; <http://www.vcaps.org/en/>; <https://onenyc.cityofnewyork.us/>.

METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF
URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 3(2017)

REVIEW PAGES: BOOKS

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In this number

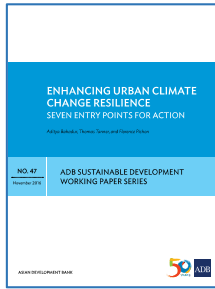
URBAN ADAPTATION STRATEGIES

The problems that cities face in the 21st century can no longer be dealt with the old solutions and tools. Urban Resilience is about facing and learning to adapt to hard challenges in ways that look towards the future. Most of the world's population now lives in towns and cities that are disproportionately located along coasts and rivers, and therefore faces substantial risks posed by hydrometeorological shocks and stresses. By 2050, the percentage of the world's population living in cities and towns will grow from 50% to 70%, urban areas in many cases retain high socioeconomic vulnerability, such as urban poverty, informal settlements, lack of municipal services, land tenure issues, etc., which are exacerbated by the exposure to climate-related shocks and stresses (United Nations, 2014). The urban paradox is evident in the hard and conflicting coexistence of dynamic growth and social exclusion in urban regions (Barresi & Pultrone, 2013). In the context of work on climate change, development, and natural hazards, resilience is generally understood to mean the ability of systems to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.

In the U.S., seventy-five cities have undertaken adaptation planning in the past decade, and a second wave of cities is starting to plan. The first wave contained a diversity of cities - large and small cities, in each of nine climate regions in the U.S. Coastal cities driven by concerns about sea-level rise - most prominently along the eastern seaboard, Gulf Coast, and San Francisco Bay - have been especially active in adaptation planning.

Some important challenges related to broader urban governance; understanding the political economy context, navigating the power structures, and dealing with drivers or barriers to change; and engaging with the complexities of treating cities as systems. This challenges requires regular feedbacks between urban systems, the need for action at different scales of governance, and the critical bearing of areas outside the political boundaries of the city. It's about being able to redefine goals and develop skills that make the urban systems stronger. Resilience is all about dynamic transformation.

According to these themes, this section suggests three books and reports that help to better understand the issue of this number: Enhancing Urban Climate Change Resilience. Seven Entry Points for Action, Essential Capacities for Urban Climate Adaptation. A Framework for Cities and Redefining the city Athens Resilience Strategy for 2030.



Title: **Enhancing Urban Climate Change Resilience. Seven Entry Points for Action**

Author/editor: Aditya Bahadur, Thomas Tanner, and Florence Pichon

Publisher: Asian Development Bank

Publication year: 2016

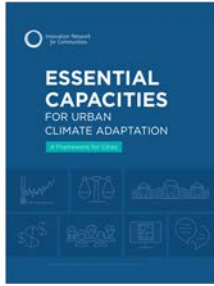
ISBN code: -

This report was realized by Asian Development Bank. This has given rise to a growing interest in the concept of Urban Climate Change Resilience (UCCR), which recognizes the complexity of rapid urbanization and uncertainties associated with climate change. Many development agencies are working carefully with their member countries and partners to develop these frameworks. This report highlights that while technology and infrastructure are integral to enhancing of resilience challenger, there are also some others aspects as those institutional, financial, spatial, and social. Looking across a vast body of literature on urban resilience and examples of practice reveals seven entry points for action that, in contextually specific combinations:

- Generating, sharing, and regularly updating data, information, and knowledge on how urban growth interacts or will interact with potential impacts of climate change is a first step for enhancing a city's ability to strengthen UCCR;
- Forward-looking urban planning tools, such as land use planning and development planning that allow adopting integrated, inclusive, and reflective approaches, provide a comprehensive and sustainable route to enhancing UCCR;
- Development processes associated with urban infrastructure and services, including water and sanitation, energy, transport and telecommunications, ecosystems, built environment, and health and social services, can strengthen UCCR by instituting new processes to ensure their organizational systems support resilience and recognize the interconnections among sectors;
- Individuals and institutions within city governments often know the city intimately, and building their capacity is critical for bringing UCCR to life;
- Community development processes that allow capturing diverse perspectives of communities, especially the perspectives of the most vulnerable, are essential for enhancing UCCR;
- There are huge needs for and potential gains from involving the private sector in enhancing UCCR;
- Catalyzing finance is key to the success of UCCR and includes finances available from different scales of governance: microfinance and local development funds; taxes, levies, and fines at the city level; earmarked and non-earmarked funding from provincial and national governments; and multilateral, bilateral, and philanthropic funding.

