TeMA

Journal of Land Use, Mobility and Environment

The three issues of the 12th volume will think again the debate on the definition and implementation of methods, tools and best practices connected to the evolution of the main scientific topics examined in depth in previous TeMA Journal volumes.

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THE TIMES THEY ARE A-CHANGIN'

Vol.12 nn. 1 - 2 - 3 april-december 2019

print ISSN 1970-9889 e-ISSN 1970-9870
University of Naples Federico II

TeMA Journal of
Land Use, Mobility and Environment

THE TIMES THEY ARE a – CHANGIN'
1 (2019) – 2 (2019) – 3 (2019)

Published by
Laboratory of Land Use Mobility and Environment
DICEA - Department of Civil, Architectural and Environmental Engineering
University of Naples "Federico II"

TeMA is realized by CAB - Center for Libraries at "Federico II" University of Naples using Open Journal System

Editor-in-chief: Rocco Papa
print ISSN 1970-9889 | on line ISSN 1970-9870
Licence: Cancelleria del Tribunale di Napoli, n° 6 of 29/01/2008

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Volume 12 N.1 (2019)

Volume 12 N.2 (2019)

EDITORIAL PREFACE: TEMA JOURNAL OF LAND USE MOBILITY AND ENVIRONMENT 1 (2019)

THE TIMES THEY ARE A-CHANGIN'

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In these last ten years, TeMA Journal has published several international studies and researches supporting the scientific debate on the urban complexity and the future challenges of urban areas. Thus, the three issues of the 12th volume will think again the debate on the definition and implementation of methods, tools and best practices connected to the evolution of the main scientific topics examined in depth in previous TeMA Journal volumes.

The section "Focus" contains two articles.

The first article, titled "Good Practices for the Management of Fragile Territories Resilience" by Federica Pignatelli (Italian National Institute of Planning), Mariangela De Vita (Construction Technologies Institute, Italy) and Pierluigi Properzi (Italian National Institute of Planning). The physical and socio-economic reconstruction process of a territory damaged by a traumatic event at first pursues the path of emergency management and subsequently the rehabilitation of the damaged areas. These political and economic strategies are still unsystematic, so it is difficult to foresee eithers long or short-term effects. This paper presents an analysis carried out on the city of L'Aquila following the earthquake of 2009, in which indicators were defined to assess and monitor the reconstruction process.

The second article "Green is the colour. Standards, equipment and public spaces as paradigm for the Italian sustainable city" by Giuseppe Mazzeo (Italian National Research Council), Floriana Zucaro (University of Naples, Italy) and Rosa Morosini (University of Naples, Italy). The characteristics of Italian cities made urban equipment a symbol of democratization and quality of the cities, due to the obligatory of minimum quantities of spaces for public services. The 50 years from the issue of D.M. 1444 allows expressing a series of evaluations on the role of the public equipment in the processes of urban transformation and governance. Starting from this analysis, the paper proposes adequate and updated solutions in terms of the evolution of the standards categories and their quantitative and qualitative characteristics, deepening the role of the urban facilities as potential sources of innovation.

The section "Land Use, Mobility and Environment" collects three articles.

The first article, titled "Success Factors of Smart Cities: A Systematic Review of Literature from 2000-2018", by Abdulaziz Aldegheishem (King Saud University, Saudi Arabia), deals with the concept of smart City as it has been argued within the scientific literature in order to find out drivers and success indicators on which future research policies are depending. The author points out several drivers, related to different aspects, that stimulate cities to be smart. The aim of the author is to contribute to the scientific literature by showing what are and how some indicators can improve the transition towards the "smart city" conditions.

The second article, titled "Submission Title: Analysis of the first urban regeneration area in Kocaeli after Gölcük earthquake by using zoning plans", by Burcu Aslan (Kocaeli University, Turkey) and Cankut Dağdal İnce (Kocaeli University, Turkey). The natural disasters can be unpredictable, the issue of preparing cities for natural disasters, planning cities and regulating laws accordingly are becoming increasingly crucial. Urban regeneration activities are one of these preventions taken in this purpose. It is observed that countries such as Turkey, faced with natural disasters intensively, suffer from serious physical, financial and moral losses. It

is important not only to make urban areas more resistant to disasters but also to design according to social, economic and ecological criteria to make more livable. In this study, social, health, green, transportation and educational areas of the first urban regeneration area in Kocaeli were examined in terms of the basic needs of the city.

The third article "Impacts of Land Disputes on Community Development", by David Ngwoke Mbazor (Federal University of Technology Akure, Nigeria) deals with an important issue especially for developing and transition countries: the issue of impacts from land ownership on urban and infrastructural development. Through the statistical analysis conducted on 317 questionnaires of the Inyimagu community in the state of Ebonyi in Nigeria, the paper proposes solutions including the review of land law.

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 the Resilience City and the Fragile City. In particular, the Web section by Rosa Morosini describes three web resources of: (i) The Euro-Mediterranean Center on Climate Change; (ii) Central and Eastern European region web for Biodiversity and (iii) State of the Planet. The Books section by Gerardo Carpentieri briefly reviews three relevant books related to the Issues' theme: (i) Outer Urban Public Transport. Improving accessibility in lower-density areas; (ii) Autonomous vehicle ride-sharing services and (iii) Environmental and territorial modelling for planning and design. The Law section by Maria Rosa Tremiterra keeps readers up to climate change adaptation plan with an overview about the Italian regional context (Lombardy and Emilia-Romagna regions). The Urban Practices section by Gennaro Angiello presents two case studies of planning for digital transformation at the municipal level: (i) Barcelona (Spain) and (ii) Baltimore (Unite States). The News and Event section by Andrea Tulisi, select conferences deliberately deal with different issues not necessarily related to the theme of resilience, but which basically question on the future of cities.

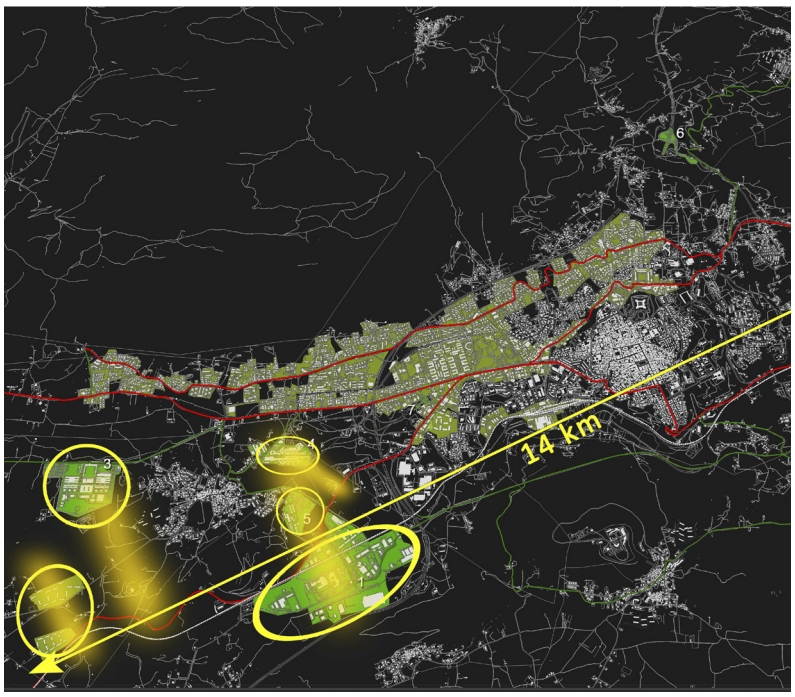
TeMA
Journal of
Land Use, Mobility and Environment

TeMA 1 (2019) 5-30
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5837

review paper received 1st February 2019, accepted 29th March 2019

www.tema.unina.it

How to cite item in APA format:
Pignatelli, F., De Vita, M., Properzi, P. (2019). Good practices for the management of fragile territories resilience. *Tema. Journal of Land Use, Mobility and Environment*, *12*(1), 5-30. doi: http://dx.doi.org/10.6092/1970-9870/5837



GOOD PRACTICES FOR THE MANAGEMENT OF FRAGILE TERRITORIES RESILIENCE

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ABSTRACT

Italy is a territory frequently affected by natural disasters that have a huge impact on urban transformations. The physical and socio-economical reconstruction process of a territory damaged by a traumatic event at first pursues the path of emergency management and subsequently the rehabilitation of the damaged areas. These political and economic strategies are still unsystematic, so it is difficult to predict either long or short term effects. This paper presents an analysis carried out on the city of L'Aquila following the earthquake of 2009, in which indicators were defined to assess and monitor the reconstruction process. The method used to define the indicators is 'absolute', in such a way as to represent a replicable model that can be adapted to different territorial and emergency contexts. Furthermore, the set of indicators proposed can be used not only to monitor the reconstruction process, but also to guide public policies and to suggest shared strategic guidelines, not originated by the urgency of after-shock conditions. The proposed model is a tool to be used from the early stages of reconstruction, in order to predict the outcome of the reconstruction itself. In this way, it is possible to manage urban transformation in a coherent and organic way in all its phases by adopting a single tool. The use of the model shown in the research also makes it possible to enhance the resilience of a territory by exploiting its intrinsic characteristics.

KEYWORDS:
Reconstruction Indicators; Post-earthquake Reconstruction;City Resilience;Territorial Transformations; Fragile Territories Management; Guide-lines

TeMA
有关土地使用、交通和环境的杂志

TeMA 1 (2019) 5-30
print ISSN 1970-9889, e- ISSN 1970-9870
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review paper received 1st February 2019, accepted 29th March 2019

www.tema.unina.it

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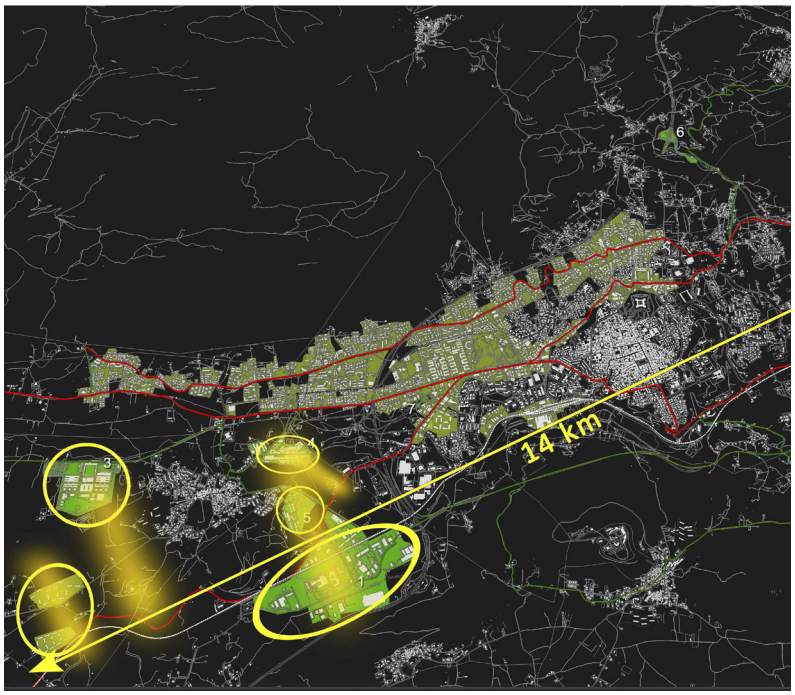

管理脆弱区域恢复能力的有效措施

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摘要

意大利的国土频繁遭受自然灾害的影响，这对其城市转型造成了极大的影响。在对遭受破坏的区域进行物质和社会经济重建过程中，首要任务是应急管理的建设，其次才是对受损区域的复原。而重建过程的政治和经济举措仍处于无组织状态，因此难以预测其长短期效果。本论文就2009年地震之后的拉奎拉市（L’Aquila）展开分析，制定指标以评估和监测重建过程。用于制定指标的方法为“绝对法”，以此呈现一个适用于不同区域和紧急情况的可复制模型。此外，文中提及的一系列指标不仅可用于监测重建过程，还可针对非灾后紧急情况为公共策略提供指引，以及提出共用的战略指导方针。该模型是一种可用于早期重建阶段的工具，旨在预测重建结果。这种方式能够通过单一的工具，对城市转型的所有阶段以连贯且有机的方式进行管理。对研究中所示模型的运用还可利用区域的内在特征以增强其恢复能力

关键词:
重建指标；地震后重建；城市恢复；区域转型；脆弱，域的管理；指导方针

1 INTRODUCTION

In recent decades, politics and research have confronted each other to reduce the impact of disasters on society: international agencies and national governments have begun to define clear objectives and commitments for disaster reduction. The Hyogo Framework for Action (HFA, 2005-2015) and the subsequent Sendai Framework for Disaster Risk Reduction (SFDRR, 2015-2030) represent fundamental steps in this sense. The policy and the global research area by which nations are trying to reduce the vulnerability is therefore "Disaster risk reduction" (Aitsi-Selmi, 2015). In the last years DRR has been strictly related to resilience, that assumes a key role in promulgating worldwide vulnerability reduction (Paton & Johnston 2017). The substantial effort among global agencies in trying to mitigate the disastrous effects was accompanied by abundant academic discussions and analyses on both "DRR" and "resilience". The current academic debate and discussion do not currently show clear signs of convergence towards a concerted series of concepts to be used in practice. However, the relation between the reduction of disaster impacts and resilience has been deeply argued by T. R. H. Davies and A. J. Davies (Davies & Davies, 2018). Italy is characterized by complex urban areas and territories, which derive from long processes of urban transformation determined not only by social and economic reasons but also substantially defined by natural calamities. The need to 'rehabilitate' the places devastated by traumatic events, immediately poses the problem of intervention modes, which widely depend on the political and strategic choices of the public administration. To this date, there is a lack of operational procedures that are able to conduct the reconstruction process in an organized and coherent way, from the first phases of emergency management to the completion of the reconstruction process – that is physical, social, economic and cultural. The strategic choices are determined by the outcomes of this process. These currently appear to be unpredictable because they are the result of a management lacking in the method. Governance actions, in the attempt to find a balance between eliminating dangers in the immediate after-shock and preserving the physical nature of places, should not be conditioned by the availability of resources. What really happens is that the economic issues begin, already from the first stages, to condition the future structure of a territory (Fiorani, 2018), also because of the fact that the strategic choices are mostly made only during full emergency rather than in anticipation of an event. With regard to the architectural scale, the intrinsic adaptability of Italian cities is evident in the numerous transformations, which followed the frequent traumatic natural events. These have been able to preserve the features of historic buildings and there contexts. In fact, the authentic preservation of historical architecture allows us to better understand and interpret various aspects of considerable importance, e.g. materially documenting both the previous vulnerabilities and the ability to adapt to traumatic events that have occurred in the past (Bartolomucci, 2018). Transferring this to a larger scale, it would be reasonable to state that the Italian territory, and the Italians themselves, have a 'natural predisposition' to resilience that has facilitated the adaptation of a huge cultural heritage - which includes buildings, historic centers and landscapes - to a more modern way of fruition and with renewed potential. Recognizing the quality of resilience to the Italian territory is also possible thanks to the weak definition that is attributed to this concept from both scientific literature and executive practice, with which the processes of transformation and enhancement of a territory are tackled. Indeed, Rizzi et al. highlight how over time the concepts of risk management and vulnerability assessment are evolving towards a direction that abandons the reduction of the city/territory fragility, to the benefit of its ability to adapt: in this adaptability resides the degree of resilience (Rizzi, 2017). Borsekova et al. state that resilience of cities can be perceived as a "roof" or "umbrella" of an urban system that is formed by four main pillars – economy, society, institutions and environment – and these pillars stand on the foundation stones of adaptability, robustness, flexibility, resources, inclusiveness, redundancy and integration (Borsekova, 2018). Therefore the DRR seems to be the best defined and understood term, perhaps due to its relationship with the consolidated discipline of Risk Management; clarity in the use and meaning of "resilience" is less obvious. The lack of clarity on the concept of resilience can be associated, in a first phase, with the impossibility of quantifying its dimensions, due to the

qualitative properties that are not measurable and which are usually attributed to them. If the resilience must be one of the standards for determining the ability of a territory to adapt in relation to its risks and fragility, it must necessarily be measurable, as all the others standards. For this reason, in recent years scientific literature has highlighted the need for the identification of a method and a multidisciplinary and interdisciplinary approach to planning, which the sole "Regulatory Plan" is not be able to guarantee. For this purpose, different IT platforms and models have been set up in an attempt to unify and manage knowledge through dynamic control tools. A study (Di Lodovico & Di Ludovico, 2017) reports the analysis of 8 platform models developed to allow and facilitate the interaction between different actors in the transformation project of an urban context, integrated with sensors for monitoring or supported by appropriate indicators. Furthermore, D'Ascanio et al. illustrate how resilience is becoming a necessary component for the achievement of sustainability standards set by E.U. for Smart Cities (D'Ascanio, 2016); the transition between Smart City and Smart Territory is possible thanks to the use of enhanced and at the same time simplified governance tools (Di Ludovico, 2014). In this paper a methodology for the definition of a set of indicators is presented. The method shown can represent a guide in post-disaster reconstruction processes. The need for the development of this methodology originates from the earthquake that hit the city of L'Aquila in 2009. On the basis of the data obtained from the analysis of the emergency and post-emergency phases, it was possible to identify a replicable model for assessing the reconstruction process and for disaster management. This method is based on the choice of indicators presented by the research, suitable for use for the definition of the strategic and operational lines of intervention also.

2. TOOLS AND METHODS

That natural disasters occur is undeniable. Preparing to cope and react in a best way is essential. According to Molavi (Molavi,2018), a resilient city can survive after a devastating trauma. The concept of resilience was initially both associated and placed in opposition to the concept of vulnerability. The strategies adopted to reinforce the resilience of a territory were therefore aimed at reducing its vulnerability. Subsequently, within the scientific debate, resilience was associated to a broader vision and is thus no longer bound to the reduction of vulnerability only. For Colucci (Colucci, 2012) the capacity of a territory to be resilient depends mostly on the degree of organization in a territory at the stage prior to the event. In fact the better prepared the system, the quicker it will return to normality. The integrated use of appropriate management tools is necessary to achieve a resilient city vision. The indicators are qualitative and quantitative measures resulting from the facts systematically observed which describe the characteristics of certain phenomena analyzed in order to allow their evaluation (Martinez & Dopheide, 2016). In recent years, the management, monitoring and evaluation of a post-disaster reconstruction process are emerging topics in the field of scientific research. The main challenge presented to local governments is the effective management of both the emergency phase and the urban and territorial transformation process linked to the physical reconstruction of homes and infrastructures and to economic and social recovery. Until recently only few researchers have attempted to synthesize the entire reconstruction process. *Reconstruction following disaster* (Hass,1977) is one of the few case studies that has analyzed a reconstruction process completely. Hass, Kates and Bowden in their research state that, as result of disaster, reconstruction actions are more effective and easy to achieve if there are existing intervention policies and action plans. Another significant contribution to literature on Reconstruction was a 1998 publication by the American Planning Association "*Planning for Post-disaster Recovery and Reconstruction"* (PAS Report, 1998). According to the researchers, the reconstruction process would have more chance of succeeding if the cities were already equipped with a reconstruction plan within the existing planning instrument, in order to reduce the possibility of decisions that could limit the future development of the territory affected by the disaster. There is an existing inherent trend in the search for a model that could be useful for public administrations to define in advance the priorities of a reconstruction process. It can be

said, however, that most of basic literature does not deal with the Process of Reconstruction in its entirety, but almost always focuses on certain aspects and is so lacking in many respects. The use of indicators in the monitoring of the urban transformation process can be considered a method of efficient management of city/territory fragility, as they are able to describe and evaluate multiple parameters and variables that exist, such as the different geographical scales and the different timing of the phases related to the event (emergency-reconstruction). "Furthermore, the use of indicators, in addition to encouraging the development of basic knowledge and hypothesis testing" (Chang, 2009),"guarantees objectivity in process analysis and allows comparison between different case" (Shohei, 2007). It must be noted that literature on these issues is very scarce. In a study Saporiti et al. (Saporiti, 2012) hypothesize a panel of indicators able to assess the degree of recovery of a territory by placing the problem at different levels, including the global and the local, the individual and social/community spheres. The contribution proposed takes into account the current debate within the urban planning discipline, which revolves around the refusal of the plan as a promoter of development. For this reason, "now the traditional paradigm of regulation seems obsolete" (Calafati, 2014). For these reasons, the management of the development trajectories is entrusted to the same Set of Indicators which is meant to monitor the reconstruction process. This paper suggests a planning model that helps to overcome the system provided for by Law 1150/42 and which provides definite principles and development guidelines. A simplification of the system which has in the 'Indicators' a flexible and adaptable instrument is thus predictable. The Set of Indicators will guarantee the future vision of the territorial and urban layouts, because it is, at the same time, both a frame for urban policies and a reference table for the evaluation of the urban transformations begun by the process itself. The proposed method uses the Indicators not only to monitor an ongoing transformation process, as described in the case study of L'Aquila, but also to guide the initial phase of definition of the Strategic Lines and actions of the reconstruction. The effectiveness of the method presented consists also in the possibility of considering all the dimensions of the system, physical, economic, social and not only the urbanistic dimension.

3. URBAN TRANSFORMATION IN POST-EMERGENCY CONTEXTS: THE CASE STUDY OF L'AQUILA

On the 6 April 2009, an earthquake of magnitude 6.3 Richter hit a large portion of the Abruzzo region in Italy. The greatest damage occurred in the city of L'Aquila and in the 20 neighboring towns, affecting an area in the Apennines with a significant industrial presence and a vast rural presence. The total population involved (1 January 2009) was 144,415 persons, equal to about 11% of the regional population and 0.2% of the national population (CRESA, 2011). The buildings damaged or destroyed, only in the municipality of L'Aquila, were between 10,000 and 15,000, thus causing the temporary evacuation of about 72,000 inhabitants and leaving about 67,500 homeless. More than 50% of the 'crater'[1] population resided in the Municipality of L'Aquila alone. This occurred together with the effects of the economic crisis that began in 2008 and continued in the following years.

3.1 THE SOCIO-ECONOMIC SYSTEM AND THE NEW URBAN SHAPE

For more than the last decade in L'Aquila, a very weak economic development has been taking place, made uncertain by the ongoing profound institutional and economic changes. Consequently, once the factors that had generated a development trajectory over the past decade had been exhausted, the city found itself in a phase of economic deadlock to which local institutions did not give much importance, trusting in the economic stability that the role of administrative and university city seemed to guarantee. During the decades preceding the earthquake, the economy of this territory was characterized by a poor integration between the

[1] "Cratere" and "Cratere Sismico" describes in Italian the list of municipality damaged by an earthquake.

manufacturing sector and the other sectors, including incomes deriving from Public Administrations and apartment rentals. The development of the University had helped to create the detachment between sectors. The local economy tended to exploit the position revenues. The result was a high degree of fragmentation, also due to the lack of coordinated strategies. The earthquake struck a city that was in a phase of economic stagnation, due also to the international economic crisis of 2008, and without a certain strategy of development. The earthquake accelerated the processes of transformation of the socio - economic structure. These are weakening the innovation and development capacity of the city and its territory. This is because the focus of decision-making processes has been addressed towards the reconstruction of the physical system, overshadowing the economic development issues. The infrastructures comprising both public and private building assets were damaged. It is particularly difficult to quantify the damage linked to production activities. In fact, in addition to the buildings, the damage suffered by equipment and machinery, or those resulting from the loss of stocks, must be considered. At the same time, the indirect damages deriving from the drop in demand due to the partial or total interruption of activities must be estimated. In addition, the loss of revenues resulting from the cancellation of orders and the damages related to the costs of relocating production and / or service activities have to be considered. More than 50% of the total active units present in the 57 Municipalities of the 'Cratere sismico'[1] are concentrated in the Municipality of L'Aquila. Before the earthquake, from a spatial point of view, L'Aquila was a city built in parts. A polycentric dimension held together the multitude of hamlets and inhabited centers - some large (Paganica: 5,000 inhabitants; Pianola: 1400 inhabitants) and others far from the main nucleus (Arischia: 8 Km; Assergi: 14 Km); a linear dimension, constituted by the settlement system located along the Aterno valley, extends for about 14 km. At the same time a diffuse and porous dimension coexist, and this is represented by urban voids, abandoned areas and important natural reserves. In this differentiated system, the identity recognized by all the citizens of Aquila who lived inside the ancient walls and in the hamlets, was the city's historical center. With respect to the historical center, in the years of the post-war construction expansion, the city was disposed to the east and to the west in an initially balanced manner and then, over the years, hierarchized and unbalanced towards the west. During the eight *LaurAq* workshops, held in L'Aquila in June 2010 following the analysis of the transformations that affected the city of L'Aquila after the earthquake, seven definitions of the city have emerged:

- '*città coerente*' (coherent city): that part of the city built within a system of shared rules, which has maintained a relationship of coherence in its different parts. It is the historical part of the city that extends its perimeter just outside the ancient walls;
- '*città consolidata*' (consolidated city): the city where the coherence has disappeared but within inside a homogeneity of the urban structure it is still recognizable, but that was deficient even before the earthquake. It extends its perimeters close to the highway that constitutes its invisible limit;
- '*città in formazione*' (city in progress): the residue of an unfinished plan. It is discontinuous within the urban structure that has different densities due to a significant presence of empty spaces, abandoned spaces and without a definite destination. It includes the outermost suburbs to the east and west;
- '*città dellefrazioni*' (city of hamlets): plays an important role because the polycentrism of the hamlets, originally failing, has been strengthened as a result of the earthquake;
- '*città dell'emergenza*' (emergency city): born in opposition to the voids generated by the various 'Zone Rosse'[2], it was built in five months without a settlement rationality. It thus constitutes a difficult urban problem due mainly to its size (about 18,000 inhabitants), the consumption of soil and its social and economic issues (Fig. 1.a);

[2] The " Zone Rosse" are devastated areas forbidden to the general public.

- '*città lineare'* (linear city): pre-existing to the earthquake and derived from the industrial locations of the '60s, today is emphasized by the new 'C.A.S.E.'[3] locations and from the relocation of urban and territorial equipment in industrial agglomerations. This Linear City has determined an erratic and ungovernable mobility, because of lack of a linear infrastructure of public transport (Fig. 1.b);
- '*città dello sprawl'* (sprawl city): following the earthquake, there was 'an explosion' and a redistribution of population and facilities. This dispersion in the territory is underlined by the sprawl - 800 authorized buildings and as many unauthorized (data from L'Aquila Municipality 2011) emerged from the municipal deliberations that were liberalized. The construction of residences and productive activities in the municipal territory was carried out, in derogation of environmental landscape restrictions. The metabolization of these areas is still particularly difficult (Di Cristofaro & Pignatelli, 2011). This has happened because the phenomenon of urban sprawl has been recognized as one of the main anthropic threats with regard to natural landscapes. However, it is a theme only marginally addressed within the process of local development management (Zullo, 2015) (Fig. 2).

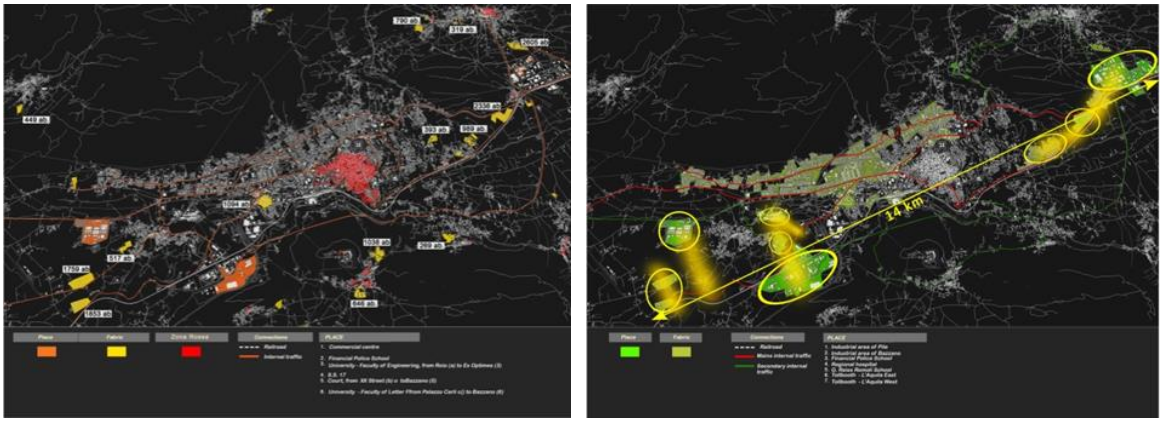

Fig. 1 (a) Emergency city (left); (b) Linear city (right)

The earthquake caused a weakening of stratified urban balances with long-lasting and difficult-to-contrast effects. Thus there was a break with the existing urban network and its morphogenetic role. The subdivision of the city in the seven cities listed above, has led to a distortion of the functional mix, a banalization of community living spaces and a loss both of proximity relations, which constitute the binding of community life, and urban relations between the different parts of the city, causing a weakening of the system of public spaces and an increase in the erratic mobility.

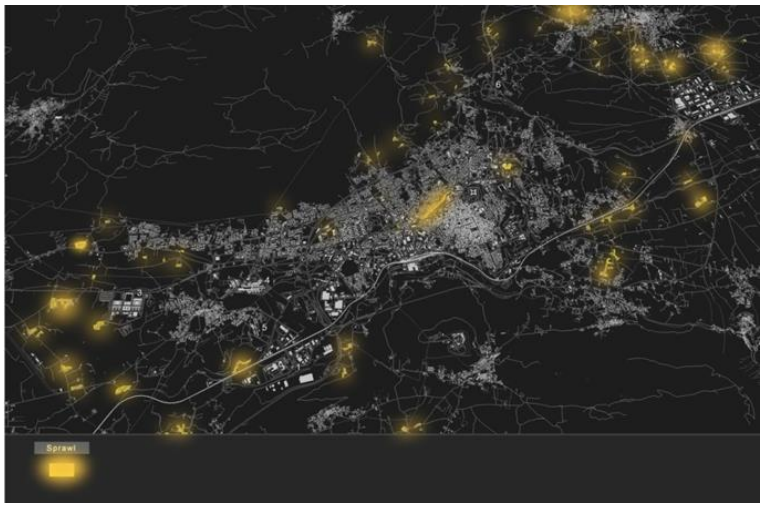

Fig. 2 Sprawl City: the sprawl is highlighted in yellow

[3] "C.A.S.E." this is an acronym describing emergency temporary housing.