These seven points need to come together in contextually relevant combinations to strengthen the resilience strategies but usually treated as isolated sectors of activity. The report describes and outlines each entry point, the benefits, the range of practical actions to leverage the potential of this entry point for operationalizing pathways to Urban Climate Change Resilience, and the challenges of using each entry point. Some cities may have made more progress on some entry points than on others, revealing the need for customized solutions based on local factors. Over time, and with experience, the points proposed in this study may be refined and new ones added.

The report identifies a wide range of potential actions can be identified for private sector engagement in enhancing Urban Climate Change Resilience. Many sectors can be pinpointed for engagement, with three modes distinguished: Strengthen business continuity; Explore business opportunity; Consider business as a stakeholder; and Provide incentives for engaging the private sector.



Title: **Essential Capacities for Urban Climate Adaptation. A Framework for Cities**

Author/editor: Innovation Network for Communities

Publisher: -

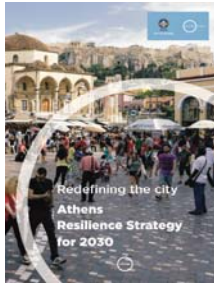
Publication year: 2017

ISBN code: -

This report developed by the Innovation Network for Communities (INC), a non-profit organization whose mission is to develop and spread scalable innovations that transform the performance of community systems. It presents a framework for urban climate adaptation that proposes seven essential capacities actions to implement climate adaptation of the cities, that should need to develop in the short and long term. This framework is based on a review of recent adaptation practice and is diverse from other frameworks because it focuses primarily on processes for adaptation planning and specific actions to take depending on which climate hazards a city. Listed below are the seven essential capacities for urban adaptation:

- Scientific Foundation. Capacity to assess and understand climate risks and vulnerabilities of city's built, natural, and economic assets and its populations, and use these analyses for ongoing adaptation planning;
- Communications. Capacity to communicate with and educate civic leaders and community members in ways that build and sustain a sense of urgency to adapt for climate changes;
- Equitable Adaptation. Capacity to make social and economic equity a central driver of the city's adaptation approach;
- Inclusive Community Engagement. Capacity to fully engage stakeholders and the public, especially vulnerable and underrepresented populations, in developing, implementing, and monitoring adaptation plans;
- Intergovernmental Alignment. Capacity to coordinate planning and action across governments at local, regional, state, tribal, and federal levels;
- Technical Design. Capacity to design, test, and implement adaptation actions that require engineering, legal, and other highly specialized details, as well as performance metrics for monitoring;
- Financial Resources. Capacity to repurpose, leverage, and obtain public and private funds to invest in infrastructure development and other adaptation actions.

The report identifies the new and enduring capabilities that cities need to build on the current knowledge level on the issue of urban adaptation. It focuses on climate adaptation preventive actions a city seeks to take in anticipation of climate hazards, which may also be called climate preparedness or climate resilience. The climate adaptation solutions, propose in this report, do not include the emergency response to the recent climate hazard events or the after-event process of recovery. It present cities with a useful framework, based on their practical experiences, for understanding how to grow and prosper in the face of increasing climate disruptions. In support of this information, the report provides best practices from cities that have been developing versions of the essential capacities, an overview of main adaptation planning frameworks, and links to useful tools and technical instruments. The project of the framework is based undertook four research activities. During the first phase, the research team interviewed thirty-five city practitioners, climate-adaptation experts, city-support and conservation NGOs, and funders of urban adaptation work. In the next phase, it is exanimated twenty-two U.S. cities' adaptation plans and six international cities' plans. The third phase is focused to literature review of guidance and tools for and recent studies and articles about urban adaptation planning in the U.S. cities. I the last phase of feedback. Selected city practitioners, researchers, and philanthropic funders provided feedback on our draft materials.