3.2 THE PROCESS OF RECONSTRUCTION, GOVERNANCE SYSTEM

The Reconstruction of L'Aquila was proposed in the aftermath of the earthquake of the 6 April 2009 as a particularly complex issue both for the uniqueness and thesize of the phenomenon - the devastation of one of the most important andextensive historical cities of Central Italy – and the recostruction itself.This is because the recostruction is not reconectable to the traditionaldisciplinary systems. This aspect especially has led to a reflection on the adequacy of the discipline in case of emergency processes and on the congruence of a traditional approach to the issue/problem (regulatory and forecasting) of reconstruction, which for its significant exemplarity and uniqueness misses in the experiences of strategic planning and in advocacy planning reference solutions. The themes of economic reconstruction of the affected communities (in l'Aquila this is an extremely complex matter and it is rooted in terms of identity and local characterizations) and the integration of the economies in crisis again due to the earthquake. The original economies must compete with new and aggressive economies of reconstruction. The management of these processes has tried to find its solution in Governance, defined by ordinances and decrees. (LAURAq, 2010). Within the process of reconstruction distinct phases emerge. In the early days following the disaster, the Central Government issued a comprehensive regulatory framework. This phase began with the enactment of Decree Law N° 39 of 28 April 2009 an Law 24 June 2009 N° 77. This was a primary legislation which envisaged General sectors of intervention and that gave impetus to two successive commissarial management models, until the apllication of Law 134/2012. This norme marks the third and final phase of reconstruction, which decreed the end of the State of Emergency by returning the management by a Commission (3 years) to an ordinary regime after a long time. This management has produced an acceleration of Private Reconstruction. Even so, notwithstanding the semplifications introduced, a sliding must be registred of the predictions made in the report presented Parliament by the STM[4], wich indicated the year 2022 as the year in wich work wold be concluded. This failure can be attributed to the interpretation of an exclusively programmatic nature of the reconstruction plan, introduced by the Law 77/2009. This erroneous interpretation has resulted in the inefficiency of the Law. The case of the city of L'Aquila may be read as a metaphor of urban disciplinary insufficiency that the scenario of the earthquake has sent into crisis (Properzi & Di Ludovico 2018).

4. THE RECONSTRUCTION OF L'AQUILA: LOOKING FOR A PERSPECTIVE

The process of reconstruction is an issue that spans various sectors, both public and private, and intangible assets, economic and social. In the city of L'Aquila the management of the territory did not have a guiding vision; the proposals and the instances were found to be inefficient when coping with the ever greater problems encountered within the city lifestyle. This inefficiency was found also in the Process of Reconstruction of both physical and intangible relations (Iagnemma & Pignatelli, 2013). It follows that the Reconstruction Process establishes a different perspective with which to view the city and his Government, referring to the various areas of planning and using what is called an integrated approach. The integrated approach implies the need to address the many aspects that affect the Urban Governance of the reconstruction simultaneously, in order to form a collective strategy within which to develop policies and management interventions. For this reason, the essential role is played by strategic planning, which must act on various aspects of the process. The words 'strategic planning' refer to a planning model that involves a project action where the boundaries between urban planning and management policies are weak and mostly do not have relevance to the goals that the reconstruction gives. In Italy the Regulatory Plan, intended as a land management tool, can gain form and content. Since the early '90s, in our country an evolution has been taking place that is making the Regulatory Plan more and more flexible by means of regulatory functions and also with strategic and address functions. The Regulatory Plan is now increasingly seen as a local development process which sees spatial

[4] "STM" StrutturaTecnica di Missione constitutes in L'Aquila(Italy) the body at the base of the commissarial management models

planning interacting with economic development. Regardless of what is happening at the regulatory level, it is interesting to reflect on the opportunities that this transformation entails.

The complexity of contemporary Planning that embraces diverse areas inevitably refers to a participatory logic, of which the same building process is an integral part. This is not to speak about mere cooperation between institutions or coordination skills, but organic and mandatory participation by all the territorial Governments. There are all those actors that already provide their views on the choices of planning in separate locations, and that should instead assess the compatibility of the proposed spatial planning on the basis of shared cognitive frameworks (INU, 2009). Management models for emergency and reconstruction in the city of L'Aquila fluctuated between governance and government. The various forms of the plan also fluctuated among the conformative, normative and predictive traditions and the innovative and strategic ones. (Andreassi & Properzi 2012). This logic invokes other aspects, not at all obvious, as the awareness and political committment from the Administration, institutional innovation in terms of governance, the creation of mechanisms for preparation, monitoring and evaluation necessary for the establishment and implementation of the process. A process, irrespective of the type of target, the size of the catchment area and the specific objectives, is based on the integration of different components, through a model, complex by nature and that must obtain, efficaciously and efficiently, the expected result, ensuring at the same time a suitable return in terms of costs/benefits. To ensure that this occurs the strategies must be detailed and the objectives well specified. A well-defined planning process involves having to work not only on the design choices, but also on building cognitive frameworks and indicators.

Following these directions, the process of reconstruction should be able to:

- construct an in-depth and details knowledge base for each sector set on the participations of the local actors through an integrated analysis (economic, social, urban, environmental, cultural, etc.);
- facilitate understanding of the local context;
- prepare objectives shared by all local actors;
- divide objectives in to obtainable and define programs and projects;
- submitting the results to a continuous process of follow up (periodic and scheduled inspections).

The specific objective of the research is the definition of a Set of Indicators that serves to develop guidance for post disaster reconstruction.

The research therefore presents a Set of Indicator useful for developing Guide-Lines for after-shock reconstruction. These Guide-Lines must apply to the strategic direction (objectives) that must be obtained through the reconstruction process. The Guide-Lines will therefore be used to start co-planning policies through acquiring of actions necessary for the termination of the reconstruction.

The approach chosen uses a replicable model for defining a set of indicators to monitor the process itself. This provides a tool to be used not only in progress during control, but also at the initial stage of defining the strategic lines and actions. In this way it will be easier to measure the efficiency of the processes because the information takes into account all the dimensions (physical, economic and social system) of the reconstruction (Pignatelli, 2016). "In analyzing the literature in this regard, it is important to clarify that the use of indicators in this sense implies an approach that does not include the analysis for parts of a complex system, but consider each part in its specific and particular context" (Vallega, 2008).

Another important concept related to this approach, is the circular logic within which the use of indicators is placed in order for the approach itself to become effective. The cycle is already at the base of the model of 'policy life cycle', developed by Winsemius in the '80s. "This model structures the decision-making process in 4 phases and involves the use of indicators both in the design phase and the evaluation of policies" (Caciotti, 2010). Within the process of reconstruction, the circularity is noticeable because the relationship between cause and effect (actions and policies) determines a continuous, circular path in the application of indicators and revision of policies.

For this reason the reference used for the definition of the set of indicators, able to guarantee the maximum of effectiveness of the Process of the Reconstruction as mentioned above, is the one called PSR (Pressures, States, Responses). This model, proposed for the first time by the OECD in the 1994 in the environmental field, allows not only to organize synthetically the information but more explicitly it is the expression of a way of understanding the relationships between society and the surrounding system, through a schematization of the complexities of the system analysed:

- Pressures: impact factors which have the general form of emission or removal of resources;
- State: state of the art of the different components of the process;
- Responses: objectives/policies that individuals responsible for the territorial Government should achieve.

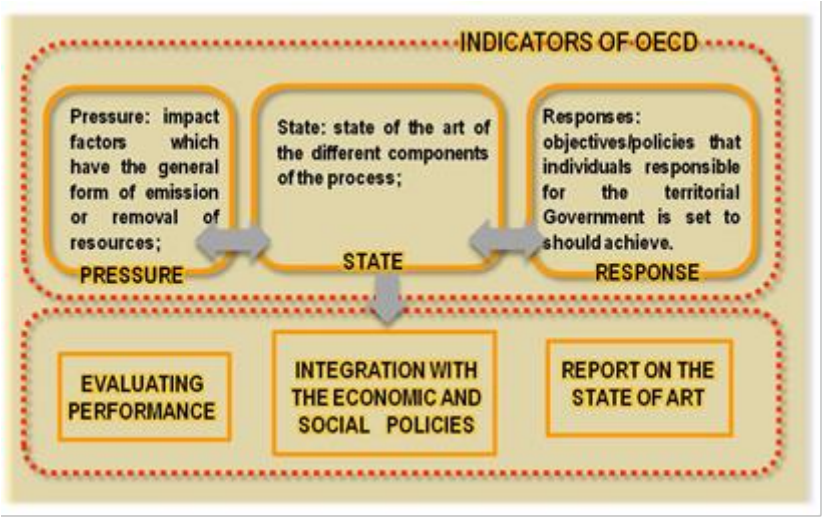

Fig. 3 OECD model: relationships between Pressures, States and Responses

The components, and related indicators, of the PSR model are connected by a circular logical relationship according to which the pressure acting on the system influences the state of the system itself which, in turn, determines the responses to be put into action to achieve the desired standard by reducing pressure on it. The model PSR evolved in the DPSIR model (Determinants, Pressure, State, Impacts, Responses), proposed by the EEA in 1995. This highlights two phases (Determinants and Impacts), already implicitly present in the previous model, but providing a more articulated scheme. In the present research, however, it was thought to use the previous PSR model, because it is simpler and it is considered more effective in describing the complex mechanisms of the Reconstruction Process. It is therefore worthy of note that there is a causal relation in the sequence of the model PSR Pressure-State-Response. The feedback loop, that is the ability of a system to take account of the results in order to change the characteristics of the system itself, develops on a scheme whereby the answers (the policies) can act independently on other elements without affecting the circularity of the process, but rather allowing the Administration to act promptly within it (scheme in Fig. 4).The purpose of this model is therefore to optimize the learning phase with those of processing and evaluating or monitoring the process of reconstruction.

4.1 THE INDICATORS FOR THE PROCESS OF RECONSTRUCTION

Within the process of reconstruction, 3 basic elements are highlighted:

- Inputs - the information entered in the process of undergoing a transformation;
- Constraints, rules and controls - the procedures and measures required to carry out activities that make up the process itself;
- Outputs - the resulting information.

Schematically, the reconstruction can be represented as a 'box' where input, constraints, rules and controls enter and return as output. Unlike inputs, constraints, rules and controls enter into the 'box' but do not undergo any change. We can affirm that the outputs are the object of transformation while resources, constraints, rules and controls are the entities that enable the development of transformation in an optimal manner.

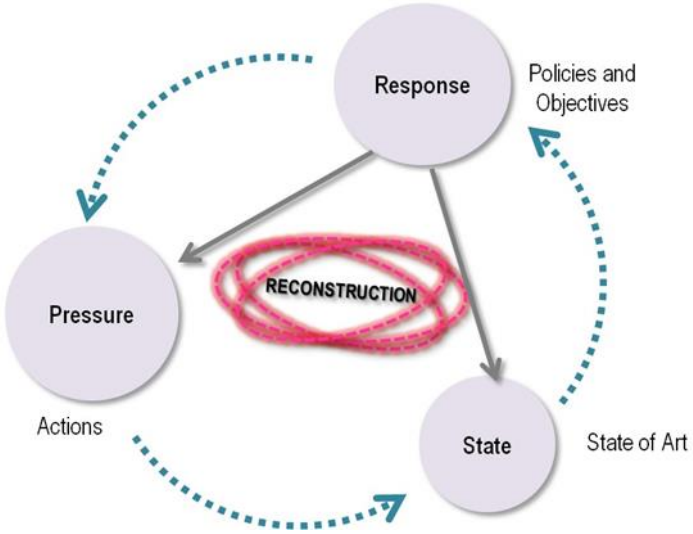

Fig. 4 Process circularity in the sequence of the PSR model

The research focuses on generating a replicable model for defining a set of indicators, which can be understood as a guide on one hand and as a check on the other. The Set of Indicators thus generated can be used to guide the implementation of the process itself, to monitor whether there are deviations from the objectives set in progress, or retrospectively (once it has been implemented completely) for verification purposes.

The Set of Indicators should cover essentially all aspects of the process, since it serves to generate and/or measure the achievement or non-achievement of a standard. For this reason it is a means of documenting and investigating, through the use of physical and structural data, certain classes of phenomena. It is an organized collection of information retrieval that occurs through the systematic study of the development of a particular phenomenon, in order to observe the evolution of variables over time. Indeed, it takes place in the form of periodic detection and on a regular basis. We can say, then, that the ultimate goal of defining the Set of Indicators is to understand what the positives and negatives outcomes are by comparing them with the analyses carried out during the previous period.

From this point of view the extent of the phenomenon is the focus of the management of a process. It allows to locate the data to be collected and analysed, to document the development of current activities, identify strengths and weaknesses and therefore guide the phases of improvement.

It is known that with the growth of the amount of data, it is increasingly difficult to manage the system. The indicators, then, must fulfil three basic functions:

- Control - the indicators are used to evaluate and monitor the performance of the process itself;
- Communication - the indicators allow you to disclose the performance of a process to all actors by providing quantitative information not otherwise available. Indicators that are little representative of a process can determine conflicts and confusion;
- Improvement - the indicators identify performance gaps between expectations and results. The magnitude and direction of the gap provides guidance for the development of strategies to optimize the process.

The basic functions of the indicators revolve around a standard; their aim is an expected outcome that is the measure of the goal itself. The expected outcome, in the specific case of the process of reconstruction, is what

Public Administrations expect to reach once their policies have been implemented. The indicators are used to measure the actions and the results that ensue; therefore, if used without the right precautions, they can lead to a distorted analysis of the processes and can encourage incorrect procedures. In the proposed model, each sub category of reconstruction is represented by a number of indicators, which have specific connections among them in compliance with the circular logic of the process (Fig. 5).

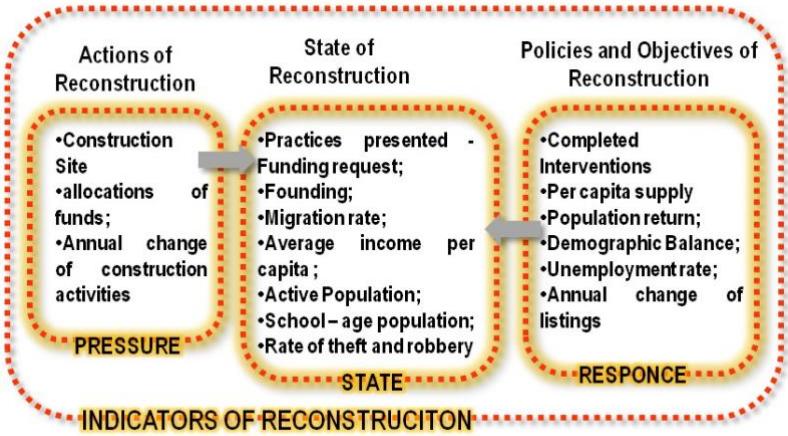

Fig. 5 The model proposed in order to obtain reconstruction indicators following the PSR process

Definition of the indicator set

If wishing to create knowledge that will serve as a base of the process of reconstruction, concern is generated by the existence of a multitude of aspects involved within the process itself and from which to begin. It is this plurality of facets which is reflected in the construction of the Indicator Set. It is clear that we must avoid focus on individual points of view and that we should, instead, find a common matrix.

Of course the process of reconstruction is defined through an idea of complex relationships, having as scenario the territory devastated by an earthquake. It is important to emphasize that in this context the object Process of Reconstruction is described by parts that are both tangible and intangible: flow of people, energy and matter -both internal and from the surrounding territory- in their intermingling define the quality. "It follows that the system to be proposed cannot limit its end exclusively to issues of physical reconstruction, but should also cover the issues of socio-economic development and welfare" (Vallega, 2008). The Set of Indicators must then be able to lead the Reconstruction, described according to its two qualitative and quantitative characteristics and according to predetermined objectives, by analyzing all the factors that affect the performance. With this tool you can also favour a system of public policies that can spread the knowledge of the process of reconstruction in such a way as to involve the citizens through direct participation. The fields of application of the indicators can be identified and grouped into two categories: 'Material Category' and 'Intangible Category'. 'Material Category' serves to define the capacity of physical reconstruction, by investigating the State of the Art of the buildings (private and public), the progress of expenditure and the socio-economic system; 'Intangible Category' considers and assesses the requirements and performance of the territory by analysing factors such as the economic demographic attractiveness, the economic dynamism and the social welfare. Within the 'Material Category', indicators represent the process of reconstruction in a structuralist form. The individual and the community are left out: the social perception of the process is considered only if it ensures that the process itself can be represented as a machine. We limit ourselves to tangible elements, material realities, that can be separable. The 'Intangible Category' both joins and is opposed to the material category. In this case the process of reconstruction is considered mainly in relation to the perception of local communities. It does not refer to an object but to a socio-economic subject representative of the development.

Considering this perspective, the process of reconstruction is no longer seen as a machine but as a set of values that should be considered in their entirety.
The relationship between the two categories of indicators and the PSR model, that underlies the proposed method, can be better summarized through the following table:

PSR Model and Categories for Reconstruction

Material Category	Immaterial Category
The Reconstruction Process is represented as a disaggregable reality (**Pressure indicators**)	The Reconstruction Process is represented as a non-disaggregable reality (**Pressure indicators**)
The Reconstruction Processis represented as a machine, in which the relationship that links the inputs to the outputs is clearly evident (**Response indicators**)	The Reconstruction Processis represented as a set of values considered in their entirety (**Response indicators**)
The Reconstruction Process is summarised through indicators that describe and explain it in its entirety (**Status indicators**)	The Reconstruction Process is summarized through indicators that help to understand the progress of socio-economic development (**Status indicators**)

Tab. 1. PSR Model and Categories for Reconstruction

For both main areas the definition of the Set of Indicators is obtained through the same process.
In the first instance themes representing the two categories have been identified:

- Material Category (CRFE): Architectural Heritage (private and public); Progress of Expenditure; Socio-Economic System;
- Intangible Category (CRPE): Demographic Attractiveness; Economic Dynamism; Social Welfare.

Subsequently the strategic objectives of the reconstruction were defined to match as many indicators:

- responsiveness;
- transparency;
- timeliness;
- certificates (internal consistency);
- resilience;
- reliability.

Set goals can affect the choice and definition of indicators. For this reason it has been useful to build a 'matrix of relations' between targets and indicators so that it is possible to understand how a single indicator could represent one or more targets simultaneously.
In order to understand which of the proposed indicators better describe a phenomenon, the matrix alone was not enough. It was decided to proceed using the Pareto Method: the Pareto analysis is a statistical technique that can be used to support decision making necessary to identify the significant subset of causes or actions that produces the highest percentage of effects.
The most significant passages of the Pareto analysis are:

- constructing a table that associates each because its frequency of occurrence as a percentage;
- arranging table rows in descending order of importance;
- adding a column with percent cumulated;
- developing a line plot with causes on x-axis and cumulative percentages on the y-axis and interpolating the points (diagram of percent cumulated);

- developing the same template a histogram with the x axis and the y axis causes associated to the corresponding percentages;
- locating the intersection point with the curve traced by a line parallel to the x-axis and the aggregate value of 80% on the y axis. (Project Manager Center, www.http://www.humanwareonline.com/project-management/center/analisi-di-pareto).

The matrix initially proposed was, therefore, complemented by adding values that indicated the importance of each goal. This importance has been associated with a numerical value on a scale from 1 to 5 (1 = very low, 2 = low, 3 = average, 4 = high, 5 = very high). In addition it was decided to define how each indicator was pursuing the objectives, in relation to the topic under consideration, through symbols. Therefore the indicators can represent a strong (●), moderate (□) or weak (◇) objective. The coding of these three symbols is:

- ◇ = 1;
- □ = 3;
- ● = 5.

An array in obtained where along the x axis is the set of indicators taken into consideration and the objectives to be pursued along the y-axis. Through the mathematical operations you will arrive at the definition of absolute weight for each indicator, whose maximum is 130, and the relative weighting, calculated in relation to the sum of the Absolute values of the weights of the individual indicators (Fig. 6).

Using the information in the matrix it was possible, starting with the importance attributed to the objectives, to determine a scale of priority indicators. The absolute weight of the indicators was obtained by the sum of the products between the degree of importance of each objective and the value to which the indicator represents the goal itself.

$$Kj = \sum_{i=1}^{m} d_i * v_{ij}$$

Where Ki is the absolute weight of the indicator j-th (j ranges from 1 to n); n is the number of indicators; d_i is the degree of importance of the objective i-th, 3 =, 4.5; v_{ij} is the value that describes how the indicator aims, vij = 1, 3.5;m is the number of goals.

The relative weight with which to construct the cumulative curve can also be obtained by calculating the formula:

$$Kj^* = \frac{K_j}{\sum_{j=1}^{n} K_j}$$

Where Kj * is the relative weight of the j-th marker; Kj is the absolute weight of the indicator j-th; n is the number of indicators;

Looking at the chart below it may happen that, for example, the indicators that may help to describe 80% of the targets are numerous. Since it is known that the fewer indicators used in monitoring the greater the reliability, it has been decided to further reduce that number by choosing those indicators that turn out to have greater absolute weight, identified either by the height of the bars that make up the histogram, both from the increased slope of the line that represents the trend of cumulative percentages (Fig. 7).

The choice of indicators in the Material and Physical Category (CRFE), inherent to the themes of Building Heritage (both private and public) and Advancement of Expenditure, derives from the analysis of the data used for the Reconstruction monitoring proposed both by the Civil Protection and by the Special Offices for Reconstruction. As far as the thematic of the Socio-Economic System is concerned, the selection was carried out starting from both the analysis of the data used for monitoring the Reconstruction proposed by the Civil

Protection and the Special Reconstruction Offices, and the use of the Istat databases for the analysis and interpretation of economic and social phenomena.

SOCIO – ECONOMIC SYSTEM

OBJECTIVES	IMPORTANCE	INDICATORS: Practices presented Funding request	Construction Site	Completed Interventions	Per capita allocations of funds	Per capita funding	Per capita supply	Popolation return	Annual change of construction activities	Migration rate
Responsiveness	5	◊	◊	□	◊	◊	◊	●	●	●
Trasparency	5	◊	◊	◊	◊	◊	□	●	□	□
Timeliness	5	◊	◊	□	◊	◊	◊	●	□	●
Certificate(internal consitency)	4	□	◊	□	◊	◊	◊	●	●	●
Resillience	4	◊	◊	◊	◊	◊	◊	●	●	●
Realiability	3	◊	◊	◊	□	□	□	●	●	●
ABSOLUTE WEIGHT		**34**	**26**	**60**	**32**	**32**	**42**	**130**	**110**	**120**
RELAITVE WEIGHT % respect to the sum of the maximum absolute values		**9%**	**4%**	**4%**	**20%**	**18%**	**20%**	**4%**	**11%**	**10%**

Fig. 6 'Matrix of relations' relating to socio – economic system

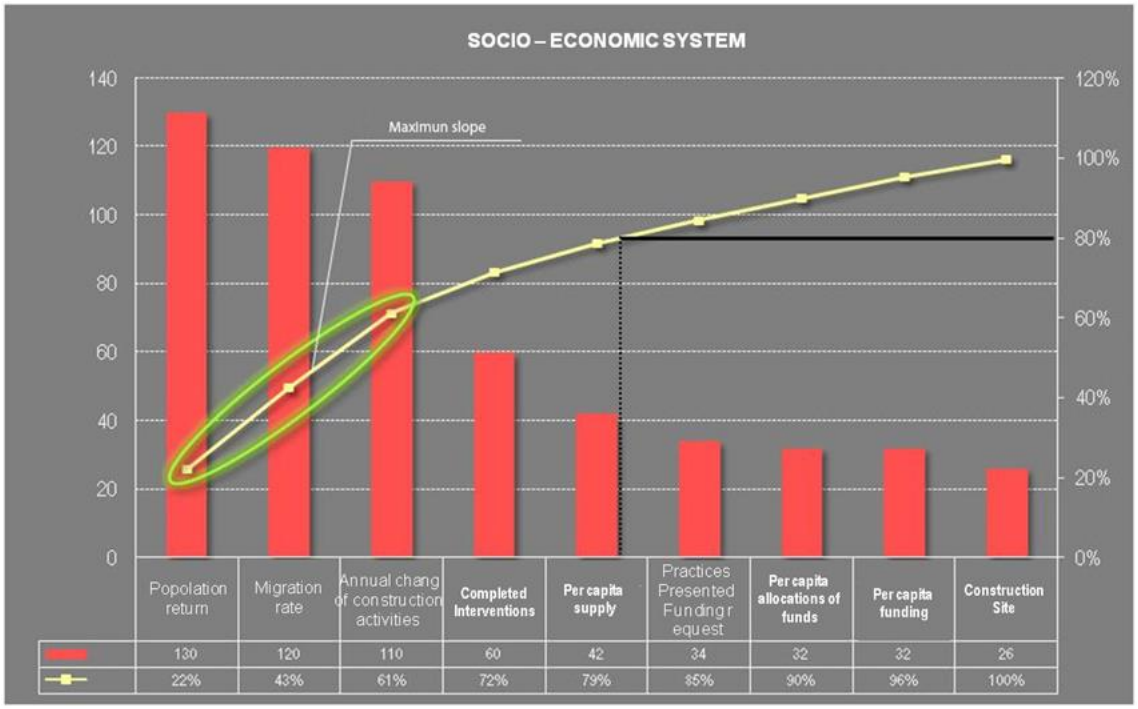

Fig. 7 Pareto histogram relating to socio-economic system

However, in the case of the Immaterial Category, in order to define the indicators, on the one hand an analysis of the Istat databases was carried out for the interpretation of demographic, economic and social phenomena, and on the other hand a study on the Bes Report proposed by Istat (which illustrates the 12 domains relevant to the measurement of social well-being) was used.

The indicators have the following characteristics:

- relevance, i.e. they are the most appropriate to describe the phenomenon;
- practicality, i.e. they are easy to set up and easy to use. They Must constitute a good basis of communication that is accessible to all;
- economicity, i.e. they are not expensive to recover.

Moreover, as regards their units, they will be:

- numerical (eg. Number of practices presented, working population);
- percentage or rate;
- report.

This leads to define the following set of indicators, described in Tabl. 2-7.

Code	Name	Type	Description	Value
(1.1. FE)	Practices presented or funding requests	STATE	The indicator describes the State of the Art by identifying the number or percentage of the practices presented (Private Reconstruction) and tenders financed (Public Reconstruction).	Number and/or %
(1.2. FE)	Construction sites	PRESSURE	The indicator identifies the number or percentage of open sites (public and private Reconstruction).	Number and/or %
(1.3. FE)	Interventions Completed	RESPONSES	The indicator identifies the response of the process by the number or percentage of operations concluded (private and public Reconstruction).	Number and/or %

Tab. 2 Material category, indicators relating to heritage buildings (Private and public) - CRFE

Code	Name	Type	Description	Value
(2.1.FE)	Allocation of funds per inhabitant	PRESSURE	The indicator describes the advancement of day-to-day expenditure (funding)	€/inhabitant
(2.2 FE.)	Per capita financing	STATE	The indicator describes the State of the Art through the relationship euro/inhabitant (Euro financing)	€/inhabitant
(2.3 FE.)	Per capita supply	RESPONSES	The indicator identifies the response of the process by the value of the money spent.	€/inhabitant

Tab. 3 Material category, indicators relating to shopping feed – CRFE

Code	Name	Type	Description	Value
(3.1.FE)	Population return	RESPONSES	The indicator identifies the response of the process by the number or percentage of the population that has returned to home.	Number and/or %
(3.2, FE.)	Annual change of construction activities	STATE	The indicator describes the State of the Art by locating the building contractors.	%
(3.3. FE.)	Migration rate	STATE	This indicator describes the level of migratory changes per year. It is obtained from the ratio of annual migrations recorded and the resident population.	%

Tab. 4 Material category, indicators relating to socio-economic system - CRFE

Code	Name	Type	Description	Value
(1.1. PE)	Demographic Balance	RESPONSES	The indicator serves to represent the natural balance and net migration rate.	Number and/or %
(1.2. PE)	Active Population	STATE	The part of the population, aged between 15 and 64 years, capable of performing an occupation.	Number and/or %
(1.3. PE)	School-age population	STATE	Population subject to compulsory education.	Number and/or %

Tab. 5 Intangible category, indicators relating to demographic attractiveness – CRPE

Code	Name	Type	Description	Value
(2.1. PE)	Unemployment rate	RESPONSES	Measures the percentage of the workforce who cannot find work	%
(2.2. PE)	Average income per capita	STATE	This is the amount of gross domestic product on average possessed, over a period of time by a single person.	€/year
(2.3. PE)	Annual change of listings	STATE	The indicator describes the State of the art by locating the annual percentage variation of the activities	%

Tab. 6 Intangible category, indicators relating to economic dynamism - CRPE

Code	Name	Type	Description	Value
(3.1. PE)	Rate of theft and robbery	RESPONSES	The indicator locates the number or percentage of burglaries in homes and the robberies.	Number and/or %
(3.2. PE)	Level Associations	PRESSURE	Per capita public expenditure allocated to the indicator describes the management of cultural heritage	%
(3.3. PE)	Psychological rate	STATE	Percentage of the population suffering from psychological disorders after an earthquake.	Number and/or %

Tab. 7 Intangible category, indicators relating to social welfare - CRPE

4.2 THE APPLICATION OF THE MODEL TO THE CASE STUDY: A LESSON TO REMEMBER

By monitoring and analyzing the State of affairs it was possible to observe what worked and what did not work in the process of rebuilding, a process that is still underway in the city studied.

Measuring the level of recreating a generic territory hit by a disaster is a complex. The main difficulty lies in the multidimensional character of the phenomenon, the measurement of which requests, initially, the overcoming of obstacles of a conceptual nature related to the peculiarities of the phenomenon. In this case it is oriented towards the construction of a synthetic measure that, through an appropriate aggregation function, is able to capture the many facets of the phenomenon under study, as described by the Set of Indicators identified. It is believed that the primary indicator system, nonetheless provides comprehensive and complete information can not be read easly because of the multidimensionality of the phenomenon under observation. The Set of Indicators needs to provide a unique quantification (one-dimensional) which collects all the information, so that it is readily visible and interpretable. This quantification is called Synthetic Index (Fig. 8 and 9). This is why the observation of the phenomenon is simplified. It was decided to associate to the Synthetic Index a tool that would allow a visual comprehension of the progress of reconstruction. This tool is the Radar Chart, which can display multiple series of data simultaneously, allowing an immediate comparison among them (Fig. 10). Therefore, the method illustrated is able to provide a measure of resilience directly related to the values expressed by each individual indicator and even more clearly by the Synthetic Index.

The data obtained in 2015 from monitoring carried out shows a slow but still favorable enabling of the Physical Reconstruction (index CRFE 60% for the city of L'Aquila, including reconstruction data both private and public), proving that the improvements and simplifications introduced with the new Governance were necessary. We see that the Reconstruction of the Building Heritage, both private and public, is now proceeding at a sufficient rate and that for almost all the buildings for which an application for contribution has been made, the practicability permits have been reconfirmed or the site is in operation. This trend is confirmed by observing the progress of the expenditure. It should be noted, however, that private reconstruction has a faster trend than public reconstruction. The thematism of the socio-economic system, always linked to the Category of Physical Reconstruction, is what indicates an unsatisfactory trend. First of all, we observe that it is not possible to have the data concerning the "Returned Population". This is because the Municipality does not carry out monitoring in this sense. This lack is to be considered serious in a catastrophe like this that hit a city populated by 73,203 people in 2009 (source CRESA), all of whom were considered as evacuees in the emergency phase. We can say that strategic co-planning of the territory affected by the earthquake is still lacking. In terms of institutional issues there has been a lack of coordination between the various levels of public administration. The proliferation of actors involved in the "earthquake issue" was the cause of incomplete and partial decisions,

making the process of reconstructing fragmented and not organic. The political fragmentation gave rise to the inability to locate and manage coherently the challenges posed by the earthquake. This fragmentation of the standard made the rehabilitation processes complex and difficult to understand. This has therefore not led to a shared strategy for long-term recovery. All this resulted in the substantial failure of the local administration, especially with respect to its chief town, in assuming the decision-making and coordination role that is proper to it. These considerations are confirmed in the values of Intangible Reconstruction (index CRPE 42,2% for the city of L'Aquila).

		HERITAGE BUILDING			SHOPPING FEED			SOCIO – ECONOMIC SYSTEM		
OBJECTIVES	IMPORTANCE	Practices presented	Construction Site	Completed Interventions	Allocations of funds per capita	Per capita funding	Per capita supply	Popolation return	Annual change of construction activities	Migration rate
Responsiveness	5	□	●	□	□	●	□	◊	□	◊
Trasparency	5	□	●	□	□	●	□	◊	□	◊
Timeliness	5	□	●	□	□	●	□	◊	□	◊
Certificate (internal consitency)	4	□	●	□	□	●	□	◊	□	◊
Resillience	4	□	●	□	□	●	□	◊	□	◊
Realiability	3	□	●	□	□	●	□	◊	□	◊
ABSOLUTE WEIGHT		78	130	78	78	130	78	26	78	26
RELATE WEIGHT % compared to the maximum reachable		60,0%	100,0 %	60,0%	60,0%	100,0 %	60,0%	20,0%	60,0%	20,0%
RELAITVE WEIGHT % respect to the sum of the maximum absolute values		6,7%	11,1%	6,7%	6,7%	11,1%	6,7%	2,2%	6,7%	2,2%
PHYSICAL RECONSTRUCTIVE CAPACITY EXPRESSED **CRFE** - SYNTHETIC INDEX								60,0%		

Fig. 8 Synthetic Index relating to Physical Reconstruction

		DEMOGRAPHIC ATTRACTIVENESS			ECONOMIC DYNAMISM			SOCIAL WELFARE		
OBJECTIVES	IMPORTANCE	Demographic Balance	Active Population	School – age population	Uneployment rate	Average income per capita	Annual change of listings	Rate of theft and robbery	Level Associations	Psychologic rate
Responsiveness	5	◊	□	◊	□	●	◊	◊	□	□
Trasparency	5	◊	□	◊	□	●	◊	◊	□	□
Timeliness	5	◊	□	◊	□	●	◊	◊	□	□
Certificate (internal consitency)	4	◊	□	◊	□	●	◊	◊	□	□
Resillience	4	◊	□	◊	□	●	◊	◊	□	□
Realiability	3	◊	□	◊	□	●	◊	◊	□	□
ABSOLUTE WEIGHT		26	78	26	78	130	26	26	78	78
RELATE WEIGHT % compared to the maximum reachable		20,0%	60,0%	20,0%	60,0%	100,0%	20,0%	20,0%	60,0%	60,0%
RELAITVE WEIGHT % respect to the sum of the maximum absolute values		2,2%	6,7%	2,2%	6,7%	11,1%	2,2%	2,2%	2,2%	6,7%
EXPERT PERFORMANCE RECONSTRUCTIVE CAPACITY **CRPE** - SYNTHETIC INDEX								42,2 %		

Fig. 9 Synthetic Index relating to Intangible Reconstruction

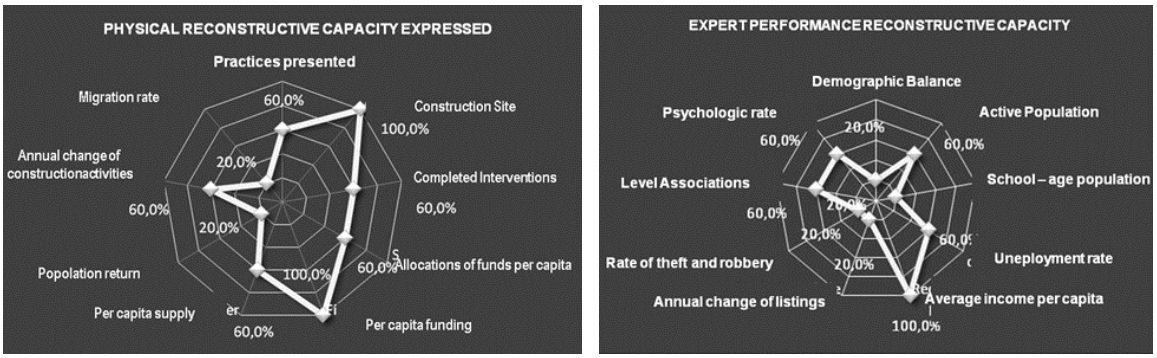

Fig. 10 Radar Chart: (a) Material Category – CRFE (left) ; (b) Intangible Category – CRPE (right)

5. TOPICS OF DISCUSSION

The strengthening of the resilience of the territories frequently affected by natural disasters is essential for a sustainable development strategy; this strengthening would achieve increasingly high performance standards through the rapid urban and landscape transformations associated with these special contexts. The resilience of an area depends to a large extent on the responsiveness of individuals, who must be able to conceive and implement adaptation measures (OECD, 2013). At the same time, the role of public administrations in the socio-economic recovery of a territory affected is crucial due to the choices that are apply and the objectives pursued with development policies. For this reason, following a consistent and organized methodology through forecasting models of the strategic objectives that can lead the territories to recovery is especially important in areas exposed to natural disasters. At the same time, irrespective of the occurrence of the disaster, equipping the administrations with a tool that can manage and overcome any future shocks, means improving the endurance and adaptability of a territory. "International experiences indicate a good metric of expected results from a development strategy (…will serve not only to monitor progress towards these results, but to allow changes, increase accountability and motivate citizens and policies" (OECD, 2013). The natural disaster impacts the disaster area, by destroying the physical capital and the social fabric. Improving the response to risk of the area affected, means to create precisely place-based policies (local development). Place-based policy aimed at implementing development strategies and respondents meet local objectives and needs identified, discussed and implemented in cooperation with the actors of the place. It is a cohesion policy and is associated with the recognition of the added value from the analysis of endogenous potentials and needs. In practice this results in the formulation of local development strategies. For this reason, the choice of indicators cannot be separated from the territory affected, as demonstrated by the case study presented in this work. In the experience of the city of L'Aquila, the diagnostic method of reconstruction process applied, can be seen as a prototype for future cases of reconstruction after disasters. In fact, thanks to the set of indicators, it was possible to understand what the Reconstruction Process involves in both positive and negative terms. What emerged was that the Italian government's policy regarding the immediate response to the disaster was to guarantee an indiscriminate convergence of large amounts of human and financial resources. The Achilles' heel of the post-disaster emergency management in Italy, and therefore also in L'Aquila, is the inability to complete the system by fully articulating the planning resources for emergencies and their management. The national guidelines for these processes are excessively complex, out of date and not in step with the times. One year after the earthquake the historic centers of the affected towns were still off limits. Another two years passed in "Gestione Commissariale" (L.77/2009), which lengthened the times and slowed down the Reconstruction itself, so much so that we talk about the end of the emergency phase only in 2012 (L.134/2012), with the takeover of ordinary management and the establishment of two Reconstruction Offices (USRA and USRC). It is thanks to this bureaucratic reduction that the reconstruction has finally gained

momentum. From a demographic and settlement point of view, however, all this has resulted in a demographic decline due to changes of residence with the consequent decrease in the school-age population. Furthermore, the slow recovery of reconstruction has generated the difficulties for small and medium enterprises and an increase in unemployment. The efficiency of the model lies in the evaluation of all dimensions of the system - physical, economic and social - at the moment of choosing the means of intervention for the recovery of the territory. There are various lessons that we can learn, as results from the application of the case study; the most significant is that of having to predict a system of strategic planning which from the very beginning will guide and shape the process of reconstruction, looking at both the physical reconstruction and the socio-economic development of local realities. For this reason it was decided to integrate the indicators of Socio-Economic System (CRFE) and social welfare (CRPE) used for the monitoring of L'Aquila with those updated by Istat for BES [5](Istat,2018), as shown in Tab. 8-11. The indicators of the BES (Fair and Sustainable Wellness) have been developed by ISTAT and CNEL, to assess the progress of a society not only from an economic but also from a social and environmental point of view, taking into account measures of inequality and sustainability also.

Code	Name	Type	Description	Value
(3.1.FE)	Population return	RESPONSES	The indicator identifies the response of the process by the number or percentage of the population that has returned to home.	Number and/or%
(3.2, FE.)	Mobility of Graduates	PRESSURE	This indicator describes the response of the system according to the attractiveness of graduates.	%
(3.3. FE.)	Migration rate	STATE	This indicator describes the level of migratory changes per year. Is obtained from the ratio of annual migrations recorded and the resident population.	%

Tab. 8 Material category, indicators relating to socio-economic system a) - CRFE

Code	Name	Type	Description	Value
(3.4.FE)	Investments in intellectual property	PRESSURE	The indicator describes the per capita public expenditure on research and development, software and databases, entertainment, literary or artistic works and other intellectual property products	€/inhabitant
(3.5, FE.)	Annual change of construction activities	STATE	The indicator describes the State of the Art by locating the building contractors.	%
(3.6. FE.)	Spending on cultural heritage management	PRESSURE	Per capita public expenditure allocated to the indicator describes the management of cultural heritage.	€/inhabitant

Tab. 9 Material category, indicators relating to socio-economic system b) - CRFE

[5] BES (Fair and sustainable welfare) is an index develops, by Istat and CNEL, to evaluate the progress of a society not only from an economic but also social and environmental point of view.

Code	Name	Type	Description	Value
(3.1. PE)	Rate of theft and robbery	RESPONSES	Indicator locates the number or percentage of burglaries in homes and the robberies.	Number and/or %
(3.2. PE)	Physical and sexual violence	STATE	Indicator locates the number or percentage of acts of physical and sexual violence	Number and/or %
(3.3. PE)	Dissatisfaction with the landscape and the city	STATE	Percentage of the population unhappy with the place where they live	Number and/or %

Tab. 10 Intangible category, indicators relating to social welfare a) - CRPE

Code	Name	Type	Description	Value
(3.4. PE)	Air quality	STATE	Indicator locates of air quality.	Number and/or %
(3.5. PE)	Difficult access to certain services	STATE	The indicator describes the State of the Art by identifying the difficulty of access to certain services	%
(3.6. PE)	Time dedicated to mobility	RESPONSES	Percentage of time that the population uses in moving.	%

Tab. 11 Intangible category, indicators relating to social welfare b) - CRPE

Although the proposed method has various strengths, there are also weaknesses. It is, in fact, a non-autonomous process with regard to the schematization of the data. It is possible to link the indicators, and therefore the open data associated, with a GIS environment. In this way, thanks to the use of plugins, not native but designed ad-hoc, it would be possible to view, store and extrapolate the results directly from the software. This would allow to manage the entire process through ICT dynamic control tools.

5.1 FUTURE RESEARCH DEVELOPMENTS

The Reconstruction Process is a theme that embraces various sectors, public and private, material and immaterial, economic and social. It constitutes a different perspective with which to look at the city and its government, referring to the various areas of planning and using what is called an integrated approach. The integrated approach implies the need to simultaneously face all the multiple aspects that concern the Urban Governance of the Reconstruction, in a sort of overall strategy within which to develop policies and management interventions coherently and integrally. For this reason, the fundamental role is played by the strategic planning activities, which must intervene on the multiple aspects of the Reconstruction itself, by working not only on the design choices, but also on the construction of cognitive frameworks and indicators. Consequently we can say that monitoring becomes an integral part of the Reconstruction Process, making it acquire the character of circularity: from the framework of shared knowledge, decisions are determined whose consistency and compatibility is established through evaluation (ex ante evaluation) and through the monitoring of the implementation of decisions. In this way the two phases (evaluation and monitoring) are never really considered completed, being in constant revision. Beginning with the method suggested, this paper proposes the drafting of guidelines that can address the strategic lines of public administration so as to

guide urban transformations according to the optimization models resilience of an area. The general structure of the guidelines will follow the circular pattern proposed in Fig. 11: response and pressure indicators serve both to the definition for the control and, if necessary, for a subsequent redefinition of the strategic guidelines and proposed actions, while those of State are used only to monitor the situation at the time t. It should be noted that one policy does not exclude another, but are complementary and integrated. The reconstruction process can been governed by the Guide-Lines, taking in to the consideration the necessities for a socio-economic development, such as the environmental and the social and economic emancipation. Actions and interventions studied with the above Strategic Lines in mind, could be revealed as tools for overcoming administrative obstacles and to allow messing connections to converge. In this way will become more transparent and participatory. The Public Administrations will thus be able to obtain a wider range of objective elements and input before taking their respective decisions.

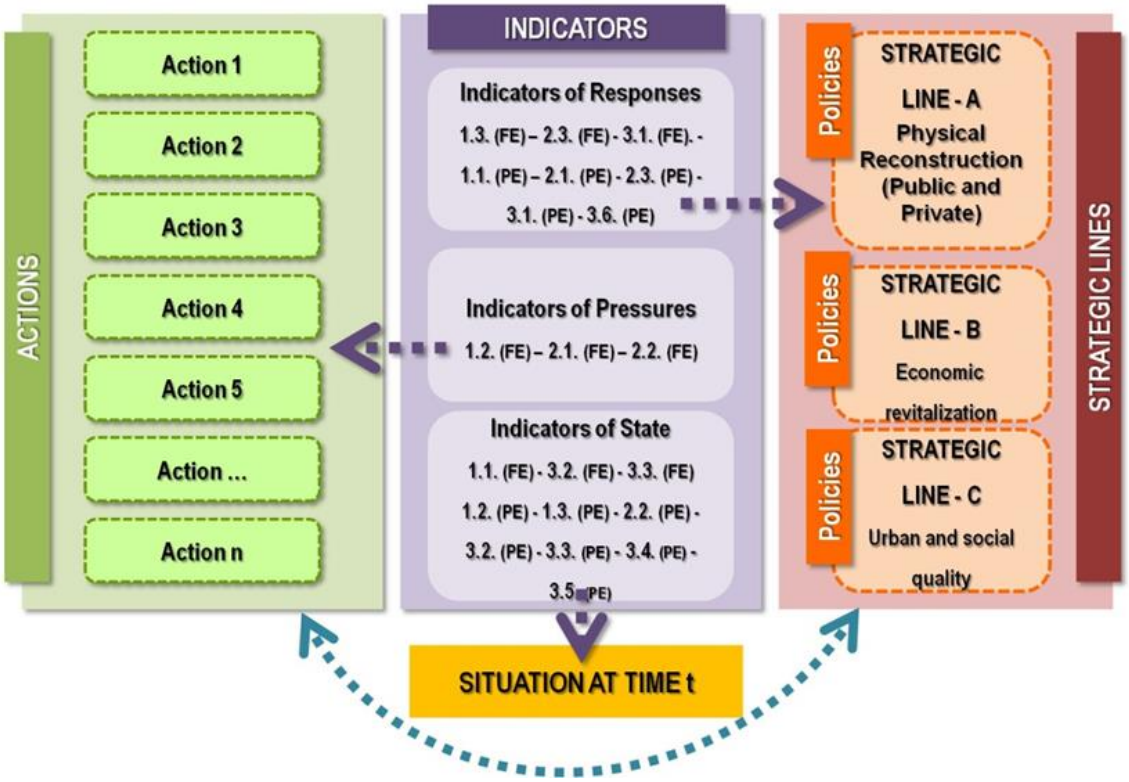

Fig. 11 Schematization of the guidelines structure proposed

6. CONCLUSION

The work aims at proposing a replicable method to define a set of indicators able to guide and monitor the transformation process of a territory affected by a natural disaster. The issues dealt with regard the extent to which an affected territory manages to use the traumatic event as a starting point for recovering from the critical issues by relying on the existing local potential. The L'Aquila earthquake was a medium-power seismic event which, however, caused a great deal of damage. The management of the Reconstruction process has been tackled by Italian government policy in a way that is not always optimal. The earthquake has accelerated the economic stagnation phases producing greater uncertainty about the future. It is on events of this magnitude that the research must concentrate, because they are more and more frequent and without certain and defined guidelines regarding their management in the post-emergence phase. The resilience of a territory, following a disaster, lies in the ability to withstand and respond to shock, through processes that are able to use the urban and territorial framework, the system of share knowledge and adaptive governance processes. These must ensure retrieval of performance level needed to begin now development processes. The essential

sustaining element for the Reconstruction Process is the Set of Indicators. This is necessary, as has been seen, for guiding a serious Public Policy and for quantifying the level of response of areas exposed to natural disasters, whose unexpected occurrence may require a new set of development management models. The possibility of using resilience through indicators that provide reliable results would equip public administrations with tools able to guide the strategic choices for local development, reaching the desired level of territory and urban resilience with the aim of guaranteeing their long-term wellbeing. It can therefore be affirmed that the strategic lines, the policies and the actions that are proposed are able to express as a whole a strategic order and a will to transform reality in a participated and shared way.

Author Contributions: F.P. designed the research, wrote Sections 3 and 4, performed the analyses, produced tables, schemes and results, wrote Section 5 and 6 with M.D.V.;M.D.V. designed the paper and wrote section 1 and 2; P.P. supervised the research and the paper.

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AUTHOR'S PROFILE

Federica Pignatelli is an engineering, she graduated with a special mention "Thesis worthy of publication" from the University of L'Aquila, where she also obtained a PhD in April 2016. Her thesis discussed the "Performance diagnostics of the process of reconstruction". In the months of May and June 2009 she carried out voluntary work at the Civil Protection following the 2009 earthquake. She was a member of the LAURAq as operative secretary - L'Aquila Urban Planning Laboratory. From 2011 to 2016 she carried out activities of teaching support in the Course of Urban Planning Technique I and in the Course of Urban Planning at the University of L'Aquila. She became treasurer of the Abruzzo-Molise division of the National Institute of Urban Planning (INU) in 2013. She became Territorial Representative within the division council in 2016. She is the author of several publications and participations as a speaker in seminars. Currently she is a freelancer working in urban and architectural reconstruction. As from the 2009 earthquake she has carried out assignments and collaborations with several institutions both in the field of building design and in urban planning.

Mariangela De Vita is an engineering, she graduated with full marks and honours from the University of L'Aquila where she also obtained a PhD in July 2017 with a thesis on the performance evaluation of technical textiles applied to architecture. From 2016 she has collaborated with the Construction Technologies Institute (ITC), a scientific facility of the National Research Council of Italy (CNR), and since May 2018 has held a post doc research fellow at the same institute. She is the winner of numerous research grants, including funding received from the Abruzzo Region for Al.fo. and ERBOR_AQ projects. She has taken part in numerous design workshops on the theme of lightwight, parametric and sustainable architecture. From 2014 to 2015 she collaborated with the Dunamis design studio. Her research activity is oriented towards analysis and design retrofit interventions on Cultural Heritage with the aim of evaluating and optimizing compatible and more efficient solutions both in terms of energy performance and environmental comfort. The aspects related to the preservation and enhancement of the natural resilience of landscapes, places and buildings of the protected heritage plays a fundamental role in her studies.

Pierluigi Properzi is an Architect, he was full professor of Urban Planning Technique at the University of L'Aquila and general secretary of the INU - National Urban Planning Institute. He has coordinated research groups on the evolution of the national planning system (Quater) and of the regional legislative frameworks; he edited the first Report on the state of Planning on behalf of the Ministry of Public Works and participated in the ANPA research on guidelines for national ecological networks. He has been a member of the Governing Council of the Italian Association of Regional Sciences AISRE (1997-2000) and a member of the Scientific Committee of the Regional Center of Economic Studies and Social Research CRESA since 1999. He directs the AnTeA Laboratory (Territorial and Environmental Analysis) of the Architecture and Urban Planning Department and is the Scientific Director of the INU / ANCSA Laboratory for the Reconstruction of the city of L'Aquila. He has worked as a consultant for the National Public Authority (Min. LLPP - ANAS) and Regional Public Authority (Abruzzo Region - Basilicata - Molise - Friuli VG - Umbria - Autonomous Province of Trento) and has coordinated Working Groups for the formation of Framework Plans and Regional Laws. He has also drafted numerous regulatory plans for medium-sized cities and various urban strategic plans and interregional strategic platforms. He is author of over 150 publications and intervenes in the disciplinary debate on the main journals. He is also a member of the Scientific Committee (Urban Planning – Urban Information) of some of these journals. He edited the first Report on the state of planning on behalf of the Ministry of Public Works / 2001.

TeMA
Journal of
Land Use, Mobility and Environment

TeMA 1 (2019) 31-52
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5836

review paper received 3th January 2019, accepted 29th March 2019

www.tema.unina.it

How to cite item in APA format:
Mazzeo, G., Zucaro, F., Morosini, R. (2019). Green is the colour. Standards, equipment and public spaces as paradigm for the Italian sustainable city. *Tema. Journal of Land Use, Mobility and Environment*, *12*(1), 31-52. doi: http://dx.doi.org/10.6092/1970-9870/5836

GREEN IS THE COLOUR

STANDARDS, EQUIPMENT AND PUBLIC SPACE AS PARADIGM FOR THE ITALIAN SUSTAINABLE CITY

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ABSTRACT

The speed of the urban systems is related with a series of social, economic, and environmental transformations bringing often to a critic state that needs the redefinition of urban elements and relationships, in order to guarantee quality and safety to the inhabitants' lives. Related to the new spatial conditions of planning is the topic of urban equipment that is an open matter in the urban politics.
Their relevance for Italian cities made them a symbol of democratization and quality of the cities, due to the obligatory of minimum quantities of spaces for public services. The 50 years from the issue of DM 1444 allows to express a series of evaluations on the role of the public equipment in the processes of urban transformation and governance. Starting from this analysis, the paper proposes adequate and updated solutions in terms of evolution of the standards categories and their quantitative and qualitative characteristics, deepening the role of the urban facilities as potential sources of innovation.
The first part of the paper highlights some elements related to the long period of application of the law, and the results of this application in terms of increase and quality in the urban equipment of the city. The second part explores the motivations behind the need for a comprehensive updating of the subject, referring to concepts such as sustainability, and quality of urban systems. In the third part, starting from new requirements, new needs, new risks affecting urban systems, as well as from critical points of the Italian law structure, the paper proposes new categories of urban planning standards and the related functional requirements they must to satisfy.

KEYWORDS:
DM 1444/1968; Public city; Urban equipment; Standard; Italy

TeMA
有关土地使用、交通和环境的杂志

TeMA 1 (2019) 31-52
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绿色是主色调。标准、设施和公共空间堪称意大利可持续城市的典范

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摘要

城市系统的发展速度与社会、经济和环境等一系列变化息息相关，这些变化常常伴随着城市元素与诸多关系的重新定义，以保证居民生活的质量与安全。城市设施与规划的全新空间条件相联系，这是城市政治中的一个开放性问题。
受到公共服务空间最少数量的限制，意大利城市设施成为城市民主化与生活品质的象征。自发布以来的50年里，DM 1444对公共设施在城市转型和管理过程中发挥的作用进行一系列评估。从这一分析结果出发，本文就标准类别的演变及其定量和定性方面的特征提出了最新合理解决方案，不断深化城市设施作为潜在创新来源的作用。
本文第一部分重点介绍了与适用时间长的法律相关的部分要素，以及该法律的运用在增加城市设施与提升其质量方面取得的成果。 第二部分探讨了不断扩大改善城市设施需要的动机，涉及可持续性、城市系统质量等概念。第三部分，从新要求、新需求、影响城市系统的新风险以及意大利法律结构的关键问题出发，本文提出了城市规划标准新分类方法及其必须满足的相关功能要求。

关键词:
DM 1444/1968；城市；城市设施；标准；意大利

1 INTRODUCTION

In the last decades, urban systems have been dealing with a series of new challenges due to economic, social and environmental issues.

The 2008 economic and financial crisis had impacts on the world of real estate business, on public and corporate housing policies, and on large-scale urban development projects in metropolitan city regions (Bauman & Bordoni, 2014; Harvey, 2012; Kunzmann, 2016). The entity of these effects was obviously different, depending on the territorial contexts (and therefore the relative response capacities). However, in general, the economic recession amplified the already inherent complexity of the governance's processes of urban and territorial transformations (Donald & Gray, 2013; Fregolent & Savino, 2014). In Italy, in particular, we register a fall in investments in connection with the reduction of trade in the construction sector that has contributed to slowing down the urban growth trends (ANCE, 2014; Bank of Italy, 2014).

The differentiation in the growth of urban population – due to new social scenarios and technological innovations – has provoked the emergence on new needs and aspirations calling an answer by the cities.

Just think of the structure of the population in developed countries, characterized by an increasing presence of elderly people and by the decrease in the younger population, with a consequent increase of old age and dependence indices that, in Italy, are among the highest in Europe (Eurostat, 2016). This scenario requires new forms of governance with the aim to increase the quality of life of elderly (Battarra et al., 2018; Gargiulo et al., 2018).

From a spatial and environmental point of view, cities are testing more and more the effects of climate change and soil sealing, two phenomena connected by an one-to-one relationship requiring changes of space form and use both at city and architecture levels (Blanco et al., 2011; De Gregorio Hurtado et al., 2015; Mazzeo, 2012; Zucaro & Morosini, 2018).

The speed with which these problems invest the urban systems and the multiplication of their effects, is mostly incompatible with the speed of transformation (and adaptation) of activities and spaces. This gap can be traced back to the rigid system of land use rules still characterizing traditional urban planning. The associated structural crisis of the urban systems needs the redefinition of their elements and relationships, with the identification of new ways of organizing and managing the urban system in order to guarantee quality and safety to the inhabitants' lives (Gargiulo et al., 2017; Papa, 2018).

Related to these new spatial conditions of planning is the topic of urban equipment that is an open matter in the urban politics, even for Italian cities. Their relevance in the Twentieth century urban landscape made them a symbol of democratization and quality of the cities (Astengo, 1967; Wilensky, 1975), due to the obligatory of minimum quantities of spaces for public services below which urban livability cannot be considered to be satisfied (Caldarice, 2018).

On April 2, 1968, Ministerial Decree (from now, DM) no. 1444 of 1968 was issued. It represents a unique in the evolution of the Italian planning laws because it is characterized by the identification of specific public equipment whose provision within the urban plans becomes mandatory and is quantified according to specific dimensional values (Falco, 1978). The mandatory nature and clarity of the formulation has made this law one of the most applied in the planning field and a reference point in the administrative litigation.

Inside the residential settlements, the "maximum ratio" are measured in 18 square meter for inhabitant. These spaces are devoted to public services, to mass activities, to public green, and to parking lots. The spaces for the streets are excluded by the measure. The value of 18 square meter for inhabitant is a minimum imperative quantity ad it is "normally" composed by four categories:

- 4.50 square meter of areas for schooling, in particular nurseries, kindergartens and primary schools;
- 2.00 square meter of areas for common interest activities, i.e. religious, cultural, social, welfare, health, administrative, public services (Post and Telecommunication offices, civil protection, etc.) and other;

- 9.00 square meter of public spaces equipped as green park and areas for the game and sport effectively available for such installations. Of these spaces are not part the green bands along the roads;
- 2.50 square meter of parking areas that, in specific cases, can be distributed on different levels. They are added to the parking areas provided for by article 18 of the Law 765 of 1967.

Article 5 of the DM 1444 defines also the maximum ratios between the spaces designed to productive settlements and public spaces designed to collective activities, public parks or parking areas.

Although the standards required for production areas facilities are not subject of study in this paper, it is worthwhile to make some considerations in this regard.

For these areas can be hypothesised specific indications, for example, for the parking areas, because they are often very extensive, as in areas designed to the great shopping centre, for the green areas and for the control of the soil quality. This last aspect is fundamental if potentially dangerous or harmful activities for the quality of the soil and subsoil are presents.

Tab. 1 shows a list of public equipment and the corresponding category, according to the Italian legislation.

The issue of urban planning standards has to be placed in a more general reasoning affecting the urban infrastructures. In fact, they are subjected to increasing pressures such that to require a systemic answer affecting all the elements making up the public city.

	Urban planning standard (1)	General interest equipment (1)	Primary urbanization works	Secondary urbanization works	Infrastructures
Residential street			Y		
Cycle and pedestrian paths			Y		
Technological networks			Y		
Public lighting			Y		
Communication networks			Y		
Nursery schools	Y			Y	
Primary schools	Y			Y	
Secondary schools		Y		Y	
Neighborhood markets	Y			Y	
Municipal delegations	Y			Y	
Churches, religious buildings	Y	Y		Y	
Social centers	Y			Y	
Cultural facilities	Y	Y		Y	
Equipped public green	Y		Y		
Neighbour. sports facilities	Y			Y	
Green parks		Y			
Car rest areas	Y		Y		
Parking		Y		Y	
Sanitary equipment	Y	Y		Y	Y
Security equipment	Y	Y		Y	Y
Urban waste plants				Y	
University and research		Y			Y
Great communication roads					Y
Railways, ports, airports					Y
Energy networks					Y

Tab. 1 Classification of urban and territorial public equipment. (1) Standard and equipment contained in DM 1444/1968[1].

[1] The urban plan, among other tasks, identifies and delimits the "urban planning standard" and the "equipment of general interest". When we move on to the implementation phase we talk about "primary urbanization works" and "secondary

50 years have passed since the issue of DM 1444; it is a period of time that allows to express a series of evaluations on the role of the public equipment in the processes of urban transformation and governance.
In this perspective, the present paper proposes adequate and updated solutions in terms of evolution of the standards categories and their quantitative and qualitative characteristics. It is appropriate to deepen the role of the urban facilities as potential sources of innovation, starting from new requirements, new needs, new risks affecting urban systems, as well as from critical points of the Italian law structure introducing them.
The paper is formed by three parts.
The first part highlights some elements related to the long period of application of the law. It analyses the results of this application in terms of increase and quality in the urban equipment of the city. The second part explores the motivations behind the need for a comprehensive updating of the subject, referring to concepts such as sustainability, and the quality of urban systems. In the third part, finally, the paper proposes new categories of urban planning standards and the related functional requirements they must to satisfy.
This articulation shows, in practice, a path in terms of updating of the indications of the DM 1444 and, more in general, of the significance of the public equipment in the city.