Title: Redefining the city Athens Resilience Strategy for 2030

Author/editor: City of Athens

Publisher: Rockefeller Foundation

Publication year: 2017

ISBN code: -

The City of Athens, a venerable yet intricate city of near 700.000 residents, part of a 3.75 million people metropolis, is for several years now facing a serious socio-economic crisis. Through concerted efforts, the city has managed to survive, to adapt and to transform into a more creative and collaborative city. The struggle is by no means over. This last year, calling on the insights and expertise of hundreds of stakeholders, from opinion leaders and academics to women migrants and the homeless, the city drafted its Resilience Strategy. This is a set of practicable actions which first of all strengthen and scales up what has made our city stronger: formal and informal networks and alliances. Athens Resilience Strategy offers a set of new integrated ways to prepare and protect our most vulnerable from future shocks and stresses that the city will face. Boosting the city's resilience means creating new as well as revitalizing existing open and green public spaces. This is vital for our densely built and populated city, threatened by both intense heat (climate change) and earthquakes. The city needs to become more forward thinking and proactive, turning its challenges into resources (vacant buildings, newly arrived refugee and migrant populations, energy and waste). Around such resources it will build capacity and start to develop economies that, together with tourism and the creative sector, will generate the city's future. Finally, the city will strengthen its government, through becoming more transparent and accountable, opening streams of communication, creating a digital agenda and innovation strategy. This work does not stand alone; it is supported by several documents that have been instigated by or produced in alliance with the city's resilience journey. The first one came out of the Athens Network Exchange in September 2016 under the title "Global Migration: Resilient Cities at the Forefront," and the second is a set of policy proposals "Advancing Equity for Athens' Resilience" created for the city by Transatlantic Policy Lab program as an offering and funded by the Bertelsmann Foundation. Lastly, the Athens Climate Change Adaptation and Mitigation Action plan was produced through a unique collaboration. These two documents together with the existing Athens strategic and operational plans, frame this resilience strategy. The resilience strategy is framed by four pillars, 65 actions and 53 supporting actions.

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 METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 3(2017)

 REVIEW PAGES: URBAN PRACTICES

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In this number

**PLANNING FOR SHARED MOBILITY:
TWO CASE STUDIES IN THE U.S.**

In recent years, economic, social and environmental forces have quickly given rise to the “sharing economy”, a collective of entrepreneurs and consumers leveraging technology to share resources, save money, and generate capital (Shaheen, 2016). From goods and services to accommodation and mobility, disruptive business models based on the sharing economy paradigm are emerging, shaking up the concepts of ownership and consumption.

Shared mobility (i.e. the shared use of a vehicle, bicycle, or other mode) is among the fastest growing segments of the shared economy. It can be defined as an innovative transportation strategy that enables users to gain short-term access to transportation modes on an “as-needed” basis (Shaheen & Chan 2015). The term includes a variety of services such as carsharing, bikesharing, ridesharing, and ridesourcing. More broadly, the term also includes alternative transit services, such as paratransit, shuttles, and private transit services, called microtransit, which can supplement fixed-route bus and rail services (Cohen & Kietzmann, 2014).

Shared mobility may have a transformative impact on urban areas as it can enhance accessibility by providing new mobility options, while simultaneously reducing driving and personal vehicle ownership (Baptista et al., 2014; Staricco, 2013). It can complement “conventional” public transport by helping provide first/last mile connections, alleviating pressure on transit demand in core service areas, and filling the service gaps at off-peak hours (Feigon and Murphy, 2016). Furthermore, the introduction of shared mobility options in urban areas can reduced the need for off-street parking space that can be used by local governments to create additional public spaces for non-motorized transport modes (McKinsey, 2012).