2. THE ITALIAN NATIONAL LAW AND ITS IMPLEMENTATION

2.1 IMPLEMENTATION OF THE DM 1444/1968

The application of DM 1444 has changed the way of doing planning in Italy and has made possible the creation of a new type of urban plan, closer to the construction of the public city (Gabellini, 2001; Oliva, 1999; Salzano, 2002). This consideration highlights the significant and positive impact of the law. Indeed, the attention to the retrieval of the standards has become a factor of primary importance in the design of urban plans, like the finding of the urban expansion areas, at least until the plans have been set up with an expansive philosophy. The obligation to find the standards, essential for the approval of the urban plans was, above all, the cause that made possible this result.
The enforcement of a minimum amount of public space derived from the observation that the Italian cities had grown in the second post-war period with the sole objective of maximizing land rent (Camagni, 2012). This led to the forecast and construction of new settlements with little or no public facilities, green spaces, car parks and schools.
The term "urban planning standard" indicates the minimum quantities of public (or for public use) spaces that must be obligatorily quantified and identified in the urban plans. Their implementation is delegated to a subsequent phase and takes the form of a direct intervention by the public administration or through the deployment of detailed plans.
The dimension and distribution of these standards translates, within the municipal plan, in the identification of the areas necessary for their realization and in the imposition of restrictions finalised to their acquisition to the municipal asset. There are three considerations to make.
Primarily, this obligation has had as a straight consequence the strong growth of the public real-estate assets. The counterpart to this outcome was the necessity of binding huge sums of the municipal budget for their acquisition (Mazzeo & Ceudech, 2009).
A second element to consider is related to the fairness of citizens facing the city and the plan, fairness that it is possible to reach also with public equipment that are really usable and whose management is aimed at satisfying the needs of the urban users. This way of approaching the issue should have led to the conclusion that the rights fulfilment does not impose obligatory limit values, but rather identifies mechanisms for a differentiated application according to specific territorial characteristics.

urbanization works". At the territorial level, we use the general term "infrastructure", inserting in this category linear, area and volumetric public works.

This meaning is not even recent. Even before the approval of the *Legge ponte* (Law nr. 765/1967) and of following DM 1444, there was the awareness that public equipment should be a widespread presence within the urban structure and that they should assume characters of high quality, flexibility, and modifiability so that they could maintain unaltered their role and value (Tutino, 1965).

Third point highlights that the application of the DM 1444 must also be seen from the point of view of the "multiplication of legislation" due to the contribution of the regional laws deriving from the application of the provisions of the Italian Constitution. It was implemented after a few decades with the issue of the Decree of the President of Republic nr. 616 of 1977, which carried out the transfer and delegation of a series of administrative functions from the State to the Regions. Starting from the end of Seventies, this transfer has provoked an increasingly extensive fragmentation of the planning legislation due to the implant of regional regulations on the unitary national system. Among the sectors there is also the subject of standards with their differentiation in quantitative, qualitative and applicative terms, from Region to Region (Caceres et al., 2003).

On the other hand, the Regional legislations have had the merit of experimenting at local level some elements of innovation deriving from the theoretical insights developed by the town planning schools and by the associations operating in the sector (Istituto Nazionale di Urbanistica, Società Italiana degli Urbanisti and so on). Among these, we can remember the concept of performance (see section 3.2) or the establishment of the municipal and territorial service's plans (Gerundo & Graziuso, 2014; Paolillo, 2007).

Presidential Decree 380/2001 (Consolidated text of laws and regulations on building) in Article 2-bis, (Derogations on the limits of distance between buildings) reaffirms that the rules on the right of ownership are the responsibility of the State. It establishes also that the Regions can provide exceptions to DM 1444/1968 with «own rules on spaces intended for residential settlements, productive plants, collective activities, green areas and parking areas, as part of the setting or revision of urban plans destined to an overall and unitary development or to specific territorial areas».

Among the other, this possibility was taken up by the Emilia Romagna Region, which in 2017 issued the new regional urban planning law (from now, LR). LR 24 "Regional regulation on the protection and use of territory" provides, in fact, a specific definition of «differentiated urban standards» (article 9).

In particular, the Region, with a specific rule of procedures, establishes «provisions regarding the system of territorial equipment, infrastructures and public services that contribute to achieving the minimum standard of urban and ecological-environmental quality to be guaranteed throughout the regional territory. The technical rule of procedure differentiates the services to be implemented in the urbanized territory compared to the requirements for new settlements, with the aim of promoting urban re-use and regeneration interventions».

This differentiation takes place according to a series of principles tending to favour the regeneration activities compared to those producing new consumption of soil, the reduction of which, by the way, is another of the cornerstones of this regional law.

Among the principles, the following are particularly interesting:

- the preservation of the current overall share of public areas for services;
- the primarily allocation of the public areas to meet the needs for new equipment or to modernize the existing ones;
- the possibility of allocating the areas in which no equipment must be created for the realization of social housing with the private participation or the completion of the regeneration and reuse interventions. This is possible only after verification of the satisfaction of existing or forecast equipment in the area;
- the permeable areas within the urbanized territory are destined to ecological and environmental equipment and to the maintenance of the green wedges;
- the derogation to the density and height limits in the operations of urban densification or substitution;
- the possibility of identifying areas of the urbanized territory in which the urban renewal, densification and substitution interventions can lead to the assignment of lower areas for territorial equipment than

those established by DM 1444. This is possible if they are otherwise satisfied within the area, in surrounding areas, in areas accessible through protected cycle paths or by public transport;

- the reduction of the use of the private car and the associated reduction of the parking areas, both public (from standard) and private (internal to buildings) in the urbanized areas with high sustainable accessibility, in which are planned reuse and regeneration interventions. Part of the parking standard ratio can be transferred in private buildings. These forecasts can also be applied to new urbanizations;
- the compensation measures, environmental and territorial rebalancing measures, and ecological equipment cannot reduce the construction contribution and cannot be monetised.

A last account to do is the possibility that the standards defined by Ministerial Decree 1444/68 might also be implemented under a convention between the public administration and a private entity. In this case, we talk about the affixation of a "conformation constraint" (Urbani, 2014).

This type of constraint, unlike the "expropriation constraint", does not involve a loss of ownership of the land, but only a reduction of its availability in relation to the presence of higher-level objectives of public interest (for example a landscape constraint) or in relation to the conclusion of an agreement allocating a property to a public use.

In this way, a relationship is established between public and private, for which the former specifies the destination of an area to public use equipment and the second remains the ownership of the property and its management. Public use is implemented by means of the provisions contained in the agreement. They force the private entity to specific conditions in the way the equipment is managed.

2.2 OUTCOMES

The need to threat an important section of the plan for the recognition of public equipment, with the aim of defining its size and distribution, as we can see in the case of Florence shown in Fig. 1, has had as primary outcome the growing of the ground stock belonging to the public land patrimony.

However, this process has had significant costs for the local authority's finances. We need only look that at least three types of costs must be identified with each property to be acquired to the public patrimony:

- the cost of ownership acquiring the of the property. Traditionally, the used tool is the expropriation;
- the transformation cost of the area, necessary to make it usable;
- the management costs, necessary to maintain the efficiency levels, to comply with the safety laws and to improve the conditions of use in relation to the evolution of the laws and of maintenance techniques.

These three categories of costs, connected with particular steps of their life, can be associated to any public good that is labelled as "standard" or, more generally, as public equipment.

In practice, however, it happens that many of these goods lack one or more phases of the process, to mean that they have never been acquired to public assets (therefore never expropriated), or have been acquired but not transformed, or have been transformed but not maintained. This state of beings creates a lot of problems to the cities because the extension of these unprocessed or abandoned areas causes degradation and loss of quality in urban areas, as well as a significant waste of land and an economic damage because they are unavailable for other purposes (Fabbri & Mascher, 2009).

Closely linked to the resources is the issue of usability. If, in a first phase, the costs of expropriation and transformation were fully borne by the public administrations, it was immediately realized that this mechanism would have been unsustainable in the long term.

To solve this important issue, some solutions were proposed at different times.

The first solution was the involvement of citizens or other stakeholders in the construction of the public city, through the payment of charges to build (Law 10/1977, then repealed and merged in Presidential Decree 380/2001) when they require permits for the construction of new buildings or for radical transformation of existing ones.

The need derives from the link existing among increasing of soil value, urban transformation actions and increase in urban load, in terms of demand, that goes to weight on equipment and network infrastructures. As a result, it was established that the possession of this advantage would have as counterpart the fee of a share of the costs to equip these areas with infrastructures. In this way the community re-appropriates part of the increases in value, allocating them to the realization of public works.

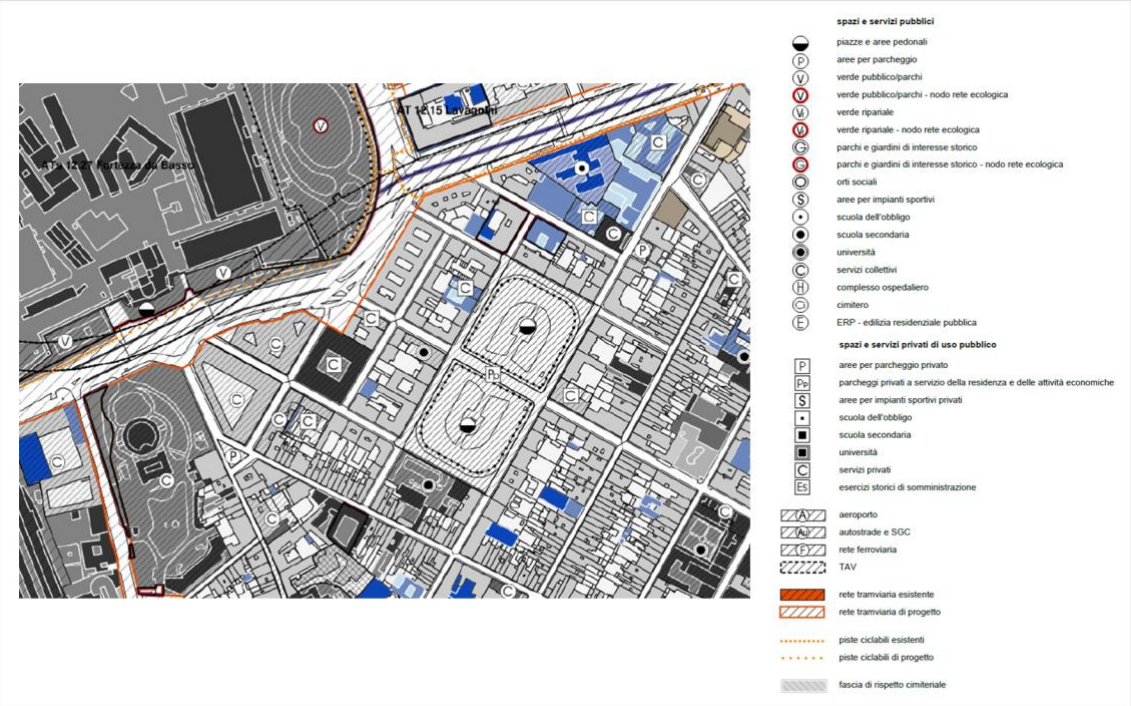

Fig. 1 Florence, Structural Plan. Equipment in the urban rule and discipline of soil and settlements. http://pianostrutturale.comune.fi.it/mappe/.

The scheme assumed that this fee was sufficient to cover the costs of urbanization. Often, this did not occur especially for the setting up of secondary urbanizations, the most significant ones (Fabbri & Mascher, 2009). We found the reason in the fact that, moreover, the funds reserved to this chapter of the local authorities' budget were often used for other purposes than the implementation of standards and urbanization. In any case, the amount of sums available did not guarantee the coverage of the above mentioned costs.

About this, Italian 2017 Budget Law (Law 232/2016) confirmed that the incomes deriving from the urbanization costs must be tied to specific destinations, that are:

- construction and maintenance of ordinary and secondary urbanization equipment;
- rehabilitation of buildings located in historic centres and degraded suburbs;
- reuse and regeneration interventions;
- demolition of illegal buildings;
- purchase and construction of green areas for public use;
- protection and rehabilitation of the environment and landscape, also for purposes of prevention and mitigation of the hydrogeological and seismic risk and of the protection and requalification of the rural heritage;
- interventions to encourage the establishment of agricultural activities in urban areas.

Second solution is the identification of public-private exchange mechanisms that would guarantee the public the cost-free property of the areas required for the implementing of standards and other equipment, in the face of the possibility for the private subjects to concentrate volumes and functions on the remaining surface area (Urbani, 2002; Micelli, 2004). These equalization mechanisms have the advantage of eliminating the costs

necessary for the first phase of acquisition but do not fully guarantee coverage of the second and, above all, of the third phase.

The third solution is to consider as standard private areas and equipment after the signing of specific conventions for public use.

In this case, the private sector, in the face of advantages identified from time to time, provides the community with a service of public use otherwise not feasible or feasible with high costs for the public administration. In this case, the public eliminates at least the first two types of direct costs. The advantage is obvious, even if to be verified case-by case basis and the costs are focuses on the third component. It may be a direct payment in the case of rents or other charges, or an indirect disbursement in the case of tax benefits.

The aspect related to the outcomes is not limited only to the financial issue, but it should be extended to the quality of the public works.

Fig. 2 Naples, Via Argine. Areas for urban standard and for public equipment. A, Green. B, Equipped green. C, General interest equipment, ABC headquarter. D, General interest equipment, sports hall Palaponticelli.

The application of the standards regulation has had a relevant quantitative feedback but a much more limited response in terms of quality. Generally, equipment falling into this category has not been able to raise the quality of cities, especially in areas where they should have acted more effectively.

In the urban expansions of the first crown and suburbs, for example, where the main poles of residential expansion formed after the Second World War have been concentrated, as in the case of Naples shown in Fig. 2. These areas require a greater attention, because their social and economic weakness caused by their recent formation.

It is also clear that this reasoning must be contextualised geographically and in relation with the urban dimension, and that there are cases marked by a great intrinsic quality. But, overall, it is not possible to dispute the fact that the design was "basic", using a magnanimous expression, with spaces and volumes often further degraded from a poor ordinary management.

Lastly, specific considerations must be made for the general interest equipment, which, according to DM 1444, should have been identified by the urban plans within specific areas designated for them (F zones).

Such equipment are necessary when there is the need to cover a demand for services whose catchment area is considerably higher than those of a neighbourhood are. These equipment may be existing or may be newly

established. In both cases it is necessary a constant checking of current and potential basins and of their extension. However, it is clear that they, unlike the DM 1444, derive from a forecast associated more to a territorial level than to a municipal one. It follows, therefore, that the programming of these allocations must be made at a supra-local level and that the urban plan should be up only the task of identifying the settlement area.

3. UPDATING

We comprise from the above the purely operational character of DM 1444. This character is a starting point for the building of a hypothesis of updating and adaptation under strongly changed conditions.
Standards are formulated as numerical limit values (measured in square meters for inhabitants) down below an urban plan cannot come down. They, in turn, are structured as an overall value divided, in turn, into four functional categories that are portions of the total.
Imposed fifty years ago, these threshold values are now outdated by the state of a greatly changed territory also for the results of years of urban planning. If we only think in quantitative terms, in fact, while fifty years ago in the overwhelming majority of municipalities the standard equipment for inhabitants was lower than the limits of the decree, today the situation is as overturned.
In other words, the issue of updating is not numerical, because in this case there would be no need to change the DM 1444. What we must to deepen is the connection between new needs, new necessities, new risks for the city and adequate and updated answers in terms of quantitative and qualitative characteristics of the equipment.
The change in the overall situation of cities can be the basis for building a new system of public equipment. This change can be exemplify using three different reading levels.

3.1 CHANGE OF PRIMARY PLANNING TASKS

The first reading level is connected with the change of primary planning tasks. Planning is born as an organized design of the urban expansions and it has gradually transformed, especially in nations with an advanced economic development: from an expansive process, it has become more and more transformative and connected with the built city. The latter becomes the place devoted to the construction of the city's innovation processes and the transformations of the built spaces are the actions that shall ensure to maintain and evolve the functional characteristics and the attractiveness of the city.
Obviously this reasoning become meaningless when we consider some areas of the planet where urban growth still takes place at a sustained pace.
Urban transformation processes are an effective way to preserve the territory because reduce or reset the land consumption modulating it in very diversified way through reuse operations of already urbanized spaces that may take the form of densification, of de-sealing (Artmann, 2014), or of re-naturalization (Mazzeo, 2012).
The planning tasks must be updated also considering the processes of climate change and the circumstance that cities are among the main causes of the changes underway. At the planning level, it is possible to borrow a series of practices that can reduce the weight of the city. This must be done at all levels, from the strategic to operational planning.
From a quantitative point of view, the cited processes modify the influence of the city's public facilities in the sense that the existing or forecasting ones have to cope with loads that can vary positively or negatively compared to a previous state.
From a qualitative point of view, these changes can have an even greater impact because they can become a place of experimentation and application of new ways of managing the equipment according to social changes and to the processes of urban evolution.

The public city, in this kind of operations, becomes strategic within urban policies and, therefore, it acquires a centrality overdoing the simple numerical enumeration of the urban standards.
This change of paradigm requires a greater attention to the urbanized portion of the city, in order to guarantee the pursuit of the objectives of urban sustainability.
Excluding the expansion, in fact, every action of transformation must take place within the urbanized boundary, with the aim to bring the city a step closer to the finish line of the environmental neutrality.
In this respect, also the innovation of equipment and standard, meanwhile modifies the classical meaning of these elements, it contributes to the achievement of this goal and it becomes, in themselves, factor of public interest.

3.2 PERFORMANCES

Public equipment are useless if they are not efficient and if they do not have quality. The question concern the existing standards and those that will be implemented.
Therefore, the second reading level is the evaluation of the standards in terms of performances. Performance, in this case, indicates the operation level and the ability to perform with satisfaction the task for which the standard has been designed. Functioning has to do with both management and maintenance, in the sense that their correct execution maintains the standard. If the standard is based on a performance, it means that can be evaluated by way of thresholds. On the one hand, it can be fully efficient (threshold 100, for example), on the other hand, non-existent or out of order (threshold 0), with all the possible in-between gradations that the functioning can assume.
The performance level can be determined according to status and utilization indicators. It implies the need for a continuous control on the efficiency and on the degree of satisfaction of the demand. It presumes also a radical change in the methods of construction and management of the equipment, as it must be considered a good that is really available to citizens. A further element to put in place is the possibility that the performance efficiency of existing standards becomes a reward for the municipal administration.
The reasoning starts with the observation that if the standard is an obligation it must exist and work for the citizens-users. If we associate the "performance" qualification to an equipment, we assume the existence of different levels of efficiency.
It follows that the administrations that maintain their public equipment at an optimal functioning level can get some kind of advantage, for example, when they make plans or when the upper levels of administrations distributes public funds.

3.3 CHANGE OF THE STANDARDS WEIGHTS

A third reading level still hypothesizes a change, but this time it is measured in terms of variation of the standard importance, based on the consideration that the current social, demographic and economic reality of Italy has profoundly changed to that of 50 years ago.
The new urban conditions are characterized for a population in a general situation of quantitative stasis, if not often of regression; for strong changes in the absolute composition and percentage of different age groups; for a mutation of needs in terms of specific demands; for the need to respond to the challenge of climate change. These and other factors make it necessary to rethink the relevance associated with each category of public equipment. We can give some examples:

- in a town centre that is in a phase of population reduction the amount of equipment per inhabitant tends to grow even without any increase in total surfaces. In such a case, the numerator (equipment) is steady, but the denominator (population) decreases. Such a condition could be considered objectively positive. The downside consists in the fact that if the provision for inhabitant increases in the face of a decrease

in the population, it also increases the cost that each citizen has to bear in order to keep in efficiency these facilities;

- the distribution of the population in the age groups has changed to the point that the age pyramid has been transformed into another form with the basis that has become increasingly narrow. Consequently, the amount of specific demand linked to age changes. In particular, the demand for compulsory education tends to have an ever-smaller dimension, while the demand for services for the older age groups tends to increase (Pinto & Sufineyestani, 2018). This translates into a changing of the types of standards, with the shift of physical and monetary resources from one age group to the other. Specifically, from the youngest to the oldest;
- the reasoning referred to the previous point could be reversed if we decide that devoting more resources to lower age groups is strategically more important than dedicating them to the older ones, also with the aim to recover positions on the birth front. This would mean reducing the attention to the higher age groups but it changes the reasoning on the standards by technical to political. The same reasoning applies to the weight that the lower income social groups assume. It is a way to pay attention to marginal social realities, since the wrong distribution of resources is not only a function of age groups but also of the level of marginality within society;

Fig. 3 Hellerup, Danimarca. Gammel Hellerup Gymnasium, 2013. Architect: BIG. Photo: Iwan Baan[2]

- efficiency of buildings, production of energy from renewable sources and reduction of water consumption are three sustainability parameters to be applied to every standard, both in presence and in the absence of volumes. The public city, as also foreseen by European regulations, becomes the means to insert and disseminate good practices in the city related to the principles of renewability and sustainability;
- a possible strategic answer is the realization of flexible or mixed-use standards. These standards can give the answer to multiple needs in the same place or in the same volume, on the basis of a diversified use of spaces and equipment (Fig. 3).

[2] The equipment is a large multifunctional space that could be used for sports, graduation ceremonies and social events. https://www.archdaily.com/412908/gammel-hellerup-gymnasium-big.

These examples make it necessary to continuously check the characteristics and weights of the single standards so that they can respond to as well to the changes taking place.
This is a topic connected with equity between the different components of society and with a more correct "allocation of resources", like economists say.

4. NEW STANDARD

4.1 METHODOLOGICAL ELEMENTS

The three reading levels above discussed represent the starting point for the development of a methodological path that, through the definition of a set of functional requirements parallel to the dimensional requirements that currently distinguish the standards, reaches the identify of new standard categories.
While new standards update the urban equipment systems to meet the new needs that the city has to face, the requirements are linked to a new way of thinking about urban equipment in terms of performance in addition to quantity, by reference to the characteristics of use and functionality that are required of them.
In this perspective, in fact, the requirements are used to ensure that the urban facilities are able to ensure the response of urban systems to a given necessity in terms of usability, simplicity, low cost of management, technological adequacy, and sustainability. Practically, they are aimed at ensuring the efficiency and the functioning of the standards.
Borrowing typical expressions of marketing, the requirements want to increase the degree of satisfaction of the users (the citizens) with levels of supply that can exceed the basic level (the quantity). They want to give them higher performance or, even, to assume attractive qualities encouraging the user to identify himself with the service and to feel it as part of their experience of urban life (Hinterhuber et al., 1997).
Among the potential functional requirements, some of them are highlighted below, with the warnings that the list is open to further extensions and that there are close interrelations between the different requirements:

- quality of the materials to be used for their realization, in order to guarantee the durability of the equipment and, at the same time, the sustainability and environmental compatibility for the entire life cycle. For example, the use of materials that can help to decrease the demand for air conditioning, or local materials to decrease transport emissions;
- consumption limits. This requirement is linked above all with the installed facilities and with the amount of energy necessary for their functioning. The requirement is also linked with the origin of the used materials and with the respect for the renewal requirements of the ecological stock. For example, use of recycled materials in place of first-use materials, or use of materials from controlled sources;
- emission limits of materials. The requirement, concerning the construction and use of materials, is related to the low amount of energy necessary for its production and to the low emissive capacity during use;
- usability limits. Requirement relating to the ability of the equipment to entirely perform its service. The limit must be intended as the identification of thresholds below which the equipment must be subject to requalification;
- time flexibility. Requirement to be understood as the possibility that the equipment can be adaptively used within 24 hours. For example, a soft mobility infrastructure that can be used for exhibitions or social gatherings;
- use flexibility. The requirement must be understood as the possibility of different uses. For example, a space / building that can host different activities in the same space and in different time slots. This requirement also presupposes the possibility that space can be easily reshaped according to needs;
- public and / or private handling. This requirement is necessary to compensate for the lack of economic and financial resources, thus ensuring a continuous use of the urban infrastructure. It also aims to enhance private initiatives worthy of some recognition depending on the activities they perform.

Tab. 2 shows the relationships between the seven requirements and the three reading levels, thus highlighting the relationship existing between them and the innovation processes underway. In doing so, it is possible to move on to the next phase, the identifying the new standard categories.

Functional requirements	Reading level a – New planning tasks	Reading level b - Performance	Reading level c – New standards weights
FR1. Quality of the materials		XXX	
FR2. Consumption limits	XXX		
FR3. Emission limits		XXX	
FR4. Use limits			XXX
FR5. Time flexibility	XXX	XXX	
FR6. Use flexibility			XXX
FR7. Public/private handling	XXX	XXX	

Tab 2 Functional requirements of the new standard in relation with the three reading levels.

4.2 NEW STANDARDS

In line with what we described up to now, the evolution of the needs and demands of today's cities, and the urge to direct urban policies towards increasingly compelling conditions of environmental sustainability need the adoption of an integrated and multi-functional approach to the standards. This approach can provide answers to new demand such as the protection from the hydraulic risk, the reduction of polluting emission, the loss of biodiversity. Moreover, one factor that is increasingly important in the functioning of the cities is related to the efficiency of mobility systems and, therefore, the accessibility to the different parts of an urban area. The setting up of the proposal of standard reshaping put together two complementary concepts, that of urban standards and that of design standards for buildings. At first sight, they do not seem to be embeddable among them, but the need for a deep update of the regulation on standards also brings with it also an update of the concept of standards, as above highlighted. This deepening in itself extends the meaning of standards and involves aspects that the 1968 legislation didn't take into account.

It is worth emphasising that if on one side the construction of the standard as a characterizing element of the public city should not be abandoned because it is a reference point of the actions implementing the planning on the urban territory, on the other it is useful to consider also provisions introducing quality standards for buildings. This double value of the standard can be interesting for two fundamental reasons:

1. Public buildings can be considered as second level standards (first level are surface standards) for which to provide quantitative and qualitative norms. Because public these buildings should be a flagship of the methods of construction of the city of tomorrow, in which the standard can be not only the surface but also the quality in the use of it, the healthiness of the products used, the reduction of overall impact of buildings.
2. The good practices of the public city, deriving from the implementation of the new standards, become quality elements applicable also to the whole city, even if with different modalities and obligations. In this way, the private construction and redevelopment activities can be channelled on the same tracks as those of the public city.

The potentiality of this process lies in the circumstance that transforming the way of building and regenerating translates into a net gain for the community into the medium and long term.

In this perspective, and with reference to Table 2, which relates the reading levels with the functional requirements, we identified some new categories of potential standards.

- Energetic standard. The equipment, both two-dimensional and three-dimensional, must consume always less and produce ever-higher percentages of energy using the available renewable sources (Papa et al., 2016). The same reasoning applies to dispersions in the atmosphere, on the ground and in water.

- Emissive standard for building and areas. The choice of materials and their correct use makes it possible to reduce the emissions of heat and harmful gas from urban surfaces. To favour this aspect it is necessary, above all, the use of qualitatively superior products whose effects will be perceived in the long term.
- Advanced design of public spaces. This category of standard is one of the least classifiable within this process of updating, but it may be interesting to push towards a design that refers to the best practices. In this way, it is possible to positively influence on some territorial phenomena such as the urban heat islands, result of the impermeable waterproofing of the territory (Zanchini, 2011).
  We emphasize that the issue of the quality of the design is a pre-condition in many projects at international level. It must also be extended to current design, much less attentive to these aspects.
- Ecosystem urban green. Ecosystem services (for a classification, La Notte et al., 2017) merge new meanings linked to the environmental criticalities (Giaimo, 2018a). The urban green, one of the classical rates of the standard, represents a mono-functional space, generally underutilized, which instead can take on new meanings (Pelorosso et al., 2013).
  We need only consider the possibility of modelling it in such a way as to become an active component in the local response to climate change and in the management of meteorological crisis conditions (storm water management) (Mazzeo & Zucaro, 2017). Water plazas, different types of essences, subsoil conformation, rainwater collection, physical connections between currently separate green areas, green corridors and bypass, are some of the working tools that can be associated with these services (Fig. 4). The expansion of new green infrastructure networks can take place with the removal of hard surfaces, with the aim to protect public and private goods and to store storm water for derivative uses. They can also help to better absorb flood events, just like they can help to rethink the importance of the infrastructure, and to modify our relation with the nature in the city.

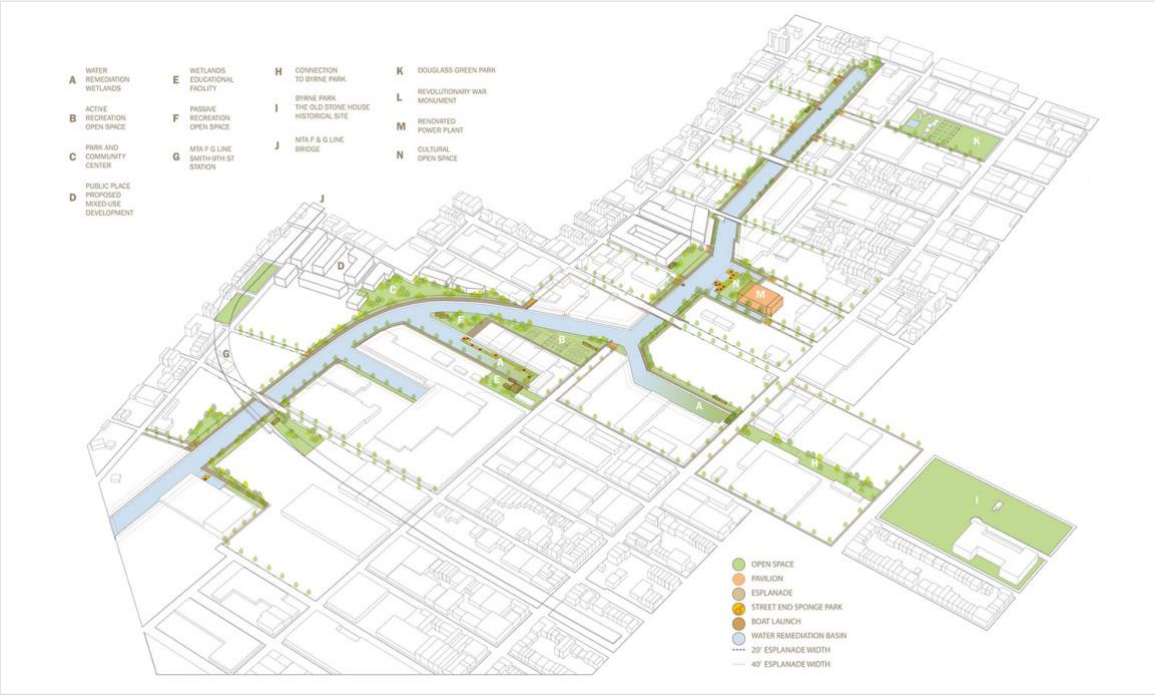

Fig. 4 New York, Gowanus Canal, Sponge Park™ Project. Dlanstudio. https://dlandstudio.com/Gowanus-Canal-Sponge-Park-Pilot[3].

[3] Sponge Park™ re-directs, holds, and treats storm water runoff to minimize the volume of overflows that occur within the canal, reducing raw sewage contamination and thus helping to clean the watershed.

The ecosystemic urban green is both a local and urban level provision. In this perspective, thus, it falls within the category of the traditional standard as well as that of equipment of general interest, as defined in the DM 1444. The intent of its inclusion among the new standards lies in the fact that it can be formed to face requirements that are not just those of the use as green areas. As an ecosystem standard it can be built in order to function as a thermal regulator (arboreal essences, three density, ponds, and so on), as a regulator of the water flow rate in case of heavy rains (water squares, underground tanks, and so on), as part of a network of territorial green corridors fitting within the city.