Given the potential disruptive impacts of shared mobility on urban transportation and, more in general, on urban quality of life and liveability, several cities and regions around the world have started incorporating shared mobility considerations in their “traditional” mobility plans. Furthermore, in some cases, they have also developed dedicated planning instruments (i.e. shared mobility action plans).

Shared mobility is gaining momentum in the United States where around 20 percent of US population used a shared mobility service in 2015, predominantly in urban areas (Dhar et al., 2017). In this context, the Shared-Use Mobility Center, a public-interest organization, is working with cities and regions across the US to foster collaboration between shared mobility stakeholders, and develop shared mobility plans. This contribution presents two relevant case studies of US regions that have recently developed a shared mobility

action plan with the support of the SUMC: i) the County of Los Angeles and ii) the metropolitan area of Minneapolis–Saint Paul.



LOS ANGELES COUNTY

With over 10 million inhabitants, the county of Los Angeles is home to more than one-quarter of California residents and is one of the most ethnically diverse counties in the U.S.. Despite its reputation as a car-oriented region, the county has made huge investments in recent decades to improve its once-non-existent public transportation system. Furthermore - due to the positive influx of public and private sector investments, and the introduction of new environmental sustainability initiatives - the county has experienced a rapid growth in carsharing, bikesharing, ridesourcing, and other forms of shared mobility. Despite this progress, however, the county still faces pressing issues related to traffic congestion, air quality and equitable access to transportation.

To maximize the public benefits of shared mobility and establish a vision for the region, the SUMC has recently realized the Shared Mobility Action Plan for Los Angeles County (SUMC, 2016). The plan is based on a two-year-period of research and interviews with local stakeholders and provides a roadmap that the county can follow in the forthcoming years. At the heart of the plan there is a 2 percent vehicle reduction goal that would remove nearly 100,000 private cars from the county's roads within the next five years by dramatically scaling up shared mobility in concert with public transit. To realize this goal, the plan includes six complementary strategies:

- Expand the Role of Transit. Transit is considered the backbone that support other forms of shared mobility. To consolidate this position, the plan envisions an integrated Transit Access Pass (TAP) fare system, based on real-time information technologies, able to create a seamless integration across all transport modes.
- Drive Cultural Change to Support Transit & Shared Mobility. Changing the prevailing perception of vehicle ownership is considered a fundamental prerequisite for the development of successful shared mobility policies. To make this change happen, the plan includes marketing campaigns aimed at promoting the positive benefits of using shared mobility options such as cost savings, increased physical activity and reduced stress.
- Emphasize and Expand Carsharing in All Communities. Carsharing has tremendous potential to increase transportation access in Los Angeles County, especially for non-work trips. To maximize this potential, the plan envisions a coordinated mix of actions, including: i) the provision of significant dedicated street space for carsharing, ii) the reduction of minimum parking requirements for buildings that offer carsharing vehicles on site for their residents, and iii) the expansion of the carsharing network in disadvantaged communities.
- Leverage the Region's Bikesharing Momentum. The LA bikesharing system has rapidly growth over the past few years. To leverage this momentum, the plan foresees a coordinated approach to scaling the region's existing and planned systems. Relevant actions in this direction are: i) make bike sharing more accessible by disadvantaged social groups; ii) build protected bike lanes, and iii) make existent and planned bikesharing stations more visible and easy to access.
- Experiment in Ridesourcing, Microtransit & Vanpooling. Some of the most innovative recent developments in the shared mobility industry have taken place in ridesourcing, microtransit,

carpooling and vanpooling. To foster these innovations, the plan suggests dedicating pick-up and drop-off zones for shuttles and ridesourcing services. This will support shared mobility initiatives, especially those that address jobs access for the service sector that is currently poor served by “conventional” transit.

- Build Out Mobility Hubs Countywide. Mobility hubs are the physical place where multiple modes converge in one location. In this regard the plan consolidates previous initiatives aimed at creating new mobility hubs in the county (or improving the existing one) by establishing guidelines for hubs design.

The plan also features a summary of anticipated outcomes, calls for increased public and private investments to expand transit and shared mobility, and identifies specific funding sources that local leaders can pursue to achieve the established goals.



MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA

Minneapolis–Saint Paul (commonly known as the Twin Cities) is a major metropolitan area in the US with a population of 3,684,92 inhabitants. The area has expanded outward significantly in the last decades as automobiles had made it possible for suburbs to grow greatly. In recent years, the region has made notable improvements to its public transit system, including launching bus rapid transit service and building a new light rail route that helped to “re-twin” the Twin Cities. It was also an early pioneer in bikesharing, carsharing and other forms of shared mobility. However, it has lost some ground lately if compared with peer cities such as Seattle and Denver that have been able to scale shared mobility and transit on a remarkable level. Furthermore, the region still faces pressing issues related to traffic congestion, affordability, livability and freedom of movement. With assistance from the McKnight Foundation, SUMC worked with leaders in the Minneapolis-St. Paul region to develop a Shared Mobility Action Plan for the Twin Cities (SUMC, 2017). At the core of the plan there is an ambitious goal of taking 20,000 cars off the road in the next five years (50,000 in the next 10 years). To realize this goal, the plan includes a portfolio of complementary strategies:

- Leverage the Metro Transit App to Establish a Data Clearinghouse. The Metro Transit app, and its planned integrations with various shared mobility platforms, has the potential to offer a myriad of benefits for the region such as real-time travel information, payment integration, targeted discounts and other incentives that encourage multimodality. To reach this aim, the plan supports the creation of an intermodal data platform. The data collected from this platform will be further used to better understand new travel patterns and identify new service opportunities for a variety of public and private transportation services.
- Stabilize and Grow Carsharing. The Twin Cities can take a number of actions to help strengthen the region’s remaining carsharing services and lay the groundwork for a more robust marketplace in future years. To this aim, the plan supports several coordinated actions such as: i) expand the carsharing network in disadvantaged communities; ii) reform local and state carshare taxes to be competitive with other regions where carsharing is successful; iii) create highly-visible carshare locations in conjunction with recent and planned street infrastructure projects.
- Pilot Flexible Transit that Focuses on Reverse Commute Challenges. Flexible transit services have the potential to address first/last mile issues, especially in suburban areas. Accordingly, the plan

supports the development of flexible services based on small and medium-sized vehicles and flexible routing that bring riders directly from a transit-heavy urban neighborhood to a diffuse but relatively high-density job center.

- Expand and Evolve Bikesharing The Twin Cities bikesharing system has rapidly growth over the past few years. However, the plan considers further expansions of the network, in coordination with the growth of the Metro Transit light rail network, in order to support multimodality.
- Optimize Parking and Street Space to Prioritize Shared Mobility. As long as parking is cheap and abundant, it will be difficult to encourage people to use sustainable modes. In order to encourage modal shift toward more sustainable transportation modes, the plan recommends reducing mandatory parking minimums for residential developments located near high-frequency transit lines. The plan also suggests using parking revenues to support shared mobility actions.
- Concentrate Efforts around Integrated Mobility Hubs. Mobility hubs are the physical place where multiple modes converge in one location, often clustered around a high-frequency public transit stop. In the Twin Cities, SUMC has observed several sites that possess high-quality transit service but missing essential components such as parking surface. In this regard, the plan identifies six potential locations that could serve as mobility hubs and defines guidelines to redevelop these locations.

The plan also calls for increased public and private investments to expand transit and shared mobility, identifies local, state and federal funds identifies funds that local leaders can pursue to achieve the established goals and provides suggestion for involving private-sector and community stakeholders.