- Urban farming standard. An essential type of ecosystem services is related to the maintenance of agricultural production in suburban areas, critical areas for the proximity with the city, and its systematic introduction into urban centres. In this case the new standard assumes a double value: it preserves natural ecosystems (also using biological production techniques, with the abatement of the use of chemical products), and it produces value in terms of exchange goods and income (Collarini, 2018). Urban green and urban farming can structure a system of active areas that we can define green and blue infrastructures, forming continuity channels within the urban array (Cannas & Zoppi, 2017).
- Standard connected with mobility and accessibility function. The accessibility of urban areas qualifies in terms of possibility of using vehicles other than the car. Key elements of this potential standard are the frequency of public transport, the percentage of users of public transport, the density of pedestrian and cycle axes, the quality of the connection spaces (Fig. 5), and the existence of equipment that facilitates the move of lower mobility groups (slow mobility) (Papa et al., 2017). It also includes equipment that facilitate the use of individual non-polluting means (electric, natural gas, and so on), as well as those related to the accessibility of internet and IT services.
- Standards related to social housing, collective residence and spaces for carrying out specific working and service activities with strong innovation matrixes. This standard deepens the possibility of building flexible relationships that allow the socialization and implementation of specific projects related to periods of study and training, to non-continuous work activities, to temporary residency.

Fig. 5 Prato, Piano Operativo. Green reconnection in San Paolo neighbourhood. Source: Urbanpromo/2018.

The listed categories can be considered in a double role: as an evolution of current standards or as the insertion of new categories within planning's procedures. In both cases, the new standards must be associated with the same obligations currently in force as those contained in DM 1444/1968 (Fig. 6).

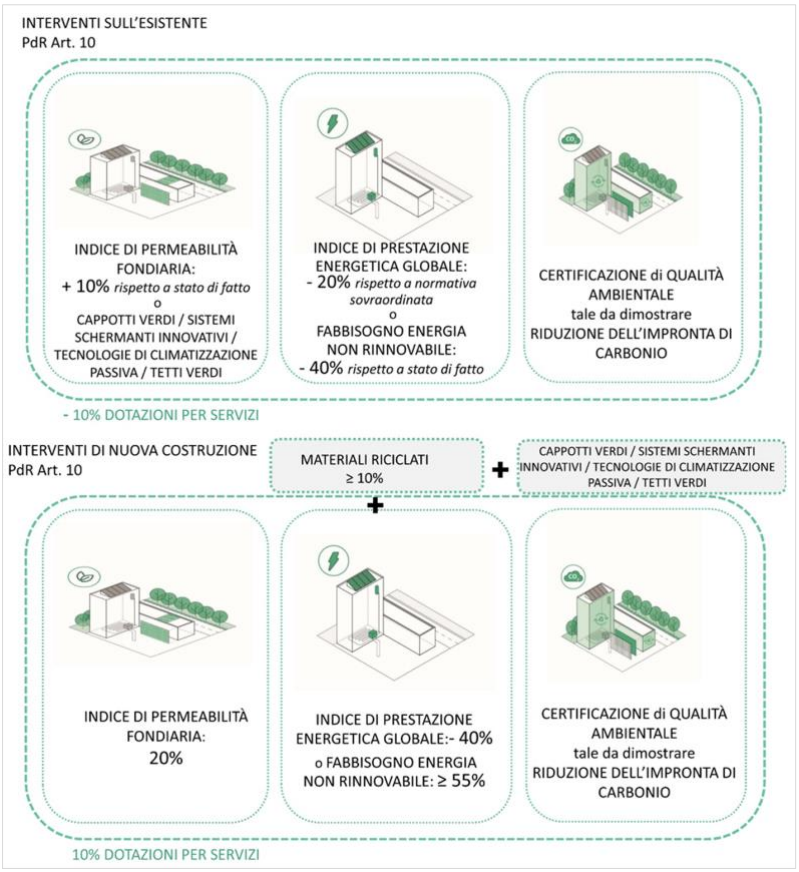

Fig.6 Milan, "Milano 2030", Revision of the Piano di Governo del Territorio (PGT), Piano delle Regole, Norme di Attuazione, art. 10. New standard for existing and new buildings. Collarini, 2018
http://allegati.comune.milano.it/territorio/20181029_PGT_Giunta_Def/03_Piano_Regole/01PR_Norme_Attuazione.pdf

Figure 7 highlights the relation among new categories of standard and functional requirements, showing the intersections whit conditions to deepen in a next step are present. These conditions do not replace the existing quantitative limits but integrate them with new properties that can be defined either through further numerical limits or through quality assessments namely, the identify of specified characters for each of them, the dimensions, and the levels of effectiveness within urban structures. Fundamental will be the preparation of a computerized catalogue of best practices, where technologies and solutions are compared and updated.

			Requirements for checking the functionality of the standard						
Main standard category	Secondary elements	Existing standards (DM 1444/1968)	Quality of the materials	Consumption limits	Emission limits	Use limits	Time flexibility	Use flexibility	Public/Private handling
Energy Control				Y	Y				
Buildings	*Schools*	*YES*	Y	Y	Y	Y		Y	Y
	Public Equipment	*YES*	Y	Y	Y	Y		Y	Y
	Other	*YES*	Y	Y	Y	Y			
Areas			Y			Y	Y	Y	
Green Spaces		*YES*				Y	Y	Y	Y
Urban Water						Y	Y	Y	
Urban Farm			Y				Y	Y	Y
Mobility	*Pedestrian Paths*		Y			Y	Y	Y	
	Cycle Paths		Y			Y	Y	Y	
	Public Transport Hub		Y	Y	Y	Y			Y
	Roads		Y			Y			
	Parking	*YES*	Y			Y	Y	Y	Y
Housing	*Social Housing*		Y	Y	Y	Y	Y		
	Collective Housing		Y	Y	Y	Y	Y	Y	Y
	Incubators - production		Y	Y	Y	Y	Y		Y

Fig. 7 New standard categories and properties for checking their functionality

5. CONCLUSIONS

The insights made on the subject of public equipment have outlined the existence of lights and shadows and the clear need to get a grip to a profound conceptual and operational renewal.

The research of new categories of standard is not sufficient to understand the extent of the evolutionary process that urban planning practice must achieve. It is necessary, in fact, a parallel reasoning on the requirements they must possess in order to respond effectively to new questions arising from the city.

Standards in their original formulation (DM 1444/1968) had to respond to a single dimensional condition that is to respect minimum thresholds of quantity. This condition was sufficient to proceed with the approval of urban plans and left any other implementation or use specification to the build phase.

The necessary progress must be to enrich the contents of the standards requirements already in the planning stage, in order to highlight the potential benefits of their implementation adapting this aspect of the plan to the complexity situation reached by the cities.

The Italian urban planning literature has underlined the problems that the legislation on standards has generated (inter alia, Falco, 1987; Treu, 1998; Zoppi, 2003; Giaimo, 2018b). Plans characterized by highly mechanistic and deterministic arrangements, an interest based only on the quantitative aspects of the equipment, without any attention to the qualitative aspects, the poor attention to services not foreseen by the law's categories, the indifference to the territorial specificities.

The resulting application has certainly improved the life conditions in the city as it operated in a situation of serious emergency and it has introduced into the planning the principle that every citizen has the right to a share of public services. As Campos Venuti writes (2001, 43): «The *Legge ponte* and the decree on standards reccomended social and environmental quality objectives for the plan».

This should not make us forget that for a long time the evolution of the concept of public services has undergone clear delays because the potential testing got bogged down on the obstacle of legislative constraints. In other words, the urban planning standards have allowed to equip the cities with new and numerous public facilities, but these, very often, have not been able to express urban quality and to become a recognized aggregation factor.

Next to the question of quality, there is the question of the adaptation of equipment to a changed urban reality, thanks to demographic, social, economic, and environmental changes.

The issue of the reuse of underused or abandoned equipment due to causes such as demographic decline, or the social changes shifting the needs within the city, is cited as one of the factors affecting the maintenance of the stock of equipment built by the institutions over the years. It is a topic of great interest with at least three critical aspects. The first is the opportunity to erode the stock of public goods, in some cases now oversized. The second has to do with the costs of maintenance and management of public goods, a cost that goes up with the decrease of inhabitants (but also with the increase in the mean age of the population), but that must be taken into account also in case of functional change. The third aspect is related to the ability of the city to adapt its equipment offer to changing needs, realizing equipment fitted with high use flexibility.

All together, these changes require a deep rethinking of the public city within an urban structure that today is radically different from that of fifty years ago.

The need to deep the reasoning on the public city results by an unprecedented combination of deeply troubling environmental problems, political changes, and innovation in technology and design. To deal with this state it is necessary an interdisciplinary work creating new urban model as result of the knowledge of planners, hydraulic engineers, transporters, ecologists, economists, and exponents of culture, with the aim to shape better-performing and more compelling cities to work, live, and raise families. It is necessary, for example, to «understanding how physical geography, ecology, and climate function is critical to the development of new types of infrastructure that are more responsive to the forces of nature» (Drake, 2016).

It is also evident that local administrations cannot implement this program if they are alone. They must have the support of upper government levels within a national program for the adaptation of cities to ongoing changes.

Based on the considerations carried out, the paper has proposed a qualitative methodological scheme. First step was the analysis of some reading levels requiring a process of adaptation of the planning techniques and contents, in general, and of public equipment, in particular. In order to get to the proposal of new categories of standards, an intermediate step was the identification of a set of general functional criteria of the equipment. The intersection between functional criteria and new categories of equipment generates a field of study to deepen by means of specific quantitative and qualitative functional criteria.

This methodological structure necessitates because DM 1444 adopted a quantitative approach, who looked at infrastructures as a machine functioning thanks to simple numerical combinations. Today the situation has changed and it became clear that qualitative processes, with greater flexibility, must support the numerical systems. In this way, they can increase the answer of urban systems to complex social and environmental events.

AUTHOR CONTRIBUTIONS

Although this paper should be considered a result of the common work of the authors, G. Mazzeo took primary responsibility for the sections 2.2, 3.1, 4.1 (with F. Zucaro), 4.2, R. Morosini for the sections 2.1, 3, and. F. Zucaro for the sections 3.2, 3.3, 4.1 (with G. Mazzeo), meanwhile the part 1 (Introduction) and 5 (Conclusions) are a product of the shared reflections between the three authors.

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 1 (2019) 53-64
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5893

review paper received 10th November 2018, accepted 12th April 2019

www.tema.unina.it

How to cite item in APA format:
Aldegheishem, A. (2019). Success factors of smart cities: a systematic review of literature from 2000-2018. Tema. Journal of Land Use, Mobility and Environment, 12(1), 53-64. doi: http://dx.doi.org/10.6092/1970-9870/5893

SUCCESS FACTORS OF SMART CITIES

A SYSTEMATIC REVIEW OF LITERATURE FROM 2000-2018

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ABSTRACT

The aim of this paper is to review smart city literature to achieve these goals. More than 150 sources of literature were approached and analyzed with a view of finding out drivers and success indicators of smart cities on which future research policies are depend. The results pointed out several drivers that stimulate cities to be smart. These drivers are related to economy, environment, governance, safety, energy, living, technology, buildings, education and people. Interestingly, a smart city should be distinguished by smartness extent achieved to meet the requirements of these drivers. That is, a smart city is the one that marked by its own smart economy, smart environment, smart governance, smart safety, smart energy, smart living, smart technology, smart buildings, smart education and smart people. This paper contributes to smart city literature by showing drivers and indicators related to smart cities success.

KEYWORDS:
Smart City; Drivers of Smart City, Indicators

TeMA
有关土地使用、交通和环境的杂志

TeMA 1 (2019) 53-64
print ISSN 1970-9889, e- ISSN 1970-9870
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智慧城市的成功因素：系统性文献综述（2000-2018）

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摘要

本文旨在通过梳理智慧城市文献资料，实现所述目标。通过对150多篇文献资料进行查阅和分析，发现智慧城市各大驱动因素和成功指标，供未来研究政策所参考。研究结果指出了促使智慧城市形成的几大因素。这些驱动因素涉及经济、环境、治理、安全、能源、生活、科技、建筑、教育和人员。有趣的是，一座智慧城市的划分，应取决于该城市达到的智慧程度是否满足这些驱动力的要求。也就是说，智慧城市是以自身的智慧经济、智慧环境、智慧治理、智慧安全、智慧能源、智慧生活、智慧科技、智慧建筑、智慧教育、智慧人员为特征的城市。本文通过阐述与成功的智慧城市相关的各大驱动因素和指标，为智慧城市的研究文献做出了贡献。

关键词:
智慧城市; 智慧城市的驱动因素； 智慧城市的; 成功指标

1 INTRODUCTION

In recent years the smart city concept becomes a general term used to refer to a positive process of urban areas (economic, environmental, transport, social, etc.) (Papa et al., 2015). Smart city concept has gained great attention in the literature since the concept was deemed as a crucial aspect of future urban planning (Albino et al., 2015). Babar (2016) estimated that 80 percent of citizens all over the world by 2020 will live in cities. Monteiro et al. (2018) pointed out that the real reason behind the emergence of this term was to find appropriate solutions in response to population growth in the cities. Numerous terms related to the smart city concept were found in the literature. Examples of these terms include: intelligent city, innovative city, flexible city, attractive city, and resilient city, digital city, high-tech city, green city, and low carbon city (Albino et al., 2015; Caragliu et al., 2011; El-Messeidy, 2016; Makhoul, 2015; Tahir and Malek, 2016).

The concept of the future city at the urban scale, focuses on the improvement the relationship between technological advancement and sustainability challenges (Moraci & Fazia, 2013). In general, definitions of smart city concept followed two major lines; a narrow line and a wider line. The narrow line in defining smart city describes this concept in terms of information and communication technology used in cities in order to manage activities, events, resources and to cope with city development consequences.

In this line information and communication technology was used to provide solutions to problems facing cities (De Oliveira et al., 2018). The widest line of the concept encompasses several aspects that go beyond information and communication technology such as social, economic and environmental aspects (Lacinák & Ristvej, 2017; Makhoul, 2015; Tahir & Malek, 2016). In a study by Albino et al. (2015), more than twenty-five definitions of smart city were cited. These definitions can be categorized into two groups related to information and communication technology and a mix of technology and investment in physical, human and social capital using governance and economic development framework. Beretta (2018) conceptualized smart city as an integration of information and communication technology with human and social capital. In the same context, Caragliu et al. (2011) divided the concept of smart city on the basis of its infrastructure into two types which were physical infrastructure along with the human and social infrastructure. In this paper, the wider line of smart city definition was followed to gain more understanding of this concept and factors that play critical roles in its achievement as an intended goal of many cities across many countries. Adopting the wider perspective of smart city, the term was defined as a system of inter-correlated subsystems, including energy, mobility, flows of materials and services, and people (El-Messeidy, 2016).

The introduction of the smart city concept was derived by numerous factors. Many countries are striving to have its own smart cities due to numerous challenges such as dealing with the increased growth of their population, increased pollution of air and contributing to the global to reduce the warming dilemma (El-Ghorab & Shalaby, 2016; Lacinák & Ristvej, 2017). In order to eliminate or at least reduce these problems, a deep review of smart city literature is required to determine aspects that should be kept in mind when smart city planning process starts. These aspects represent indicators of smart cities and can be considered as outcomes for smart cities development. These indicators enable cities to achieve criteria stipulated to describe a city as a smart city (Al Nuaimi et al., 2015). That is, indicators of smart city refer to success factors of developing smart cities. They highlighted some examples of these indicators such as intelligent management of city resources and facilities, mobility, environment, governance, and people. Meijer and Bolívar (2016) indicated that a smart city can be described in terms of three major components: smart technology, smart people, and smart governance. Tahir and Malek (2016) studied the requirements of achieving smart city goals and concluded that smart environment and smart mobility were the most important indicators of the successful development of smart city, followed by other indicators such as smart living, smart economy, smart governance and smart citizen.

Tok et al. (2014) cited the following smart cities indicators: smart living, smart mobility, smart environment, smart economy, smart people, and smart governance. All in all, indicators of smart cities when achieved are

regarded as signs of successful construction of smart cities. Al Nuaimi et al. (2015) reported several definitions of smart city from which different aspects of smart city can be concluded.

Indicators of smart city extracted from these definitions include physical infrastructure, social factors, human factors, the Internet of things, monitoring of resources and life activities in a country such as roads, ports, communications, natural resources, transportation, socio-economic development, improved governance and innovative management of resources.

Joshi et al. (2018) identified six indicators of smart cities: smart living, smart governance, smart people, smart economy, smart mobility and smart environment. Numerous literatures carried out on smart city revealed the same indicators (Cocchia, 2014; Arroub et al., 2016).

Based on these studies, the main focus of this paper is on indicators that distinguish smart cities. In fact, these indicators can be used to guide the overall process of smart city adoption since it provides policy makers, urban planners and designers with criteria that should be noted in the construction of smart cities. On the other hand, this paper enriches the body of smart city literature by elaborating significant lessons learned from global experiences in the same domain.

In other words, indicators of smart cities can be analyzed to draw a conclusion about the success factors of smart cities. (Minimum length of your contribution is approximately 40.000 characters including spaces).

2. RESEARCH METHODOLOGY

2.1 RESEARCH STRATEGY

Khan et al. (2003) identified five steps of conducting systematic reviews; formulation of research questions, searching relevant sources of papers and identifying inclusion and exclusion criteria, assessment of study quality design, summarizing the evidence and interpreting the results. Uman (2011) reported the following phases of systematic review; formulation of research questions, definition of inclusion and exclusion criteria, developing research strategies and locating articles, a selection of articles, extraction of data from these articles, assessment of study quality, analysis of studies and interpretation of findings.

Cocchia (2014) conducted a systematic review of smart city literature from 1993-2002 by collecting, storing and organizing a set of papers on the smart city concept on the basis of time, terminology, definition, typology and geographic analysis. Research strategy used in this paper consisted of formulation of research questions, the criteria used for inclusion, selection of articles, analysis of articles, and interpretation of findings.

2.2 RESEARCH QUESTION

The challenges faced by the developing countries are still full of the many problems facing sustainable development, which need integrated solutions for these problems in different sectors, by a focus on communications and information sector that have become the characteristic of urbanization.

For most of the cities of the world, information technology has become an important factor in the change and development of cities. The global network (Internet) has changed the urban planning model by convincing traditional planners to look at the urban planning of the city.

The technology to make the economy, the environment, mobility and governance more efficient and efficient. The concept of "growing cities" on the implementation of the correct urban planning can transform the city into a Smart city. This paper seeks to answer the following question: what are indicators of a smart city? In fact, answering this question guided the research towards a new direction.

That is, the determination of smart city indicators helps to propose a theoretical model on which future studies can depend in order to evaluate the effectiveness of smart cities and to determine the outcomes of these cities.

2.3 CRITERIA OF ARTICLES INCLUSION

Relevance of articles in terms of content, publication date, and type of the journal. Content of selected articles should be related to the research question. Articles were included in the systematic review after reading. Publication date of articles should be from 2000 to 2018.

So, the article published before 2000 was excluded from the review. On the other hand, all articles used in this paper can be cited using journal name, volume or issue number. Some articles were selected from proceedings related to the same context.

2.4 STUDIES SELECTED

The initial round of articles collected through searching databases resulted in 171 articles. Numerous keywords were used when searching for articles such as smart city, urban sprawl, transportation, Urbanism, governance. Out of these articles, 74 articles were excluded on the basis of their contents.

Due to the type of the journal and publication date limitations, 13 articles were also excluded. Hence, the final number of articles included in this review were 84 articles.

3. FINDINGS

Tab. 1 shows smart city indicators found in the literature. Examples of these indicators can be categorized under 12 characteristics: smart living, smart economy, smart environment, smart education, smart governance, smart energy, smart safety, smart mobility, smart technology, and smart buildings. These pillars were designated as dimensions, components, indicators and factors of smart cities.

No.	Smart city success characteristics	Related features	Researchers
1	Smart living	Life recreations like stadiums, theaters, public libraries; Healthy housings; e-life styles; cultural facilities and diversity	Chorianopoulos et al. (2010); Giffinger & Gudrun (2010); Occelli & Sciullo, (2013); Angelidou (2017); Caragliu et al. (2011); Lombardi et al. (2011); Nam & Pardo (2011); Lombardi et al. (2012); Lazaroiu et al. (2012); Balakrishna (2012); Pan et al. (2013); Jayashree et al. (2014); Tok et al. (2014); Abdou (2014); Buckman et al. (2014); Albino et al. (2015); Li et al. (2015); Al Nuaimi et al. (2015); Amditis & Lytrivis (2015); Meijer
2	Smart economy	ICT infrastructure; labor market flexibility; ICT-based production process; productivity; use of e-business applications; economic image; high tech industries	
3	Smart environment	Low level of carbon dioxide emission; open green spaces; water efficient use and water quality; effective management of waste and recycling; pollution control; sustainable development of urban areas; recycling projects	
4	Smart education	Education facilities, percent of funding research by private sector; remote access to education programs;	
5	Smart governance	E-government services; research and development centers in the city; smart administration; participation in decision-making process; transparency.	

6	Smart energy	Renewable energy projects; efficiency of energy systems; percentage of electricity generation; total consumption of energy	and Bolivar (2016); Sharma & Gupta (2016); Tahir & Malek (2016); Olaverri-Monreal (2016); El-Messeidy (2016); Lacinák & Ristvej (2017); Abo-elazm & Ali (2017); King & Perry (2017) ; De Oliveira et al. (2018); Venkatesan (2018); Beretta (2018); Kaur et al. (2018); Hargreaves et al. (2018); Klassen & Buske (2018); Wu et al. (2018); Adapa (2018); Joshi et al. (2018), Thaduri et al. (2018); Al-Alwani (2018); Ibrahim et al. (2018).
7	Smart safety	Individual safety, city sensor tracking; alerting systems; emergency response systems.	
8	Smart mobility	ICT-based transportation; ICT-driven logistics; advanced driver assistance systems; smart maintenance; safe transportation; sustainable transport system, e-monitoring of transportation system.	
9	Smart technology	Internet infrastructure; Intern accessibility at homes; high-tech training; and software engineering.	
10	Smart buildings	Housing quality, using solid waste management, reduced cost of construction; smart heating, smart air conditioning, smart monitoring; smart lighting; smart plug load; and smart window shading.	
11	Smart hospitals	Health conditions; health care services; e-monitoring of patients at home; connections between hospitals; biomedical sensors and hospital smart architecture.	
12	Smart people	Innovative solutions to city problems; participation in sustainable development; participation in public life; access to e-training and e-learning courses; skilled workforce; employment rate in knowledge sectors.	

Tab. 1 Success indicators of smart city found in the literature

4. DISCUSSION AND CONCLUSION

The main idea behind the construction of smart cities is to make cities more adaptable to challenges in different contexts. According to Abo-elazm and Ali (2017), evaluating the development of smart cities can be achieved in terms of the assessment of benefits such as functional, structural, formational, technological, economic, social and environmental benefits. Guiding smart city construction using the idea that built on the integration of numerous smart aspects to be effectively employed by technology solutions was in agreement with many conceptualizations of this term as provided by many authors (Abo-elazm &b Ali, 2017; Albino et al., 2015; Al Nuaimi et al., 2015; El-Messeidy, 2016; Lacinák & Ristvej, 2017; Lombardi et al., 2011; Sharma & Gupta, 2016; Tahir & Malek, 2016; Wu et al., 2018). The results of the literature conducted in this paper pointed out that smart cities are built on several pillars: smart living, smart economy, smart environment, smart education, smart governance, smart energy, smart safety, smart mobility, smart technology, smart hospitals, smart buildings, and smart people. The following sections provide a detailed explanation of each of these dimensions. Smart living refers to life recreations like stadiums, theaters, public libraries, and entertainment venues (Albino et al., 2015). Wu et al. (2018) defined smart city as a city digitally designed using advanced applications of information and communication technology like Big Data, the Internet of Things (IoT) and cloud computing. For the National development and Reform Commission of China, the concept of smart city was described as a

new model or idea adopted to plan, construct, and manage service based on cloud computing, Big Data, and IoT (Li et al., 2015). Simply defining the concept, Tok et al. (2014) and Ibrahim et al. (2018) described smart city in terms of quality of life. Smart economy, according to Albino et al. (2015), represents a key theme of smart economy, which was the availability of information and communication technologies and the ability to use technologies in production.

For Ibrahim et al. (2018), smart economy represents the concept of competitiveness. Lombardi et al. (2011) specified five smart cities indicators: smart living, smart people, smart economy and smart environment. Concerning the smart environment, Lombardi et al. (2012) portrayed this dimension of smart city in terms of level of Carbon dioxide emission, green spaces, efficient water use, effective management of waste and recycling. Smart education, on the other hand, refers to using electronic learning applications that enhance the learning process, computerized schools and ensuring students access to educational resources (Sharma & Gupta, 2016). Al Nuaimi et al. (2015) indicated that smart education can be achieved through the use of information and communication technology that enhance citizen involvement in learning environment and knowledge management practices and building knowledge-based community. Moreover, Lombardi et al. (2012) represented smart governance in terms of the number of universities in the city and research centers, e-government services, Internet access by homes, and the number of e-government users.

In relation to smart energy, El Messeidy (2016) defined smart energy-oriented smart city as a city uses renewable and efficient energy and provide its occupants with access to energy. Therefore, the focus of smart energy is to reduce energy use and greenhouse gas as well as to encourage innovation in this context (Stoltz et al., 2015). Smart safety, according to Van Heek et al. (2016), exemplifies a critical component of smart cities due to its role in ensuring an effective participation of people in social as well as economic life. Examples of smart safety application include tracking misbehavior of people, monitoring social activities, and detecting specific people in case of disasters and criminals (Pan et al., 2013).

Albino et al. (2015) indicated that the aim of smart mobility is to enhance transportation the city through the employment of advanced technology in transportation process. For Pan et al. (2013), smart mobility or transportation is one of the most important applications of smart city by which cities can manage traffic conditions, supply and demand of transportation, route navigation and reporting traffic state. Examples of smart mobility can be found in Germany, USA, France and Singapore (Joshi et al., 2018). Smart technology in its general definition covers other factors of smart city such as smart living, smart energy, smart transportation (Meijer & Bolívar , 2016). For the current study, the concept was analyzed as a separated factor in order to describe the availability of the infrastructure of the Internet in the city in addition to Internet access as well as technology innovations. King and Perry (2017) identified several technologies that can be used to enhance operations of smart buildings.

These technologies are related to smart heating, smart air conditioning, smart monitoring, smart lighting, smart plug load, and smart window shading. Examples of smart hospital systems include electronic monitoring of patients that provide two major activities: continuous follow-up of patients and transfer of e-data (Jayashree et al., 2014). Finally, the concept of smart people describes citizens who have innovative solutions to city problems, participate in the sustainable development as well as the public life, skilled and have an access to e-training and e-learning programs (Giffinger & Gudrun, 2010, Hernández-Muñoz et al., 2011; Nam & Pardo, 2011).

A final note in this paper indicated that adopting the concept of smart city, planning to construct this city and putting it into practice considered a beneficial step in the right direction since these cities help countries to cope with different challenges either at global, regional or local levels. Successful indicators required to construct smart cities depend not only on smart technologies used in these cities, but also on another set of indicators comprise smart economy, smart governance, smart environment, smart mobility, smart living, smart safety systems and smart people.

The most critical point revealed in the literature is that all indicators of the successful development of smart cities should be integrated as a one system which utilize smart technologies to achieve this goal. The ultimate end of these integrated indicators is a smart city characterized by advantageous services provided to occupants.

5. PLANNING IMPLICATIONS AND FUTURE RESEARCH AGENDA

The results pointed out, based the review of the literature conducted in this paper help policy makers, urban planners and designers by underling benefits and success factors that should consider in order to translate theoretical concepts of smart city into real projects. Lacinák and Ristvej (2017) indicated that smart cities enable countries to solve numerous problems such as air pollution, population growth and ecosystem problems such as global warming. In an effort to cope with these challenges, smart city concept was introduced as an overall system link different aspects of city life, including environment, energy, people, transportation, governance and so on. In order to ensure an effective construction of smart city, the ultimate result of a smart city project should produce a city with distinguished indicators. Many drivers that lead countries to create their smart cities were found in the literature.

The main source of these drivers are challenges facing cities. El-Ghorab and Shalaby (2016) indicated that challenges and their related reasons are the main sources that results in countries adoption of smart city solutions. According to Klassen and Buske (2018), planning and designing smart cities requires an integration of three main aspects: needs of residents, quality of life standards and availability of services. However, readiness for change as stated by Ibrahim et al. (2018) should be considered in smart city planning. Lazaroiu and Roscia (2012) reported two main conditions for a city prior, to be smart city: it should be a medium city with a full coverage of accessible databases. Reed et al. (2018) highlighted the importance of relationships between natural and artificial environment. Reviewing conclusions of previous studies conducted on smart cities in different regions revealed many suggestions.

For instant, providing a broaden research to cover many smart cities (Beretta, 2018) in relation to many aspects such as sound analysis to detect noise pollution (Bello et al., 2018), smart water solutions (Dickey, 2018), using computational intelligence to enhance education (Gomede et al., 2018), smart streets (Ahmed & Rani, 2018), smart water grid (Kim, 2018), and smart parking (Tomar et al., 2018). Future research on smart cities construction could be conducted to investigate the impact of mart cities on functioning of cities in terms of benefits acquired as a result from the development of smart cities. Since buildings are the main aspect of cities, the overall concept of smart city should consider how these buildings could be transformed into smart ones. Therefore, case studies of smart buildings across the world should be reviewed in order to justify their constructions and adopt criteria that fit the local environment and resources well.

Finally, it was concluded that smart cities should meet several criteria to deserve this name, these criteria include basic consideration that these cities should show such as adaptability to environmental problems, ability to meet citizen's needs, construction on the basis of people skills, and utilization of innovative solutions with adopting new technologies. Additionally, further studies in the same context are required, such as factors that hinder the adoption of the smart city concept, Recent studies highlighted the importance of new trends in smart cities context like using cloud computing to provide and support new services (Hosseinian-Far et al., 2018).

This paper contributes to guide future study, especially in developing countries towards guiding sustainable development programs to build smart cities by focusing on smart cities pointers, mind full, highly tactile smart cities and the critical success factors that will enable developing countries to achieve progress and development in the future, and access to the quality of life.

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IMAGE SOURCE

Fig. Cover: Jul 24, 2017 by Gary Shapiro, Three Reasons Why You Should Invest In Smart Cities Now. Consumer Technology Association President and CEO.

Rest of table by the author.

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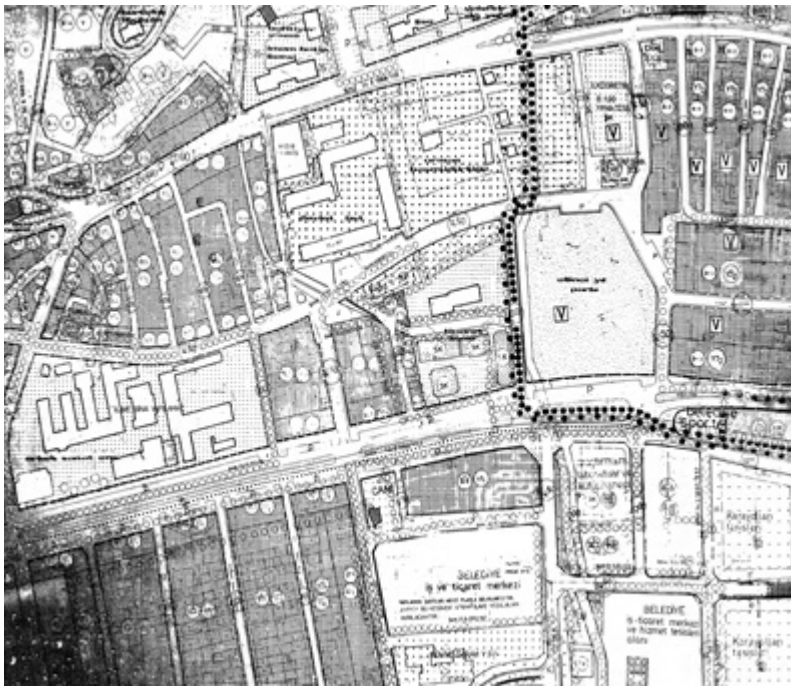
TeMA Journal of Land Use, Mobility and Environment

TeMA 1 (2019) 65-81
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5682

review paper received 4th January 2019, accepted 16th April 2019

www.tema.unina.it

How to cite item in APA format:
Aslan, B. & Ince, C.D. (2019). Analysis of the first urban regeneration area in Kocaeli after Gölcük earthquake by using zoning plans. Tema. Journal of Land Use, Mobility and Environment, 12(1), 65-81. doi: http://dx.doi.org/ 10.6092/1970-9870/5682



ANALYSIS OF THE FIRST URBAN REGENERATION AREA IN KOCAELI

AFTER GÖLCÜK EARTHQUAKE BY USING ZONING PLANS

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ABSTRACT

Rapidly growing cities following The Industrial Revolution remained insufficient to fulfill today's necessities. Also, natural disasters such as earthquakes, floods or unsound structures have affected the development of cities adversely. Although natural disasters can be unpredictable, the issue of preparing cities for natural disasters, planning cities and regulating laws accordingly are becoming increasingly crucial. Urban regeneration activities are one of these preventions taken in this purpose. It is observed that countries such as Turkey, faced with natural disasters intensively, suffer from serious physical, financial and moral losses. Therefore, urban renewal activities have gained importance in Turkey after The Gölcük Earthquake (7.4Mw) and The Düzce Earthquake (7.2Mw) in 1999. The first urban regeneration project in Kocaeli where was one of the cities experiencing hard collapses of these earthquakes is about to be completed. Research of the principles of urban sustainability and resiliency in urban regeneration practices, which are priority issues due to natural disaster risks, has come into prominence. It is important not only to make urban areas more resistant to disasters but also to design according to social, economic and ecological criteria to make more livable. In this study, social, health, green, transportation and educational areas of the first urban regeneration area in Kocaeli were examined in terms of the basic needs of the city. For this purpose, pre and post-project zoning plans are analyzed and transferred to the GIS. The areal changes in the above-mentioned needs are evaluated for changing population density and their sufficiencies are compared.

KEYWORDS:
Geographic Information Systems; Sustainability; Urban Regeneration; Zoning Plans, Natural Disaster Risk.

TeMA
有关土地使用、交通和环境的杂志
TeMA 1 (2019) 65-81
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5682

review paper received 4th January 2019, accepted 16th April 2019

www.tema.unina.it
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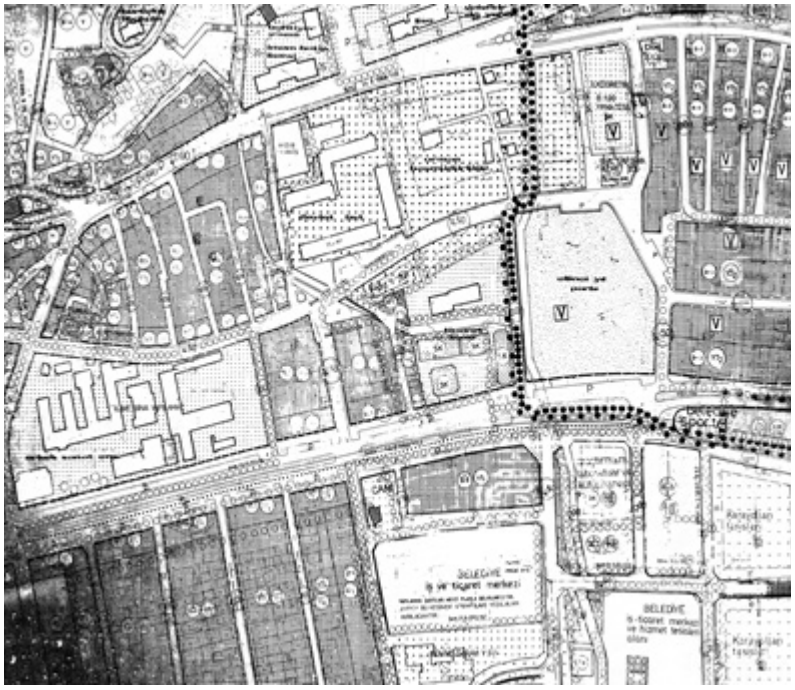

城市改造区内区域划分规划的变化分析

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摘要

工业革命之后，城市的迅速发展已经无法满足当今的需求。此外，地震、洪水等自然灾害和低质量建筑为城市的健康发展带来了负面影响。据观察，土耳其等遭受过大范围灾害的国家在物质、金融和道德领域受害颇深。因此，在经历1999年的格尔居克（Gölcük）地震（7.6Mw）和迪兹杰省（Düzce）地震（7.2Mw）之后，城市改造变得愈发重要。科贾埃利（Kocaeli）是在地震中严重受损的城市之一，其首个城市改造项目于2009年完成。在科贾埃利，很多城市改造项目已经完成并持续进行。由于灾害风险，对城市重建实践中的可持续性原则的审查也变得尤为重要。城市设计不仅要能够抵御灾害，还要满足社会、经济、生态等方面需求，这已衍生为一个重要课题。
该研究将依据城市的基本需求对科贾埃利第一和第二城市改造区（约770000平方米）的医疗、绿化、交通、教育和社会区域进行调查。为此，我们通过向地理信息系统转移的方法，对项目前后的区域划分规划进行分析。根据人口密度的变化对上述需求的区域变化进行了评估，并对其充分性进行了比较。

关键词:
地理信息系统; 可持续性; 城市改造; 区域划分规划

1. INTRODUCTION

Although natural hazards are unpredictable, the issue of preparing cities for disasters, taking necessary preventions together with laws and regulations, and planning cities in this direction has become an increasingly critical and major subject in our country and the world. A proper urban system is a city that not only supplies the social, economic and environmental needs of the inhabitants but also protects them against potential risks and achieves crisis management in case of a natural disaster or other serious conditions. The concept of resilience is an approach that has emerged to accomplish and sustain such an urban system. There are various definitions of resilience in the literature according to different purposes and different needs of cities (Molavi, 2018; Saunders & Becker, 2015). A resilient city is a city that can have the ability to recover after a disaster, maintain its balance and proceed with its urban activities as soon as possible (Papa, 2012). Essential preventions should be taken to ensure that cities are damage in the minimum possible way from disasters and crises. Resilient cities are planned and developed by considering all these risks and conditions and can use and manage all the required tools within this scope. Major tools for cities to be resilient and prepared for all risks and disasters can be listed as laws and regulations, zoning plans, disaster risk management practices, construction control services, insurances, infrastructure information systems, urban regeneration projects, etc. (Andres & Strappazzon, 2011; Benson, 2016; Godschalk, 2003; Meerow, Newell, & Stults, 2016). One of the most effective methods is the urban regeneration projects to reduce risks of the unplanned cities in disasters risk areas. Urban regeneration can be defined as a comprehensive integration of the vision and action to solve the many-sided problems of urban areas that are lacking to improve economic, physical, social and environmental conditions (Ercan, 2011; Zheng, Shen, & Wang, 2014). Increasing energy consumption and carbon dioxide emissions in cities due to increasing population also accelerates the functional, economic and aesthetic aging process in urban tissue. Along with unplanned settlement, urban sprawl causes the destruction of natural areas and deterioration of the quality of environmental life (Mohamed, Baharum, Senawi, & Salleh, 2016; Ulubaş Hamurcu & Aysan Buldurur, 2017). Taking all this into consideration, it has become important to plan cities in a sustainable way and to regulate urban regeneration activities according to the sustainability criteria.

The theme of sustainability is a system including economic competitiveness, the improvement of environmental performance and balanced social integration. In this regard, in order to achieve the ecological, economic and social targets the definition of the participants responsible for continuous control is substantial for sustainability. The private sector, national, regional and local actors and nongovernmental organizations can be considered to be involved in a sustainability issue (Ulubaş Hamurcu & Aysan Buldurur, 2017). The development of urbanization in harmony with environmental principles is directly related to the sustainability of urban planning policies (Hemphill, Mc Greal, & Berry, 2004; Noor, Asmawi, & Abdullah, 2015; Peng, Lai, Li, & Zhang, 2015; Wheeler, 2004). Nowadays, low energy consumption, efficient use of renewable energy sources, compliance with ecological principles of land use, and participation of people in decision-making processes are increasingly important issues to ensure this harmony. Industrialization and development movements are inadequate due to the continuous increase in population; raw material consumption is increasing rapidly and environmental and economic problems are arising. The growing population in cities increases demands on services such as transportation, infrastructure, waste management, and this case causes pressure on urban planning and the environment (Anderson, 2013; Gölbaşı, 2014; Newman, 1999; Nijkamp & Pepping, 1998; Shen, Jorge Ochoa, Shah, & Zhang, 2011).

In the 1950s, the urbanization actions accelerated with the increasing migration from villages to cities in Turkey. The agricultural activities decreased and demand for industrial activities has developed in this period. The increasing population caused unplanned urbanization and the squatters to occur in the cities ((Demir & Yılmaz, 2012; Genç, 2014; Güzey, 2016; Kaya, 1989; Sağlam, 2016). For many years, the governments tried to solve the urbanization problems with various zoning and construction amnesties. However, it can be said

that these amnesties and new laws did not provide enough benefits to cities and they have even made the problems more unsolvable ((Türker Devecigil, 2005; Uzun, Çete, & Palancıoğlu, 2010; Uzun & Şimşek, 2015)). Gölcük (7,4 M_w) and Düzce (7,2 M_w) Earthquakes in 1999 have caused a compulsive awakening in the whole country in terms of urbanization (Tolon & Mızrak, 2017). Especially, these earthquakes caused huge damages to the Marmara Region known as Turkey's industry zone. Kocaeli was one of the damaged cities too. Kocaeli is still one of the most important industrial cities in Turkey and it is located on a zone of high seismic risk. In addition to the urbanization problems that have become totally unsolvable in industrial cities of Turkey, these earthquakes made clear that people and their lives are vulnerable to disasters. As a consequence of all, the urban regeneration idea has become a necessity.

Zoning plans are designed to fulfill the needs of cities for the future with various land use functions ((Demiroğlu & Karakuş, 2012). Zoning plans are critically momentous in the development and orientation of cities in accordance with the principles of urbanization. However, when we look at Turkey, after the 1950s, it was unlikely possible to plan rapidly growing cities in Turkey. Cities developed with their internal dynamics and tried to find their own solutions for the needs of that time. Then, governments tried various solutions with these zoning plan arrangements suitable for these spontaneous urbanization models. These methods which shed no light on the future were also far from adapting to the circumstances of the time. Urban regeneration and legal arrangements provide the opportunity to fully regulate old zoning plans and unplanned urbanization. "The first urban regeneration area" in Kocaeli was announced in order to eliminate housing deficiencies, to increase earthquake-resistant construction and to solve transportation problems by providing access to mass housing constructed after the earthquake. In this study, zoning plans before and after the Gölcük earthquake are compared in "the first urban regeneration project" of Kocaeli. First, briefly, the history of Turkey's urbanization is described and the changes in land use functions are analyzed in a GIS model.

2. THE URBANIZATION HISTORY AND LEGAL REGULATIONS IN TURKEY

Urbanization process in Turkey, despite some differences, is similar to other underdeveloped or developing countries. Until the 1950s, agriculture-based economies generally defined the basis of relations of production in the country. Therefore, until the 1950s, it cannot be mentioned about intense urbanization for Turkey. Nevertheless, for the establishment of the modern city of the Republic of Turkey, Municipal Law No. 1580 was issued in 1930. The Law which was one of the first important urbanization laws of the Republican history mandated the development of zoning plans by municipalities for all settlements which had a population more than 2000 (Resmi Gazete, 1930).

Urbanization has gained momentum with the industrialization movements supported by foreign capital in the 1950s and the investments in major cities of the country. Other factors accelerating urbanization can be listed as the expansion in the road network and transportation facilities, and the opportunities in education and health services in certain urban areas. Immigration from rural to urban areas accelerated, because of the changes in social, political and economic relations in the society. People who migrated from villages to cities firstly built houses called "squatters" on public lands. Squatters were generally lacked infrastructure services such as electricity, water (Genç, 2014; Uzun & Şimşek, 2015). In order to prevent problems caused by rapid urbanization, Zoning Law No. 6785 entered into force in 1956 (Resmi Gazete, 1956).

In the period between 1960 and 1970, it became clear that squatter settlements, which were seen only as construction and sheltering problems, were also a socioeconomic problem. The existence of squatters was formally adopted in the first time by the state with Squatter Law no 775, which was issued in 1966 (Resmi Gazete, 1966). It was aimed to improve the existing squatter settlements and to prevent the construction of new squatters by this law. For this purpose, governments gave title deed to the squatter owners and provided infrastructure services. These applications actually legitimized the squatters and accelerated the construction of new squatters. Because actual socio-economic problems such as injustice in the distribution of income have

not been solved, to solve the squatter problem was impossible. "The amnesty laws" supported the permanence of the squatter problem. Law No. 2981 issued in 1984 was one of "the amnesty laws" (Resmi Gazete, 1984). It was tried to solve the problem by granting ownership rights to those who settled illegally in public areas with this law.

On 3 May 1985, the new Zoning Law No. 3194 entered into force to ensure the convenience of the settlements in urban areas according to planning, science, health, and environmental conditions. With this law, extensive planning and development affairs were enforced in the cities by the municipalities (Resmi Gazete, 1985). Unfortunately, it was impossible to solve the problems of urbanization in major cities by this law completely. As a result, from the 1950s to the 2000s, the social and economic problems caused by the rapidly changing relations of production and the rapid urbanization have not been sufficiently solved, hence irregular and not-resilient urbanization emerged overall the country.

3. LEGAL REGULATIONS IN TURKEY AFTER GÖLCÜK EARTHQUAKE IN 1999

The Gölcük earthquake in 1999 caused a moral and economic collapse firstly but then caused an awakening in the overall country. As a result of this earthquake, 18373 people lost their lives; 285211 houses and 42902 workplaces were damaged (Wikipedia, 2019). These extreme damages have taught the reality which unplanned urbanization puts human life at risk, especially in disaster risk areas. The earthquake revealed that the country was not prepared at a sufficient level for many issues. For example, transportation and telecommunication nets were collapsed. Search and rescue works were inadequate. It was understood that there was no proper insurance system. Generally, emergency legal arrangements were always entered in the force in order to bind up wounds after every earthquake in the country (Şengün, 2007). In this regard, the Decree-Law no 574 was issued, immediately after the earthquake. However, this earthquake affecting the whole of Turkey expressed the necessity of some radical changes for this time. Renewal of urban areas which are collapsed and not resistant to earthquakes became the main topic. There were a few urban transformation projects in Turkey until that day and the projects could usually be applied by special laws. An example was the "Dikmen Valley Urban Transformation Project", which was adopted in 1990 in the capital city, Ankara (Demirci, 2004). Another example was the "Northern Ankara Entrance Urban Transformation Project" implemented with the special law no 5104 in 2004 (Resmi Gazete, 2004). Especially, it can be said that the purpose of the "Northern Ankara Entrance Urban Transformation Project" was a physical transformation. Until that date, there was still no clear legal regulation which defines urban transformation's purposes and control mechanisms. Article 73 with entitled "Urban Transformation and Development Area" of the "Municipal Law" No. 5393, which entered into force in 2005, provided a major expansion. This article authorized municipalities to implement urban transformation in order to rebuild older parts of the city, to create housing, commercial, industrial and social areas, to take precautions against earthquake risk, to preserve the historical and cultural structure of the city. Unfortunately, many projects based on this article have received negative criticisms that urban transformation has diverged from its renewal and conservation purposes. Following the Van earthquake where 644 people lost their lives in 2011 according to Disaster and Emergency Management Presidency (AFAD)(AFAD, 2014), the necessity of regulating a specific law to reduce the losses before the disaster has become the main topic again. Finally, Law No. 6306 on "Transformation of Areas under Disaster Risk" was published on 16 May 2012. This law sets out the principles of improvement, re-settlement, and renewal in order to create healthy and safe living spaces in disaster risk zones (Resmi Gazete, 2012a). Unfortunately, this law has caused many discussions and many of its articles have been rescinded or rewritten.

Besides legal regulations related to urban transformation, some other important regulations have been entered into force after the earthquakes in 1999. "Building Inspection Law" No. 4708 which came into force in 2001 can be given as an example (Resmi Gazete, 2001). The purpose of this law is to ensure the construction of structures conforming to standards for safety of life and property. Also, one of the important regulations is

the "Regulation on Buildings to be Constructed in Seismic Zone" which were arranged in 2006 but entered into force one year later (Resmi Gazete, 2006). This regulation includes many crucial changes to build resistant-constructions against earthquake. Unfortunately, this regulation was started to be implemented in some provinces, and it was decided to implement it all over the country after the Van earthquake in 2011. Another regulation is the decree-law no 587 named as "Compulsory Earthquake Insurance" was entered into force in 1999 (Resmi Gazete, 1999). This regulation was rearranged as "Disaster Insurances Law" No. 6305 in 2012 (Resmi Gazete, 2012b).

4. STUDY AREA

Kocaeli with a surface area of 3397 km2 is located in Marmara Region of Turkey. The population of the city in 2018 has exceeded 1,9 million according to the Turkish Statistical Institute (TUIK, 2018). The city is located on an important road connecting Asia and Europe and has a natural harbor; İzmit Gulf which is a busy sea route. Because Kocaeli with important industrial institutions and an advanced economy is one of Turkey's largest industrial cities, pays the most tax contribution in Turkey. According to data from TUIK in 2015, while the average daily income of all provinces is 58 TRY, this value is 85.6 TRY for Kocaeli (TUIK, 2015). However, the earthquake (7.4 M_w) which was the epicenter of Gölcük on August 17, 1999, caused extreme damages in Kocaeli and surrounding cities. A lot of people lost their lives and houses and business sites were damaged by this earthquake. These heavy losses affected the whole country as much as Kocaeli. The restoration of economic and social damages was not really easy. Even it can be said that the earthquake had negative effects on the 2001 economic crisis all over the country. The negative cases have revealed that the government, society and cities should have taken legal, physical and social preventions against natural disasters. After the earthquake, many laws in terms of urbanization and construction have been enacted to prevent and reduce disaster damages. The Decree-Law no 574 was issued on 31.08.1999, immediately after the earthquake. The law has given the authority to determine the new housing areas and to build the mass housing quickly in the provinces damaged by the earthquake to The Ministry of Environment and Urbanization. For this aim, a total of 43053 houses were constructed in these provinces.

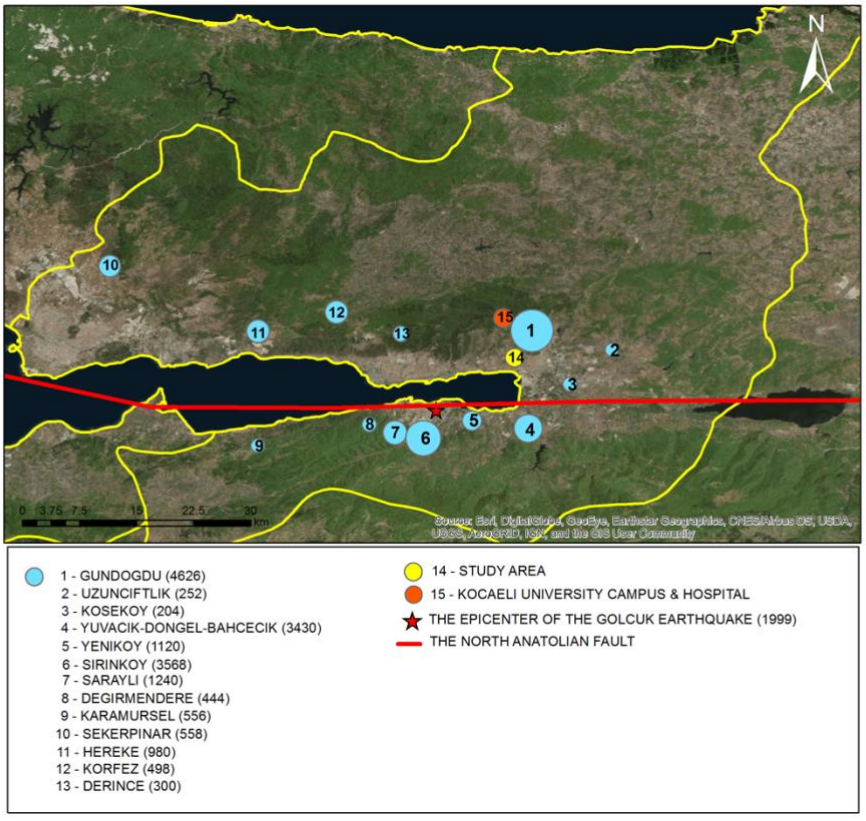

Fig. 1 Distribution of mass housing in Kocaeli after Gölcük Earthquake

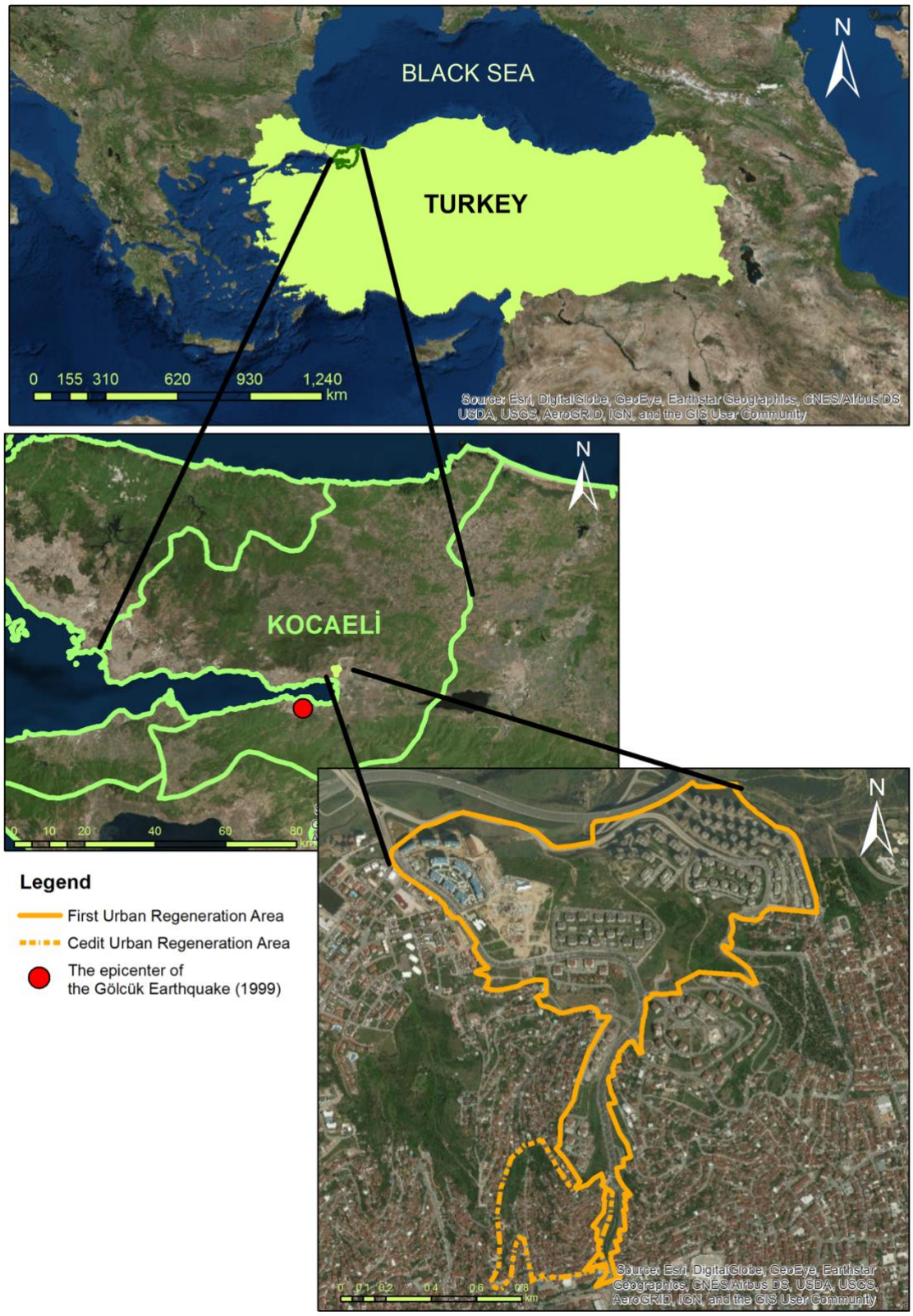

Fig. 2 First Urban Regeneration Area in Kocaeli and Cedit Urban Regeneration Area

The number of houses within Kocaeli province is 17776 (Kömürlü & Öztekin, 2007). Fig. 1 shows the distribution of these houses in Kocaeli. The main elements of this planning can be listed as follows: canalizing cities towards solid ground, reducing the density of old urban areas (Şengün, 2007) solving the sheltering problems, building earthquake-resistant constructions. Despite these optimistic approaches, it should be

known that some new problems had arisen. These problems can be listed as transportation and infrastructure problems, problems with social facilities and creation of new unearned income areas. After two major earthquakes (Gölcük & Düzce in 1999) in Turkey, the processes of urban transformation have been started for improvement of city resilience against natural disasters. In this context, various urban renewal projects have accomplished and continue to be achieved in Turkey, especially Kocaeli. The decision on the practice of the "First Urban Regeneration" in Kocaeli was taken in 2005 and the area was expanded with an additional decision in 2006 (Fig. 2). Because there was no other legal basis for urban transformation in those years, the legal basis of the "First Urban Regeneration" in Kocaeli is Article 73 of The Law No. 5393, named Municipal Law. Following the enactment of the Law on "Transformation of Areas under Disaster Risk" No. 6306 in 2012, urban transformations in Kocaeli have been started to be applied on the basis of this law. Examples of such projects are the Gölcük Denizevler Urban Regeneration and the Cedit Urban Regeneration Projects. According to the decision of the Ministry of Environment and Urbanization in 2015, Denizevler Neighborhood was defined as a risky area based on Article 2 of Law no 6306. For the local people, earthquake-resistant new constructions were built in Sivritepe approximately 3.5 km to the northwest of Denizevler (Fig. 3). The project is about to be completed in 2019. Similarly, Cedit Neighborhood was also defined as a risky area based on Law no 6306 in 2015, but the project has not been implemented yet. The Cedit Project is the neighbor of the study area and is shown in Fig. 2.

Fig. 3 Denizevler Urban Transformation Area and Sivritepe New Houses Area

The study area which is the first urban regeneration area was determined to be about 770000 m^2 with the final decision taken in 2010. The construction was mostly completed, and the remaining parts are about to be completed by 2019. Fig.2 2 shows the satellite image of the study area. Fig. 4 shows the view of the area in 2007 (left) and 2018 (right). First urban regeneration area is located at the city center. 4626 houses, Training and Research Hospital of Kocaeli University and new campus of the university were built to the north of the project area, after these earthquakes, as shown in Fig. 1.

The zoning status of the project area was generally planned as detached and three-story, before the regeneration. Some buildings were allowed to build two-story. However, as explained in the previous section, it can be said that due to consecutive construction amnesties and shanty settlement, it was not according to the legal situation of construction in the region. As a result, the area is one of the areas that have been built and then subjected to the legal process in Turkey.

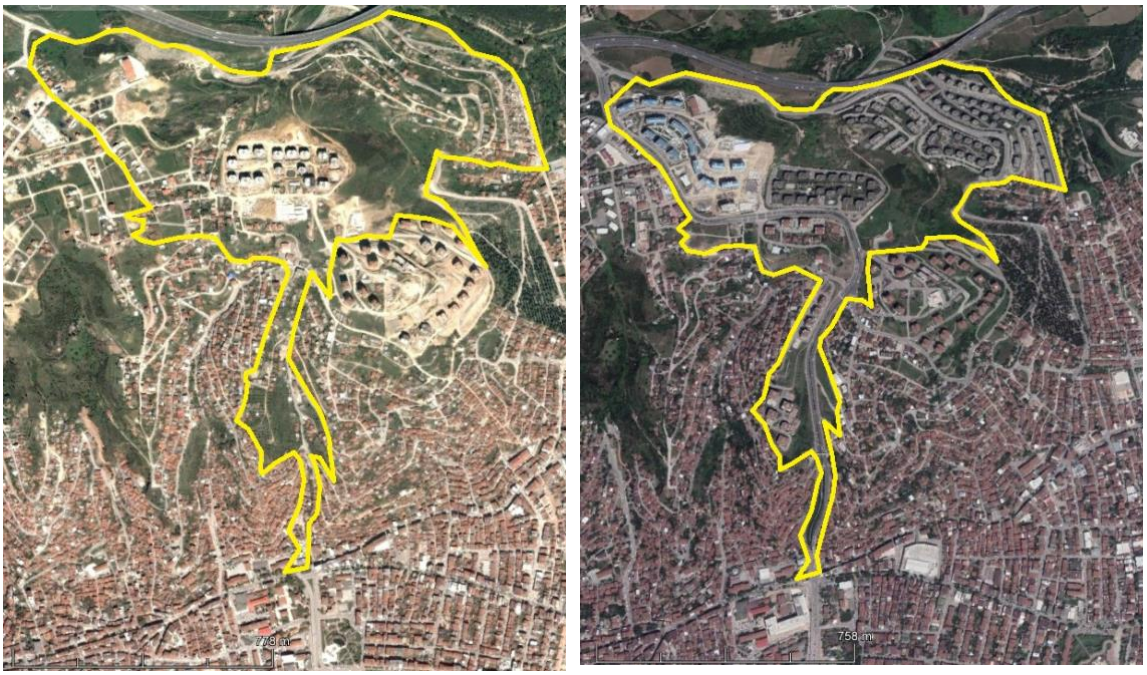

Fig. 4 Study area highlighted with the yellow line, in 2007 (left) and in 2018 (right)

5. ANALYSIS WITH THE DESIGNED GIS MODEL

In the first step of this study, it is aimed to detect the change of different usage functions in the zoning plans, before and after urban regeneration project. For this aim, the old and new zoning plans are transferred to the geographic information system using the ArcMap 10.1. The land use functions in the plans are divided into 11 different classes as shown in Tab. 1. There was no area for the Cultural Facility, the Technical Infrastructure Facility, and the Trade classes in the old zoning plan. It is seen that these classes are included in the new zoning plan after the urban regeneration. On the other hand, it is determined that the area of approximately 1,2 ha, which was excluded of the zoning (non-zoning area) because of geological reasons in the old zoning plan, was evaluated as road and green area in the new zoning plan. Also in the study, the Green Area class in the old zoning plan contains the total of six sub-classes which are the Children Playground, the Area to be Reforested, the Park, the Green Area, the Cemetery Area and the Highway Area. Similarly, the Green Area class in the new zoning plan contains three sub-classes in the form of the Area to be Reforested, the Green Area and the Highway Area. Fig. 1 shows that there is a highway in the north of the urban regeneration area. There are areas that the General Directorate of Highways expropriated and woodland around the highway. For this reason, these areas are included in the Green Area class. The Cemetery Area in the old zoning plan

was designated as a reserve area but was not used as a graveyard in those years. Hence, the Cemetery Area is also included in the Green Area class.