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METHODS, TOOLS AND BEST PRACTICES TO INCREASE THE CAPACITY OF URBAN SYSTEMS TO ADAPT TO NATURAL AND MAN-MADE CHANGES 3(2017)

REVIEW PAGES: NEWS AND EVENTS

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In this number

SAFE-TO-FAIL ADAPTIVE URBAN DESIGN:
NETWORKING PRACTICES TO MINIMIZE THE
CONSEQUENCES OF FAILURES

Urban resilience is a concept that only recently has been actively undertaken by cities around the world. However, while the concept of resilience is intellectually intriguing, it remains largely unpracticed in contemporary urban planning and design, because its feasibility would need a mental switch in a system that is still predominantly deterministic. Becoming more resilient means that a city strives to enhance its ability to bounce back and grow even stronger and better in the face of the chronic stresses and acute shocks; it would mean to overtake a “fail-safe” mentality based on the promise of science and technology to be able to define a perfect urban model that could persist for generations in favor of the “safe-to-fail” paradigm based on the creation of adaptation scenarios that would allow to fail but control or minimize the consequences of the failure. (Kim et al., 2017). In this way, “resilience capacity is well-suited to an adaptive approach to planning and design, in which innovation is pursued through responsible experimentation, developing a culture of monitoring, and learning from modest failures” (Ahern, 2011). As such, city resilience is a continuous challenge for individuals, communities, institutions, businesses and infrastructure systems to address current trends and future transitions, trying to take advantages from the ongoing experiences. Furthermore, the monitoring of this citizens’ dialogue and integration of experiential and professional knowledge appears currently more feasible thanks to the potentiality of Social Media Geographic Information as source of knowledge for the planning practices (Massa & Campagna, 2014).

A fertile ground of application of this theory could be the URBACT program that, for about 15 years, has been the European Territorial Cooperation program aiming at fostering sustainable integrated urban development in cities across Europe. It is an instrument of the Cohesion Policy, co-financed by the European Regional Development Fund, the 28 Member States, Norway and Switzerland, whose mission is to “enable cities to work together and develop integrated solutions to common urban challenges, by networking, learning from one another’s experiences, drawing lessons and identifying good practices to improve urban policies”. Among the almost one hundred cities networks created within this program, Resilient Europe network, involving 11 European cities (Rotterdam, Glasgow, Antwerp, Bristol, Potenza, Ioannina, Thessaloniki, Burgas, Katowice, Malmö, Vejle), uses the innovative governance approach of Transition Management, a process-oriented methodology that enables social learning through iterations between collective vision development and experimenting. This form of co-creation process will be applied in every

city and across the cities for specifying “what city resilience means” for each city, to enable a translation and identification of resilience aspirations of stakeholders in a participatory vision development way and to formulate an Integrated Action Plan to pave the ground for achieving city resilience.

In this perspective were selected some international conferences taking place in the coming months, that will contribute to the networking of experience, knowledge and best practices on the urban resilience topic.



URBAN FUTURE _ GLOBAL CONFERENCE

Where: Wien, Austria

When: 28th February – 2nd March 2018

www.urban-future.org

As we said previously Transition management approach requires a collective vision able to drive the above mentioned mental switch, starting from those concrete experiences that currently seek to find innovative solutions of governance in cities. The URBAN FUTURE global conference is the World’s largest meeting point of “City Changers”: mayors, architects, mobility experts, city planners, scientists, sustainability managers, representatives from Start-Ups, environmentalists, innovation experts and many more will meet to share experiences and to implement their ideas for sustainable, livable cities. “Citizen engagement: how to make sure people don’t feel left behind”, “Climate protection and adaptation for city leaders”, “Cities going low-carbon: from freaks to mainstream strategy”, “Retrofitting and energy efficiency: how to pimp-up existing building stock”, “The invisible Smart City: the impact of social investment”, are some interesting titles of the almost 30 sessions of the conference divided in four main themes: living and city planning, communication & leadership, resources and mobility.