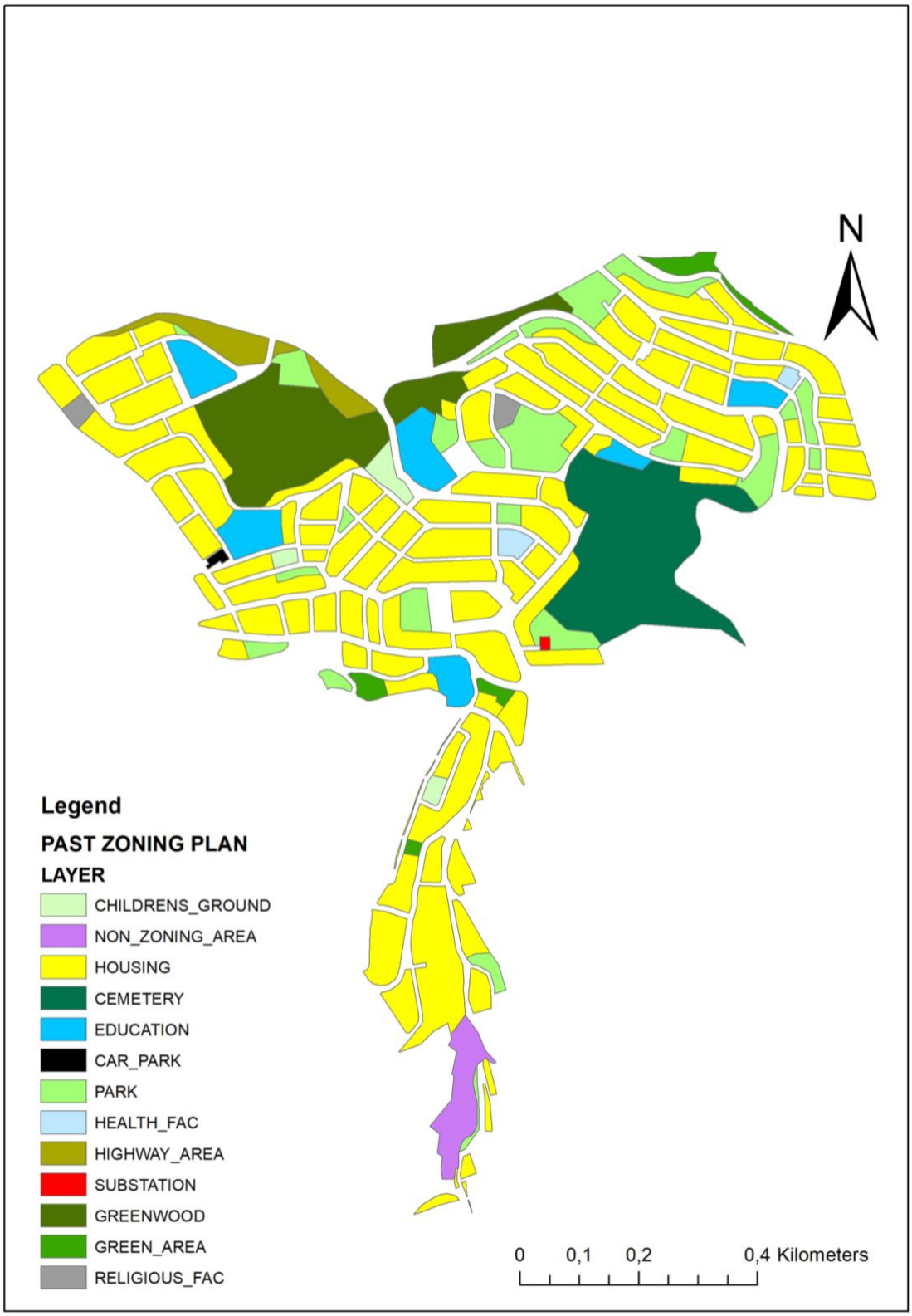

Fig. 5 Distribution of land classes before the urban regeneration

Fig. 5 and Fig. 6 show the geographical information system and the distribution of land classes formed with old and new zoning plans. A graph of the ratio of land classes to the total size of urban regeneration area is given in Fig. 7. It is seen that the percentage of the Housing Areas is preserved as size when Tab. 1 and Fig. 7 are examined. There were 729 parcels in the area before the urban regeneration. However, as can be seen

from the satellite image of 2007 in Fig. 4, it cannot be said that the area had dense housing. The major reasons for this situation are that transportation and infrastructure services were not sufficient. Despite that, it is understood that about 4100 buildings could be built in this area according to the old zoning status. According to 2016 statistics, the average population per household is 3,5 in Kocaeli (TUIK, 2017). In this case, it is predicted that the estimated population of the area could reach about 14500 according to the old zoning plan.

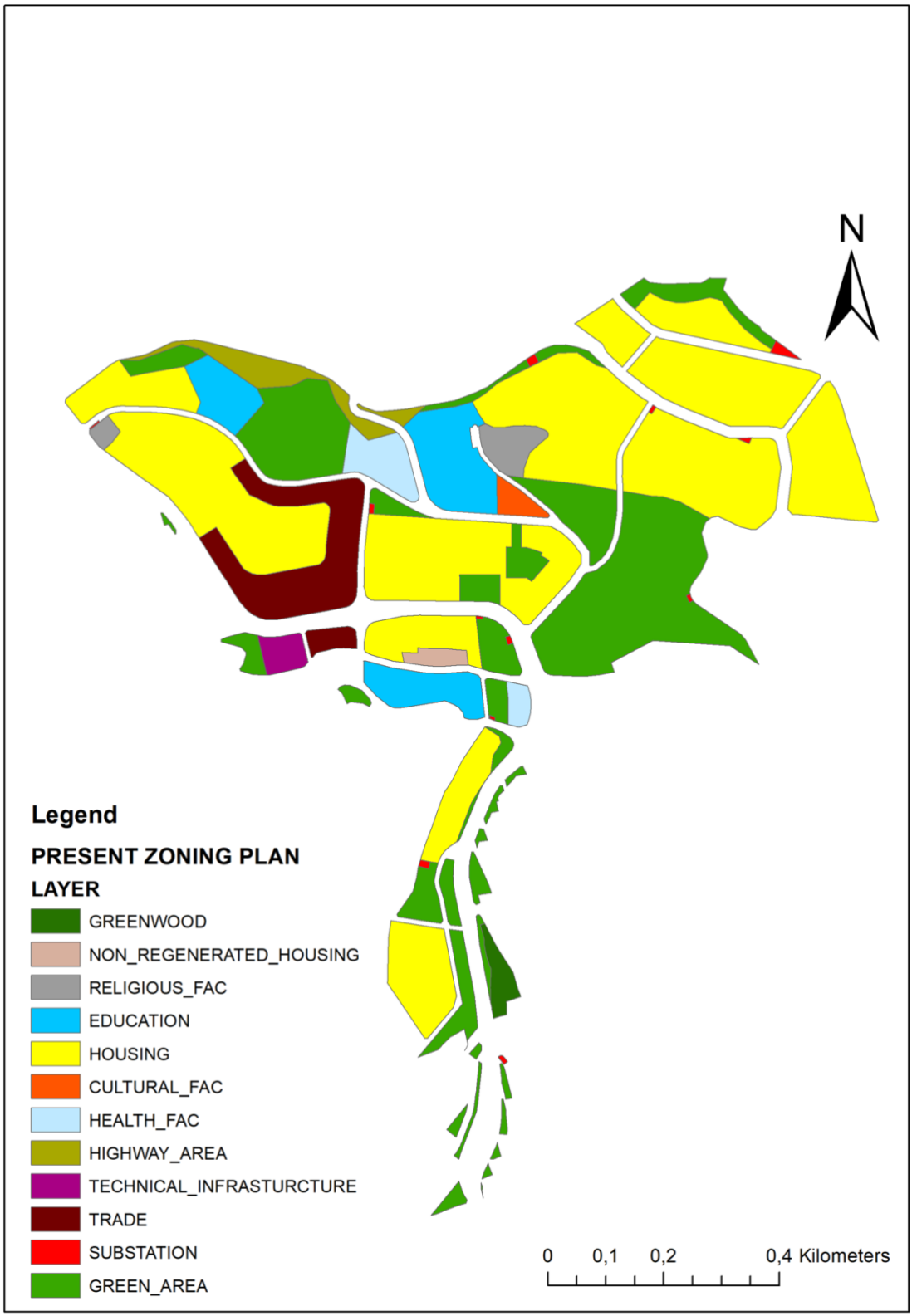

Fig. 6 Distribution of land classes after the urban regeneration

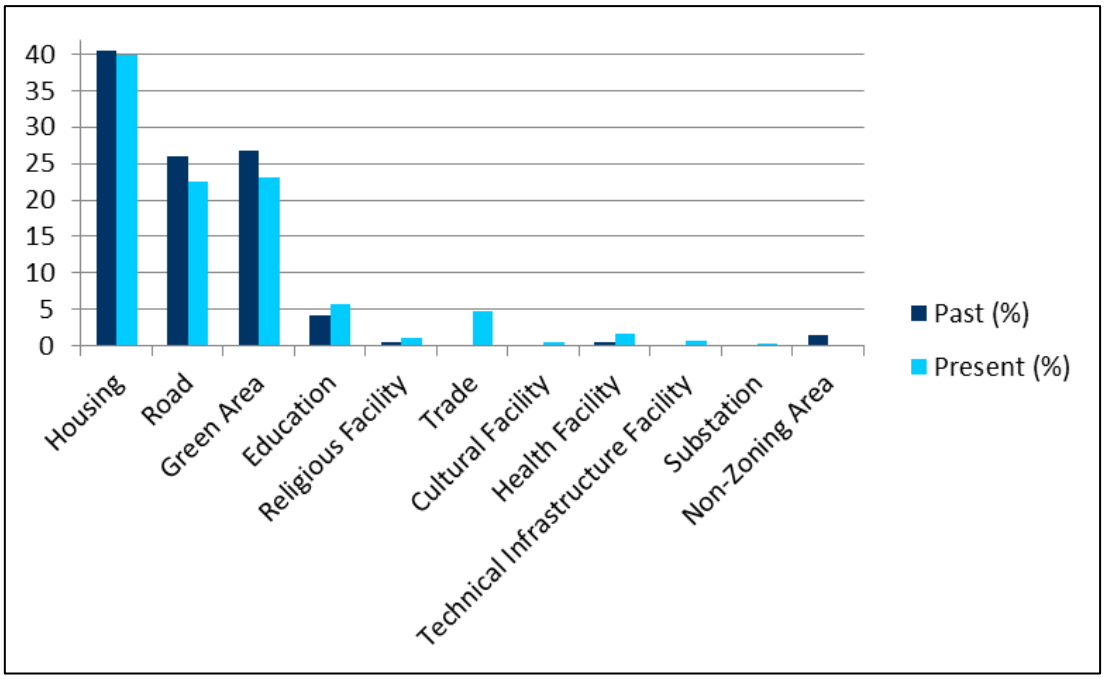

Fig. 7 The ratio of land classes to the size of total urban regeneration area

LAND FUNCTION	PAST (M^2)	PAST (%)	PRESENT (M^2)	PRESENT (%)
Housing	311,383.93	40.50	306,959.45	39.92
Road	199,968.54	26.01	172.637.47	22.45
Green Area	206,318.44	26.83	176,877.24	23.00
Education	32,169.16	4.18	43,633.24	5.67
Religious Facility	3,659.52	0.48	8,788.68	1.14
Trade	0,00	0.00	37,154.60	4.83
Cultural Facility	0,00	0.00	3,575.00	0.46
Health Facility	3,219.62	0.42	12,593.57	1.64
Technical Infrastructure Facility	0,00	0.00	4,625.00	0.60
Substation	372.48	0.05	2,036.42	0.26
Non-zoning Area	11,788.97	1.53	0.00	0.00
TOTAL	768,880.67	100.00	768,880.67	100.00

Tab.1 Changes in land use functions

As a result of the urban regeneration project, a total of 104 buildings were planned in the areas for housing. The construction permission to build has been increased to between 8 and 13 storey in the new zoning plan. When the whole project is completed, the total number of houses will be 4,906. In this case, the population in the area can be expected to be around 17,000. As a result, although there is a slight decrease in housing areas, the estimated population growth rate in the area is 1.17 and this ratio is predicted not to increase the population excessively.

Although the Education areas were 6 parcels before the urban regeneration, there are 3 parcels in the study area after the regeneration. However, it is seen that the Education areas increased 1.36 times. The increase in the area is greater than the possible population increase. In the Religious Facility areas, the number of parcels was not changed at the end of the urban regeneration, while the areas increased 2.40 times. It can be said that this increased rate is higher than the estimated population growth rate. Similarly, while the number of parcels of the Health facility areas remains the same, the increase in the area at the end of urban regeneration is calculated as 3.91 times. In the old zoning plan, the area that determined for the Substation

was only 1 parcel; but 12 parcels are determined for the Substation area which there is an increase of 5.47 times in the new zoning plan. Especially, the rates of increase in religious and Healthy facilities and Substation areas were found to be quite high compared to the estimated population growth rate.

When the changes in Green areas in old and new zoning plans were examined, it is determined that green areas decreased 0,86 times after the urban regeneration contrary to other land use functions. Similarly, there is also a 0.86 times decrease in the roads. Interpretation of these changes in land use functions as only increasing and decreasing will be insufficient for urbanization. The positive or negative effects of increasing or decreasing changes in a sustainable city model should be detected with many parameters.

6. RESULTS AND DISCUSSIONS

Turkey suffered from heavy losses after the earthquakes in the Marmara region and it is understood that the cities were not resilient and prepared for natural disasters. For this purpose, various preventions on the subjects such as laws and regulations, zoning plans, disaster risk management practices, construction control services, insurances, and urban regeneration projects have been implemented after 1999. However, there have been various differences and disruptions in the implementation of these preventions among cities. For example, the "Building Inspection Law" No. 4708 was not implemented throughout the country until 2011. It is also known that some buildings are still not sufficiently inspected according to this law. Similarly, insurance of structures against natural disasters is compulsory according to Law No. 6305, but insurance process could not be extended throughout the country. In addition, this law is used to warrant only material damages after an earthquake. Whereas, this law should also guarantee the financing of the projects to reduce damages before natural disasters.

The primary goal in many urban regeneration projects in our country has been to produce earthquake resistant mass houses. Resilient and sustainable urban designs have turned into secondary goals. Therefore, urban regeneration projects have been frequently observed in areas where there are no settlements. Such projects can be interpreted as opening new areas for settlements or creating new unearned income areas. In recent years, urban regeneration applications have been accelerated in areas under disaster risk or in areas where disaster risk structures exist according to the law no. 6306. However, there are still many areas and constructions under disaster risk in our cities. The number of earthquakes (M_w>6.0) in The Marmara Region have been 17 in the last 400 years. In addition, according to scientific studies, the probability of a major earthquake in only the Marmara Region for the next 30 years is about 50% with an optimistic perspective (Bohnhoff et al., 2013; Murru et al., 2016; Paradisopoulou et al., 2010; Parsons, 2004). Therefore, it is urgent to regenerate the areas under disaster risk as soon as possible.

Until the earthquake, Kocaeli has continued growth of along the seashore. There have been many reasons for this situation from the past to the present. These reasons can be listed such as the rugged topography outside the coast, the factories, and seaports located along the coast and the country's main railway and highway transportation line at the seashore. In general, because the ground along the coast is not suitable for the settlement, earthquake damages have occurred in these areas mostly. It was aimed for deceleration of spontaneous growth of the city immediately after the earthquake. For this purpose, the largest of the mass housing areas were built in Kocaeli under the decree-law no 574 is in the northern part of the city center. Total of 4626 houses was built in the northern part for disaster victims (Kömürlü & Öztekin, 2007). In addition, Training and Research Hospital of Kocaeli University and new campus of the university were built to the north of this area as shown in Fig. 1. This planning and structuring raised the problem of transport between the city center and the north of the city. The project, which is discussed in this study is the first urban regeneration project in Kocaeli after the earthquakes in 1999 and it is about to be completed now. The basic aim of the project was to establish a transportation system between the city center and new northern settlements and to support the development of the city towards the north. This purpose was provided with Gazanfer Bilge

Boulevard, which is an important artery as shown in Fig. 3. Other objectives of the project were to build earthquake-resistant structures in the project area and to perform more resilient and sustainable planning for the project area.

It can be said that there are significant improvements in the functions of Education, Religious, Cultural, Health Facilities, Trade, Technical Infrastructure, and Substation after the regeneration when the analysis mentioned in Chapter 5 is interpreted. This case is an indicator of sustainability which explains the increase of access to education, health and infrastructure services for the dwellers in the area. There is a 0.86 times decrease in the roads, which does not actually mean that transport services are getting worse. The old transport network consisted of narrow streets ranging in width from 6 to 12 meters in the area. Although the area is 2.5 km away from the city center, it had difficulties in transportation. This is why the area was not preferred for settlement before the urban regeneration project. A 30-meter wide boulevard and a 20-meter wide street constructed after the regeneration provide access to the north of the city as well as the area. The expansion of roads will also be able to provide significant contributions to search and rescue operations during natural disasters. On the other hand, the slope in the new boulevard is up to 15% due to topographical difficulties. This situation brings some risks to transportation. As a result, it is not enough to interpret roads only through areal size changes. Similar discussions can be made for a 0,86-times change in green areas. The advantages or disadvantages of the newly designed green areas compared to the old ones should be revealed with many parameters. For example, the pros and cons of the change in green areas should be discussed according to flora and fauna or the usage of children, elderly people, young people, etc. before and after the regeneration. For this reason, it is a necessity to analyze all this information of the settlement in terms of resiliency and sustainability with GIS models. GIS constitutes the first phase of the study. It is aimed to analyze the sustainability of each of the land use functions with various parameters in future studies.

From past to present, it is a certain truth that the various zoning and construction amnesties cannot solve the problems of urban sprawl in Turkey and especially in industrial cities such as Kocaeli. For this reason, Law no. 6306 on Transformation of Areas under Disaster Risk which went into effect in 2012 is an important step towards providing more modern and healthy living areas to cities and people although it has caused many controversies. The urban renewal projects in Turkey have been the subject of various discussions for these aspects since then. Displacing people from their habitats, forcing them to live in high-rise buildings, or getting unearned incomes through constructions are the main topics of the discussions (Demirkol & Bereket Baş, 2013). The pros and cons of urban renewal projects should be made analyzable according to many parameters. The importance of Geographic Information Systems is undeniable for monitoring, analyzing or establishing new models of the effects of spatial changes on the sustainability and smartness processes. The main thing is that not only the reconstruction of habitats but also the changing land functions can be monitored, analyzed and improved.

7. ACKNOWLEDGMENT

Authors would like to thank the Municipality of Izmit who shared the zoning plans of the Urban Regeneration Area.

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IMAGE SOURCES

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TeMA Journal of Land Use, Mobility and Environment

TeMA 1 (2019) 83-96
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5888

review paper received 2nd November 2018, accepted 29th April 2019

www.tema.unina.it

How to cite item in APA format:
D. N. Mbazor & B. Ojo (2019). Impacts of Land Disputes on Community Development. Tema. Journal of Land Use, Mobility and Environment, 12(1), 83-96. doi: http://dx.doi.org/ 10.6092/1970-9870/5888

IMPACTS OF LAND DISPUTES ON COMMUNITY DEVELOPMENT

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ABSTRACT

Land disputes as experienced in different parts of Nigeria have strong effect on rural and urban socio-economic development. Land disputes have disastrous and life threatening effects on individuals as well as on groups, communities and even entire nations. The goal of this study is to investigate the impacts of disputes on land in relation to human capital and infrastructural development of communities. In view of this, the study examined the specific impacts of land disputes on the development of communities in Inyimagu district. In achieving this, Three hundred and Seventeen (317) questionnaires were retrieved from the residents of the various villages that make up Inyimagu community in Ikwo local government area of Ebonyi state Nigeria, a community that has been ravaged by communal clashes with the adjoining villages including Nsobo community in Obubra local government area of Cross River state over the issue of land ownership. Data were analysed using a simple descriptive statistics. Finding shows that village claim of long time settlements, long-term enmity amongst families among others factors are the major reasons for the incessant land disputes in these communities. The study will contribute to the knowledge of understanding the major factors responsible for land disputes in rural communities and the effects of such disputes to the socio-economic growth and development of the effected communities.

KEYWORDS:
Dispute, Land, Land in dispute, Land Ownership, Land use Act.

TeMA
有关土地使用、交通和环境的杂志

TeMA 1 (2019) 83-96
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5888

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城市改造区内区域划分规划的变化分析

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摘要

本文旨在通过梳理智慧城市文献资料，实现所述目标。通过对150多篇文献资料进行查阅和分析，发现智慧城市各大驱动因素和成功指标，供未来研究政策所参考。研究结果指出了促使智慧城市形成的几大因素。这些驱动因素涉及经济、环境、治理、安全、能源、生活、科技、建筑、教育和人员。有趣的是，一座智慧城市的划分，应取决于该城市达到的智慧程度是否满足这些驱动力的要求。也就是说，智慧城市是以自身的智慧经济、智慧环境、智慧治理、智慧安全、智慧能源、智慧生活、智慧科技、智慧建筑、智慧教育、智慧人员为特征的城市。本文通过阐述与成功的智慧城市相关的各大驱动因素和指标，为智慧城市的研究文献做出了贡献。 本文旨在通过梳理智慧城市文献资料，实现所述目标。通过对150多篇文献资料进行查阅和分析，发现智慧城市各大驱动因素和成功指标，供未来研究政策所参考。研究结果指出了促使智慧城市形成的几大因素。这些驱动因素涉及经济、环境、治理、安全、能源、生活、科技、建筑、教育和人员。有趣的是，一座智慧城市的划分，应取决于该城市达到的智慧程度是否满足这些驱动力的要求。也就是说，智慧城市是以自身的智慧经济、智慧环境、智慧治理、智慧安全、智慧能源、智慧生活、智慧科技、智慧建筑、智慧教育、智慧人员为特征的城市。本文通过阐述与成功的智慧城市相关的各大驱动因素和指标，为智慧城市的研究文献做出了贡献。

关键词:
地理信息系统; 可持续性; 城市改造; 区域划分规划

1 INTRODUCTION

The Nigeria Land Use Act of 1978 highlights the constitutional right of every eligible person to own land and in any place that does not contribute negatively to his or her development as long as they follow specified guidelines. The 1978 Land Use Act vests all land in the Governor of each state of the federation to hold in trust and administer for the people. It provides that land may be administered under two tenure systems: statutory and customary tenures. While statutory land is administered in accordance with written laws, by government officials, customary land is administered by traditional authorities based on unwritten and localized customary laws in certain places in Nigeria.

It is generally said that "all development starts and remains on land", as such efforts to develop a town or community should be well planned and integrated to be meaningful and useful to the people. The continuous growth in world population and the associated changes in lifestyle call for a need to examine current trends in land issues, which also include land disputes. Dispute or conflict is a phenomenon that cannot be avoided in human interrelationship with each other. Social, economic, religious and political issues are agreed to be at the heart of the source of human disputes. That is, differences in interest on these issues can cause conflict of various natures. Land disputes often have extensive negative impacts on economic, social, spatial and ecological development of any nation. This is especially true in developing countries and countries in transition such as Nigeria, Ghana, Cameroun etc., where land market institutions are very weak, opportunities for economic gain by illegal action are widespread and many poor and deprived people in the society lack access to land. Land disputes have disastrous and life threatening effects on individuals as well as on groups, communities and even entire nations (Wehrmann, 2008). It also affects city growth and development. Therefore, issues of land disputes should thus be handled with utmost care as land is noted to be a primary resource that men and women in most communities in Nigeria depend on for their livelihood and social economic growth and development. Mudenda (2006) supported this assertion and stated that "Land is a source of food, shelter, social status and power". It is on the basis of these that this study is meant to investigate the impacts disputes on land has on human capital and infrastructural development of communities under study.

Since creation of the earth, and from one generation to another generation, land has been held as the greatest resource and indeed the backbone of wealth in many African communities, whether in towns or in rural communities. Land is known to be the focal point of economic growth, poverty eradication and the general improvement of livelihoods, (Government Gazette, 2004). Similarly, to the investor, land is the basis of wealth creation; to the peasant and commercial farmer, a basis of production and to the community, a source of pride and social status. Land is a vital natural resource that hosts and sustains all living things namely; plants, animals, man and infrastructure. It is a fixed socio-economic asset that aids production of goods and services and hosts virtually all activities that take place on earth (Magel, 2001). The above mentioned arguments reveal that land is central to continuity of life, indispensable in physical development and complex in social relations of production in the economic world. In other words, to every land, there is the socio-cultural dimension to it. As a result, dispute over land is often combined with strong economic, spatial, cultural and emotional values. There are indications that man's complex socio-economic, cultural and physical attachments to land have placed land in a sensitive and unique position. Many countries of the world, especially developing countries in Africa have experienced severe problems relating to land. The most prevalent ones include environmental degradation, landlessness, squatting, and rural poverty (Kambenja, 1997). The U N in addition argues that, one of the major land issues is dispute resolution, which if not addressed can lead to serious underdevelopment. The major problem associated with land dispute is the loss of lives and properties. Disputes on land often occur between individuals, groups and communities. Dispute on land in recent years have done more havoc than good to the 21st century generation (Ukaejiofor, 2009). Dispute on land often truncate the socio-economic and physical development of most urban and rural areas leaving the dwellers with economic hardship, poverty accentuation, health challenges, food scarcity, low standard of living, slow city and

community growth among others. It has been observed in studies that land disputes often result into several deaths and severe injuries during conflict battles especially in situations where it is a communal dispute (Fischer, 2012).

Presently, there have not been any clear terms on how to resolve land disputes in Nigeria especially between villages, towns and cities despite all the provisions in the existence of land use Act and all other efforts by the government. Communal conflict which relates mostly to land issues still dominates southern and middle belt parts of Nigeria. The need for arable land for farming and rearing of animals has increased over the years giving room for conflicts and land disputes. Irrespective of the efforts of the federal, state and local governments towards resolving land disputes, little results have been achieved as land disputes is common in villages, towns and cities, particularly in the villages who equates land possession as wealth and inheritance rights (Fischer & Ferlie, 2013). There is no doubt that the problems associated with incessant land disputes could hinder the growth and development of villages, towns and cities such as Inyimagu town and its adjoining localities. The growth of the town in terms of community infrastructures, housing development and business activities have been seriously affected by crisis associated with land disputes. Businesses are often shut down during crises in the town and this usually leads to loss of lives and valuable goods, it also leads to increase in food prices, high cost of living, unstable society, slow execution of building projects, non maintenance of community infrastructure, damage of community facilities etc.

Despite the prevalence of research in the context of land and associated disputes, the impacts of land disputes on community development has not been sufficiently covered as it affects land dispute in Nigeria. This study thus aims at providing valuable feedback on land dispute studies as well as contributes to the knowledge of understanding the major factors responsible for land disputes in rural communities and the effects of such disputes to the socio-economic growth and development of the effected communities.

2. LITERATURE REVIEW

2.1 DISPUTES IN LAND

A dispute, as defined by sociologists, is a social fact in which at least two parties are involved and whose origins are differences either in interests or in the social position of the parties (Imbusch, 1999). Consequently, land conflict can be defined as a social fact in which at least two parties are involved, the roots of which are different interests over the property rights to land: the right to use the land, to manage the land, to generate an income from the land, to exclude others from the land, to transfer it and the right to compensation for it. A land conflict, therefore, can be understood as a misuse, restriction or dispute over property rights to land (Wehrmann, 2005). The dimensions of land disputes vary significantly. Banette and Jan (2008) observed that a difference is found in the identity of the actors involved. They stressed that some of them being legitimated to Act in the way they occur, others are not. They further noted that land disputes are found in the land itself which are mostly on the basis of ownership such as state, private or commonly owned land. Understanding the specific nature of the land dispute is a vital step in knowing its effects on the growth and development of the affected area.

2.2 GLOBAL CONTEXT OF LAND DISPUTE

Globally, disputes in land are common in virtually all societies. In an ideal society, institutions and transparent procedures can be put in place to resolve such disputes or at least lead to a process that minimizes their possibility of resulting violent disputes. However, it is observed that in societies that are characterized by insecurity of interests, inequality and weak institutions, such disputes may be aggravated through sheer neglect or predatory and discriminatory policies (Chipo, 2016). Land disputes are becoming more intense and diversified world over. However, it should be noted that land dynamics are context specific and continuously

changing, and such disagreement related to them do not systematically result into violence. The consequences of these disputes are far reaching and multidimensional in outlook and may include strong negative effects on social, economic, political and ecological development. These effects are high in developing countries, where land governance is weak, land markets are poorly developed, where there is widespread corruption and political patronage and where many poor members of the society lack access to land (Wehrmann, 2008).

Talking about land disputes around the world, the list is long, endless and ever-changing in nature. Conant (2014) observed that there are more than 150 existing disputes that involve territory, mostly in Africa, Asia, and the Pacific region, but also in Europe and the Americas. Generally, land disputes manifests in different forms, which ranges from disputes between individual parties (such as boundary lines, conflicts between neighbours), conflicts between communities, states or nations, inheritance (conflicts between siblings) and disputes over the use of a given piece of land. Koelmann et al (2018) noted that land conflicts have become a major issue for governments in meeting renewable energy policy objectives in Netherland.

2.3 LAND DISPUTES IN NIGERIA

Issues of disputes surrounding land in Nigeria are multi-faceted and highly complex, with dynamics that change from time to time and depending on the part of the country where they occur. To understand land disputes in Nigeria, especially those that result in violent crises that affects city growth and development—one must understand various types of land disputes found in the country and examine the historical context in which these disputes originated and the current environment in which they continue to thrive. Gausset et al. (2005) observed that "the same territory, landscape or resource can be perceived very differently by different people, and what has been interpreted as dispute over scarce resources often appears to be dispute of perspectives, over the definition of resource, and over the resource management rules."