CITIES AND CLIMATE CHANGE SCIENCE CONFERENCE

Where: Edmonton, Canada

When: 5-7 March 2018

www.citiesipcc.org

The important role of the over described “City Changer” to address challenges of sustainability and resilience, may not be enough without the effort of the scientific community. In addition to adaptive design solutions, “research is needed to learn what makes knowledge about nature society interactions useful within both science and society to build resilience capacity and to guide society on a sustainable trajectory” (Ahern, 2011). It will demand a higher level of transdisciplinary collaboration in both research and practice than presently exists, especially regarding the pressing request for answers on the topic of climate change. On these premises takes place the Cities and Climate Change Science Conference that aims to inspire the next frontier of research focused on the science of cities and climate change. In fact, the primary goal of the conference is to assess the state of academic and practice-based knowledge related to cities and climate change, and to establish a global research agenda based on the joint identification of key gaps by the academic, practitioner and urban policy-making communities. The main themes of the conference are the followings:

- Cities & climate change (Imperatives for action);
- urban emissions, impacts and vulnerabilities (Science and practice of cities);
- solutions for the transition to low carbon and climate resilient cities (Science and practice for cities);
- enabling transformative climate action in cities (advancing science and advancing cities).



GREEN CITIES 2018

Where: Melbourne, Australia

When: 13-15 March 2018

www.greencities.org.au

The third important element to implement this Copernican revolution in the way of rethinking cities is industry. Green Cities, Australia's premier sustainability conference for the built environment organized by industry sector, could be an interesting opportunity to walk through this topic. The main questions of the conference are the followings:

- How can we spark sustainable change throughout industry and government to plan cities and communities needs to be reinvigorated to become resilient ?
- How will health and wellbeing impact the way we build our cities ?
- What can we learn about communities through reconciliation ?
- How will we win the race to renewables ?



RESILIENT CITIES 2018 THE 9TH GLOBAL FORUM ON URBAN RESILIENCE AND ADAPTATION

Where: Bonn, Germany

When: 26-28 April 2018

www.resilientcities2018.iclei.org

In September 2015 the Heads of State and Government and High Representatives, meeting at the United Nations Headquarters in New York, defined an agenda based on new global Sustainable Development Goals: the 2030 Agenda for Sustainable Development. It is a set of 17 universal and transformative goals and 169 targets balanced on the three dimensions of sustainable development: the economic, social and environmental; it represents a plan of action for people, planet and prosperity that seeks to strengthen universal peace in larger freedom.

After 2 years, ICLEI - Local Governments for Sustainability - intends to review the state of urban resilience and local implementation of the Agenda, by organizing the 9th Global Forum on Urban Resilience and Adaptation. Resilient Cities 2018 will focus on:

- Social cohesion: Building resilient urban societies;
- Resilient and resource efficient cities: transition toward a circular economy; and
- Reinventing business as usual: Private sector engagement in resilience building.

Congress themes also include current and pressing issues such as ecosystem-based adaptation, managing climate-related health risks, data and ICT resilience, and evidence-based adaptation planning.



ADAPTATION FUTURES 2018

Where: Cape Town, South Africa

When: 18-21 June 2018

<http://adaptationfutures2018.capetown/>

Thousands of cities in the developing world are facing rising pressures on institutions and infrastructure due to population growth and urbanization; developing country cities are now beginning to experience the added impacts of climate change. For those countries climate change is likely to increase already high levels of disaster risk. On these premises takes place the Adaptation Futures 2018 conference that will take advantage of its location in Africa to stimulate critical Southern perspectives on adaptation to inform regional and global policy, practice and research, and to increase the focus on the links between adaptation and sustainable development. The conference focus will be on how to move from problem diagnosis to successful implementation. It intends to investigate on community learning methods about making adaptation work, at different spatial, institutional and time scales, in different geographies, and in different political and economic settings. AF2018 is especially interested in exploring the following themes:

- Adaptation and development;
- South-South and South-North knowledge and learning;
- Adaptation and 21st century challenges;
- Collaboration, knowledge co-production and research into use;
- Financing of adaptation and climate resilient development;
- Learning from doing.

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IMAGE SOURCES

The image shown in the first page is taken from:

<https://berkonomics.com/wp-content/uploads/2015/07/man-falling-onto-safety-net-300x300.jpg>

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