Drawing from the above statement, this paper seeks to go beyond Malthusian and Neo-Malthusian concepts of population growth and increasing scarcity as the primary driver of land and other resource disputes, and instead examine the "impacts of land disputes on the growth and development of Inyimagu Nigeria." Again Gausset et al. (2005) opined that "looking at disputes through the lens of political ecology, one can see that disputes over resources are often due to distribution, management, and control, rather than scarcity". Another school of thought held that "with regards to natural resources and conflict, relative abundance of a resource (including land) may lead to conflict. This is generally refered to as the "resource curse" an idea championed by scholars such as Ross (1999) and Mehlum (2008). In the Nigerian context, Quentin Gausset (2005) argues that the abundance of natural resources in the Adamawa region of north-western Cameroon and south-eastern Nigeria "has never prevented the existence of agro-pastoral disputes, just as it has never prevented tenure disputes among farmers or among herdsmen".

When northern and southern Nigeria was merged by the British in 1914, the dominant ethnic groups in each region were confronted with an influx of people from other regions of the newly formed country as migration increased dramatically. In an effort to discourage ethnic clashes in northern cities, the British and the emirs persuaded Igbo and Yoruba people to live in separate parts of the city known as Sabon-Gari or stranger's quarters. "By cobbling the different Nigerian groups into a culturally artificial political entity, the British stimulated inter-group competition and mobilization for power and resources in the new state." The ethnic and political structures imposed by the British set the stage for decades of conflict in Nigeria.

In South West Nigeria when land grabbing is brought to the front burner, only one name comes to mind, the Omoniles. Omoniles are known to dispossess people of their property in the most crooked means possible. They foment chaos in the affected communities/area and carry out their heinous crime as if they are above the law. As their activities continue to escalate, it is sad to note that the arm of the law hardly catches up with them. Taking control of large extents of land, territories and related rights is a problem regardless of who takes it. The population of Nigeria, which continues to increase at an alarming rate with the corresponding

rapidly growing rate of urbanization as a result of the influx of a great number of people into urban areas, worsens the case of land grabbing. Nigeria has continually witnessed an increasingly urbanised and urban oriented society characterized by a daily influx of people of different tribes into major Nigerian cities since 1960. The resultant effect of such is increase in the value of land especially in the Nigerian cities of Lagos, Port Harcourt, Abuja, Onitsha, Warri, Ibadan, Awka and Calabar, among others.

Invariably, land has become gold and acquiring a plot of land in any of the aforementioned cities is not a walk in the park, whether by legal or illegal means. Land litigation has incited attacks – both spiritual and physical causing loss of lives and properties. The only thing some Nigerians want to do is control the sales of land whether by hook or crook and that is why Omoniles have continued their criminal activities with no holds barred. Their wanton display of violence on unsuspecting victims is a source of concern.

According to a report from one of the bulletin of Nigerian Institution of Estate Surveyors and valuers, average property in Maitama costs about N430 million. In Port Harcourt, the city adjudged to be the most expensive property location in southern Nigeria, the average property in this location costs about N150 million. The case of Lagos, the nation's commercial nerve center, is well known. What oil is to the people of the Niger Delta is what land is to the people of Lagos state. To s the least, the average property in Ikeja GRA area, which is occupied majorly by expatriates and wealthy Nigerians who prefer the low-key life, goes for about N250 million. Nonetheless, the good news in all of these is that a bill for a law to prohibit forceful entry and occupation of landed properties in Lagos state, is being planned for passage and observers are of the opinion that other states in the country will emulate Lagos State.

Studies revealed that a major factor of communal conflicts in most parts of Nigeria, particularly in the south east and middle belt zones is land or boundary disputes. This shows that land is becoming a very scarce factor of production either due to population pressure, land alienation or concentration of land in a few hands (Dunmoye, 2003). The study further observed that "Communal conflicts in Nigeria have been exacerbated by the economic crisis and pauperization of citizens in recent times. Factors that account for these conflicts are numerous. These include ethnicism, religious differences and their manipulation, land hunger and bourgeoning population, chieftaincy disputes and the native/settlers syndrome.

Soon after Nigerian independence in 1960, the young Country witnessed years of turbulent conflicts between the primary ethnic groups; the first Nigerian Democratic structure was overthrown in 1966, and the Nigeria-Biafran War of 1967 lasted two and a half years and claimed over one million lives; After which there arose inter-ethnic clashes around the country which have continued ever since. In the northern and the middle belt regions of the country, other than the Islamist uprising of Boko Haram, the region is dominated by clashes between Fulani pastoralists and farmer groups and sporadic inter-ethnic clashes in most cities and rural communities; in the southern region of the country, the fight is between the oil companies and local communities, that has spawned a number of rebel groups including the Bakassi Boys etc. (Idemudia, 2006). In most cities and towns around Nigeria, youth groups known as "area boys and others with different names" are causes of urban violence, destruction and crime.

According to the Nigeria Watch database, the country as a whole has witnessed 11,640 violent deaths and destruction of unquantifiable number of properties as at mid-2014. Obasanjo (2004) justifying his reason for imposing state of emergency in plateau state stated that "Violence has reached unprecedented levels and hundreds have been killed with much more wounded or displaced from their homes on account of their ethnic or religious identification. Schooling for children has been disrupted and interrupted; businesses have lost billions of naira and property worth much more destroyed." Similarly in a Distinguished Annual Lecture presented to the National Institute, Kuru, in 2002 former Head of state, General Ibrahim Babangida observed that *"the overall consequences of contemporary ethnic nationalism consist of the following among others; wastage of enormous human and material resources in ethnically inspired violent encounters, clashes and even battles; threat to security of life and property and disinvestments of local and foreign components with continuous capital flight and loss of confidence in the economy; the heightening of fragility of the economy*

and political process." Also, in a research report presented by Participants of the Senior Executive Course No. 26 of the National Institute, the economic consequences of religious and communal conflicts were noted as follows: *"In addition to the irreplaceable loss of lives, losses in terms of property (goods, houses, business premises) have not yet been fully ascertained. Some survivors have permanently lost all they laboured for in their lives. As a result, one can safely argue that the aggregate of such instances negatively impact on the overall economy of these communities and by extension, the rest of the country. New armies of the unemployed, the destitute and highly aggrieved are added on the streets with its attendant consequences. Victims are also generally male and belonging to the economically active segments of the society"* (NIPSS, 2004).

Fabusoro et al. (2008) stated that land issues are a leading cause of conflict in Nigeria. They further noted that "access to land has been shown to be important to poverty reduction, economic growth, and the empowerment of the poor". In addition, they opined that "the importance of territory is perhaps why land disputes are so prevalent in the country, and why they are more difficult to solve than other disputed issues". On the other hand, Olabode and Ajibade (2010) argued that timing of dispute resolution is very crucial in that "if two adversaries are unable to settle their territorial dispute early, the resulting dispute is likely to last for several years." It is understandably that if a dispute lasts for several years, a legacy of conflict is constructed and entrenched that makes any type of peace building effort much more difficult if not impossible. Nigeria as a country has passed through decades of land disputes, and the number of people dying and properties destroyed because of such continues to grow year by year. This has largely affected the rate at which Nigeria cities particularly in the north grow and develop. Conclusively, evidences showed that the major causes of land disputes in Inyimagu and other adjoining villages relates to claims of long time settlements on land, long-term enmity amongst families, scarcity of arable lands for farming among other factors.

3. METHODOLOGY

The research methodology adopted for this study was through collection of primary data from Inyimagu community in Ikwo Local Government Area in Ebonyi state, Nigeria which has been having inter-communal conflict among the neighbouring villages within the town and the neigbouring Cross River State. Available literature on recent communal conflicts in the study area revealed that the thirteen (13) districts that make up the study area have experienced one form of inter- communal conflicts or the other. Most of these conflicts are related to claims of ownership of agricultural farm lands in the area. Farming is the major occupation of the people of Inyimagu, Ikwo with the area known for the cultivation of a variety of crops such as rice, yam, cassava and palm wine in substantially large quantities. Information revealed that there were 13 political districts in Inyimagu (Census of Federal Republic of Nigeria, 2006). These include Agbaenyim, Akahufu, Akataka, Amuna, Effie Mgbobo, Ibem, Obegu, Ochoku, Odumowo, Ofenekpa, Oferekpa, Ugwueke and Ugwuenyim. The community is located on 6^0 3′ 11″ and North 8^0 10′ 46″ East with estimated density of 492.9/km^2 comprising 99,855 males and 115,114 females (NPC, 2016). The study purposely selected 390 household heads (30 in each district) in that up Inyimagu town for questionnaire distribution using systematic sampling method. The reason for making an equal selection was because it is assumed that the populations of the districts are same. In conducting the survey, each district is divided into clans (group of people living together). One out of every 5 compound buildings in each clan was selected using random sampling method. Where buildings were not accessible by road, minor roads or paths that served them were taken as accessible roads for the purpose of the study. In order to ensure a random start, the first building in every road within each clan was randomly chosen out of the first five Residential buildings. Where a chosen building was not used for residential purpose, the next one was selected to replace it. Household heads were targets of questionnaire administration in each of the sampled buildings. Information collected from them were on causes of past inter-communal land disputes in the area, their opinions on effects of land disputes on city growth and

development, strangers right to land and predominant land uses in the study area among others. In a compound where there were more than one household heads, the eldest one with longest time of stay was selected. In all, 390 questionnaires were administered out of which 317 (81%) were valid and worthy for analysis in this study (This is shown in Tab.1 below). This placed non-response rate at 18% of the targeted respondents who were either nursing the wounds of past disputes in their hearts or not willing to supply information related to issues of land dispute in the study area. Information obtained from the respondents were mainly related to main causes of communal land disputes and the effects of these on city growth and development. Data collected were analysed using descriptive method.

Selected Districts	Number of questionnaire Administered	Number of questionnaire Retrieved	Percentage of questionnaire retrieved
Agbaenyim	30	23	5.9
Akahufu	30	25	6.4
Akataka	30	21	5.5
Amuna	30	28	7.2
Effie Mgbobo	30	26	6.7
Ibem	30	22	5.6
Obegu	30	24	6.2
Ochoku	30	25	6.4
Odumowo	30	26	6.7
Ofenekpa	30	24	6.2
Oferekpa	30	23	5.9
Ugwueke	30	25	6.4
Ugwuenyim	30	25	6.4
TOTAL	390	317	81

Tab.1 Sample Frame and Size of the Study Area. Source: Author's field survey data, 2018

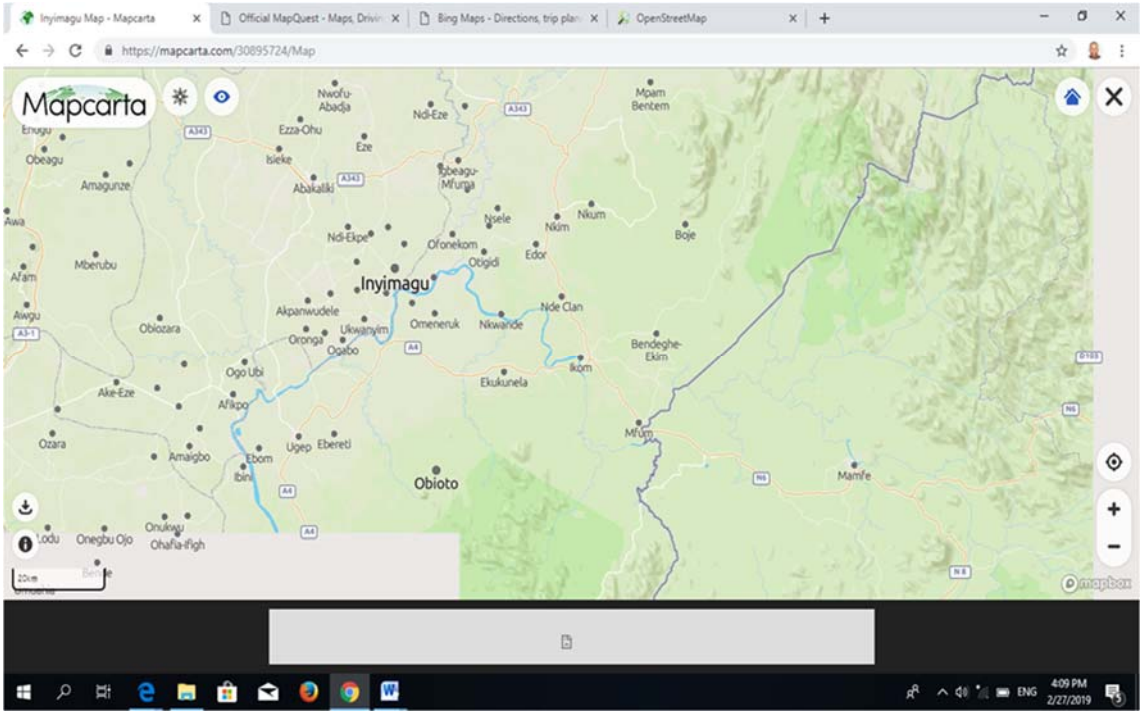

Fig.1 showing the location Map of the study area and communities affected by dispute

	Reasons for Land Dispute						
Districts	Excessive greed for money	Self-interest by the elders in the families	Long-term enmity amongst families	Claim of Settlements	Rights over Land	Other Issues	TOTAL
Agbaenyim	3 (13)	2 (8.7)	4(17.4)	5(21.7)	9(39.1)	0(00)	23(100)
Akahufu	2(8)	2(8)	5(20)	8(32)	8(32)	0(00)	25(100)
Akataka	3(14.3)	1(4.8)	5(23.8)	6(28.6)	5(23.8)	1(4.8)	21(100)`
Amuna	2(7.1)	3(10.7)	8(28.6)	7(25)	6(21.4)	2(7.1)	28(100)
Effie Mgbobo	4(15.4)	2(7.7)	7(26.9)	9(34.6)	4(15.4)	0(00)	26(100)
Ibem	3(13.6)	2(9.1)	6(27.3)	5(22.7)	5(22.7)	1(4.5)	22(100)
Obegu	1(4.2)	4(16.7)	5(20.8)	8(33.3)	6(25)	0(00)	24(100)
Ochoku	2(8)	4(16)	6(24)	6(24)	7(28)	0(00)	25(100)
Odumowo	3(12.5)	2(7.7)	4(15.4)	7(26.9)	8(30.8)	2(7.6)	26(100)
Ofenekpa	3(12.5)	4(16.7)	9(37.5)	5(20.8)	5(20.8)	0(00)	24(100)
Oferekpa	4(17.4)	2(8.7)	6(26.1)	7(30.4)	4(17.4)	0(00)	23(100)
Ugwueke	1(4.0)	4(16)	7(28)	7(28)	3(12)	3(12)	25(100)
Ugwuenyim	3(12)	1(4)	5(20)	8(32)	6(24)	2(8)	25(100)
TOTAL	34(10.7)	33(10.4)	77(24.3)	88(27.8)	76(24)	11(3.5)	317(100)

Tab. 2 Land as the Main Cause of Disputes in Inyimagu, Ebonyi State Nigeria. Source: Author's field survey data, 2018

3.1 LAND AS THE MAIN CAUSE OF CONFLICTS IN INYIMAGU, EBONYI STATE

Activities and various interests subsisting on land are the major causes of dispute in the study area and their degrees of occurrence are as shown as follows. Findings revealed that disputes in Inyimagu, Ebonyi State Nigeria were caused by land related issues. As seen in Tab.2, attempts by the natives to claim their communities' rights on land from those who are perceived to be non-natives constitute the highest percentage (27.8%) of the six variables considered to be the main cause of conflicts, and have resulted in conflicts between them and other communities. Also seen in the table, results shows that long term enmity amongst families (24.3%), Rights over land (24%), excessive greed for money (10.7%) and self interest by elders in the family (10.4%) are some of the factors that causes conflicts in the study area. The table further revealed that (3.5%) of the respondents had a contrary opinion to the effect that past conflicts in the study area could be linked with other issues different from land matter. The results further indicated that most of the recorded past conflicts in the various communities had some issues undertone other than land related matters. The import of this is that most disputes in Inyimagu were instigated by tussles over land matters.

	Owner-ship Determination			
Districts	Family & individuals	Village heads	Government	TOTAL
Agbaenyim	17(73.9)	1(4.3)	5(21.7)	23
Akahufu	21(84)	0(00)	4(16)	25
Akataka	19(90.5)	1(4.8)	1(4.8)	21
Amuna	24(85.7)	2(7.1)	2(7.1)	28
Effie Mgbobo	21(80.8)	3(11.5)	2(7.7)	26

Ibem	20(91)	0(00)	2(9.0)	22
Obegu	24(100)	0(00)	0(00)	24
Ochoku	16(64)	2(8)	7(28)	25
Odumowo	18(69)	2(7.7)	6(23.2)	26
Ofenekpa	22(91.7)	1(4.2)	1(4.2)	24
Oferekpa	21(91.3)	0(00)	2(8.7)	23
Ugwueke	19(76)	2(8)	4(16)	25
Ugwuenyim	22(88)	0(00)	3(12)	25
TOTAL	264(83.3)	14(4.4)	39(12.3)	317(100)

Tab.3 Those responsible for Land Administration, management and Allocation in Inyimagu. Source: Author's field survey data, 2018

3.2 SYSTEM OF LAND ADMINISTRATION, MANAGEMENT AND ALLOCATION IN INYIMAGU, EBONYI STATE

The study showed that land in Inyimagu, Ebonyi state Nigeria is principally owned and administered by the family rather than the government. As revealed in Tab.3, 83.3% of the respondents indicated that family or individual members of the community are in charge of their land administration, management and allocation. Only 4.4% and 12.3% of the respondents opined that village heads and government respectively are in control of land in the study area.

	Land ownerhip			
Districts	Non-natives have no full right over Land Ownership	Non-natives can be given partial rights	Anybody can have full right over land	TOTAL
Agbaenyim	0(00)	11(47.8)	12(52.2)	23
Akahufu	0(00)	6(24)	19(76)	25
Akataka	0(00)	10(47.6)	11(52.4)	21
Amuna	0(00)	6(21.4)	22(78.6)	28
Effie Mgbobo	0(00)	4(15.4)	22(84.6)	26
Ibem	0(00)	8(36.4)	14(63.6)	22
Obegu	0(00)	5(20.8)	19(79.2)	24
Ochoku	0(00)	5(20)	20(80)	25
Odumowo	0(00)	4(15.4)	22(84.6)	26
Ofenekpa	0(00)	6(25)	18(75)	24
Oferekpa	0(00)	5(21.7)	18(78.3)	23
Ugwueke	0(00)	4(16)	21(84)	25
Ugwuenyim	0(00)	10(40)	15(60)	25
TOTAL	0(00)	84(26.5)	233(73.5)	317(100)

Tab.4 Mode of Land Ownership in Inyimagu. Source: Author's field survey data, 2018

3.3 PREDOMINANT MODE OF LAND OWNERSHIP IN INYIMAGU, EBONYI STATE IN NIGERIA

There are various modes of land ownership in Nigeria as outlined on Tab.4 above. The styles of ownership differ from one community to another but the above classified styles are the predominant manner in which one can own land in the study area. As revealed in this study in Tab.4, about two third (73.5%) of the respondents were persuaded that anybody, be it a stranger or a native can have full right over any piece of

land in their community provided such right is legally acquired from the legal owner even without a certificate of occupancy issued by the government. Only 26.5% of the respondents in all the communities that make up Inyimagu are of the view that strangers should be given partial right of ownership in their respective communities. None (0 %) of the respondents are of the opinion that non-natives should have right of land ownership in the study area. The import of this is that most of the sampled respondents were of the opinion that strangers have right to own land in the study area since ownership is based on individual family members who has an unrestricted right to sale or alienate any part of his land at any time without permission from anybody.

	Effects of land disputes			
Districts	Loss of lives & properties	Close down of social services such as Schools, hospitals & churches	Loss of economic activities such as farm lands & businesses	TOTAL
Agbaenyim	12(52.2)	4(17.4)	7(30.4)	23
Akahufu	14(56)	1(4)	10(40)	25
Akataka	10(47.6)	2(9.5)	9(42.9)	21
Amuna	10(35.7)	5(17.8)	13(46.4)	28
Effie Mgbobo	16(61.5)	3(11.5)	7(26.9)	26
Ibem	14(63.6)	1(4.5)	7(31.8)	22
Obegu	15(62.5)	3(12.5)	6(25)	24
Ochoku	7(28)	5(20)	13(52)	25
Odumowo	12(46.2)	1(3.8)	13(50)	26
Ofenekpa	13(54.1)	5(20.8)	6(25)	24
Oferekpa	11(47.8)	3(13)	9(39.1)	23
Ugwueke	5(20)	4(16)	16(64)	25
Ugwuenyim	4(16)	3(12)	18(72)	25
TOTAL	143(45.1)	40(12.6)	134(42.3)	317(100)

Tab.5 Main effects of land disputes in Inyimagu, Ebonyi State. Source: Author's field survey data, 2018

Findings from the study revealed that land disputes in the study area have caused several damaging effects. This is evidenced in Tab.5 which shows that 45.1% of the respondents attested that land disputes in the study area have led to loss of lives and valuable properties. It further revealed that it has led to loss of economic activities such as farm lands & businesses (42.3%) and close down of social services such as Schools, hospitals & Churches (12.6%). The import of this is that economic, social and other activities are affected by crises that arose as a result of land dispute in the study area.

S/N	Impacts	SA	A	UD	D	SD	TOTAL
1	Increase in food prices	189	97	5	20	6	317
2	High cost of living	212	85	11	5	4	317
3	Unstable society	267	44	3	2	1	317
4	Decay of community infrastructures	217	78	7	12	3	317
5	Slow down projects development	292	16	-	7	2	317
6	Damage of community and individual properties	309	5	1	1	1	317

7	Displacement of inhabitants from their communities	302	9	3	2	1	317
	Total	1788	334	30	49	18	2219

Tab.6 Socio-economic Impacts of Land Disputes on the Development of Inyimagu. Source: Field survey, 2018

Note: SA = Strongly Agreed, A = Agreed, UD = Undecided, D = Disagreed = SD = strongly Disagreed

Tab. 6 Computation for mean rating. The rating of the impacts of land disputes in Inyimagu, Ebonyi state is hereunder computed for mean rating. The mean rating is used to make decision concerning respondent's agreement.

Impacts of land disputes	SA	A	UD	D	SD	TOTAL	Mean	Rank	Decision
1	945	388	15	40	6	1394/317	4.39	7	Agreed
2	1060	340	33	10	4	1447/317	4.56	5	Agreed
3	1335	176	9	4	1	1525/317	4.81	4	Agreed
4	1085	312	21	24	3	1445/317	4.55	6	Agreed
5	1460	64	0	14	2	1540/317	4.85	3	Agreed
6	1545	20	3	3	1	1572/317	4.95	1	Agreed
7	1510	36	9	4	1	1560/317	4.92	2	Agreed

Tab.7 Computation for mean rating. Source: Field survey, 2018

Note: SA = Strongly Agreed, A = Agreed, UD = Undecided, D = Disagreed = SD = strongly Disagreed

The information contained in Tab.6 above shows that all the 317 respondents agreed that the stated Impacts in Tab.6 are the various impacts of land dispute in Inyimagu, Ebonyi state, Nigeria. This is because the mean score for the responses are above the cut-off point of (4.0).The lowest impact of land disputes in Inyimagu as shown on the list has a mean score of 4.39. This shows that land disputes in Inyimagu has led to an increase in food prices as there is scarcity of food in the town. Item 2 on the table have mean score of 4.56 and this shows that land disputes has impact on the cost of living. The views expressed by most of the respondents during oral interview collaborates this finding. Item 3 with a mean score of 4.81 also show that land disputes affect the societal peace and lead to an unstable society. This explains why communities/villages descend on their neighbours with a slightest provocation.

The mean score of item 4 is 4.56 which bothers on the decay of community's infrastructure can also be seen as the effect of land dispute in the study area. This is attributed to a total neglect and abandonment of the facilities by both the community and the government. This decay has the tendency to cause ill health and at the extreme cases death of the inhabitants.

Item 5 have a mean score value of 4.85. This signifies that land dispute in Inyimagu has resulted to a slow down of developmental projects such as housing development etc. This is attributed to the fact that investment can only thrive successfully in a dispute free environment.

Item 6 on the table has the highest mean score of 4.95 and this shows that the greatest impact of land dispute in Inyimagu is the damage done to community's and individuals' properties in the community. The views expressed by most of the respondents during oral interview collaborates this fact equally.

Finally, item 7 which as a mean value of 4.92 indicates that land dispute in Inyimagu leads to the displacement of inhabitants from their natural and ancestral homes to other neighbouring communities

4. CONCLUSION AND RECOMMENDATION

This paper has analysed vital issues associated with land disputes and which have serious implications on socio-economic development of the study area in particular. Firstly, it provided a basis for understanding the main causes of land disputes in Inyimagu, Ebonyi state Nigeria. The study further revealed the issue of who is in control of land management and administration in the area. The study unraveled the limitations of government both at state and local levels to control the use of land as enshrined in the land use Act of 1978, instead individuals and in some cases families are allowed to be determine who owns the land and for what purpose. Perhaps this lack of centralized control of land led to land fragmentation, making individual members of the community to claim their individuals' community's rights over a given pieces of land, resulting to unresolved disputes.

From the study it can be deduced that nations that have efficient and rigid systems of land administration have less disputes over land. Therefore, from the foregoing it is recommended that the existing land law in Nigeria and elsewhere should be comprehensively reviewed to fashion out a best policy that makes both rural and urban lands to be administered by the government through effective land administration system. In this, way the issue of family land ownership will be abrogated everywhere in Nigeria. In addition, it would address the problem of strangers' inaccessibility to certain categories of land thereby speeding up development of both rural and urban areas. Having this in operation, the craving to associate a piece of land to one's life and the desire to preserve family heritage would be drastically reduced, and in cases of minor issues such boundary matters, government through an established agency will step in for immediate settlement.

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 1(2019) 97-119
print ISSN 1970-9889, e- ISSN 1970-9870
doi: http://dx.doi.org/10.6092/1970-9870/6064

REVIEWS PAGES

THE TIMES THEY ARE A-CHANGIN' 1(2019)

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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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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 1 (2019) 97-119
print ISSN 1970-9889, e- ISSN 1970-9870
doi: http://dx.doi.org/10.6092/1970-9870/6064

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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，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: Maria Rosa Tremiterra
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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。

author: Gennaro Angiello
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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。

author: Andrea Tulisi
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01

THE TIMES THEY ARE a – CHANGIN' 1(2019)

REVIEW PAGES: WEB RESOURCES

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In this number

SOIL USE AND CLIMATE CHANGE

During the Sustainable Development Summit 2015, Heads of State adopted a document called "Agenda 2030" (ONU, 2015), which set the objectives to be pursued by the Member States for sustainable development, in order to mitigate the effects of climate change.

The document recognizes the close link between human well-being and the health of natural systems and its objectives identify several areas of action in this perspective: fighting against hunger, eliminating inequalities, protecting natural resources and claiming sustainable production and consumption patterns.

Human health depends on the ecosystem conditions, which are compromised by human activity (the main cause of climate change). The roles played by air and water to mitigate the effects of climate change are quite known (Reali & Toffol, 2017) but the awareness of the role that soil can play is less widespread.

In fact, soil constitutes the second carbon tank after the oceans (Zucaro & Morosini, 2018) and, as such, it carries out a real CO2 storage action, contributing to the mitigation of climate change and favoring adaptation to it, without considering that permeable soils protect against heat waves, storing large amounts of water and keeping temperatures low (European Environment Agency, 2017).

The awareness of the multiple functions of soil ensures that one of the objectives set by the Agenda 2030 is "to promote sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally" (Agenda 2030, 2015).

In this context, several European cities are trying to exploit the soil functions: for example, Madrid organized the Gomeznarro park to include new permeable surfaces, vegetation and underground areas for water storage (European Environment Agency, 2017).

Therefore, if properly managed, soil can help reduce greenhouse gases and global temperature and contribute to flood regulation and prevention by reducing erosion.

The solutions adopted in the Belgian village of Velm (Vandaele, 2011), such as rotation crops, to reduce the countless floods that occurred above all in 2002, could be taken as a good example.

CMCC
https: www.cmcc.it

The Euro-Mediterranean Center on Climate Change (CMCC) is a non-profit research organization founded in 2005, with the financial support of the Ministry of Education, University and Research (MIUR), the Ministry of the Environment and Protection of the Territory (MATT), the Ministry of Agricultural and Forestry Policies (MIPAF) and the Ministry of Finance (MEF), and thanks to funding from the Integrative Special Research Fund (FISR) within the National Strategic Program for Research.

CMCC's mission is to carry out studies and model the climate system and its interactions with society and the environment, to ensure reliable, timely and rigorous results to stimulate sustainable growth, protect the environment and develop, in the context climate change, adaptation and mitigation policies based on scientific knowledge.

The CMCC website contains a wealth of information articulated in different sections. The home page can be divided into three parts: the left one, where users can find a significant number of links that simply direct to the section of interest and to other similar websites, such as that of the European Environment Agency. The central part, instead, is dedicated to the presentation of the latest articles uploaded on the site; on the right side, then, users can find links for the Newsletter, the box dedicated to the Events and that to the Tweets.

The most interesting sections for the topic of climate change are "Publications", "Events" and "Databases". By clicking on the section "Publications", users will display five sub-sections:

– Scientific and Refereed Papers;
– Research Papers;
– International Climate Policy Magazine;
– Strategic Plan and Reports;
– Books.

In particular, in the first sub-section it is possible to consult papers published by CMCC scientists in journals with Impact Factor identified by the Journal Citation Reports (JCR) by Thomas Reuters, scientific books and proceedings. Through the drop-down menus at the top of the page, it is also possible to make a detailed search by setting filters. Moreover, this section is rich in scientific material on climate change and land use that can be easily and quickly consulted and downloaded. Another sub-section of equal interest for the theme of climate change and land use (with the same consultation structure of the previous sub-section) is "Research Papers", which contains the research documents produced by the CMCC divisions. The texts published in this sub-section can also be found on the Social Science Research Network (SSRN) website in the Public Policy Centers - Research Papers series. From the "Events" section, users can access a full schedule of seminars, conferences and workshops. Each event is associated with a link that leads to the event details, providing information about the contents, dates and place, the organizing body and the related contacts. Finally, another interesting section is the one dedicated to the Databases, in which users can find the climatic scenario simulations conducted by several CMCC researchers. In each section consulted by the users, the news box is always kept updated, so as to make them promptly informed about all the most important initiatives regarding the issue of climate change. The website header stays fixed on the top of the page, whatever section users are consulting: this allows the reader to do a quick search by keywords through the Search box on the top right side, but also to choose the language (the site is available in Italian and English), send an email through the Webmail link and directly access the social networks of Facebook, Twitter, Instagram, LinkedIn and the YouTube channel (right beside the Search box).

CEE web for Biodiversity
http: www.ceeb.org

CEE web for Biodiversity is a network of non-governmental organizations in the Central and Eastern European region that has been working in 20 countries for 20 years. Its mission is the conservation of biodiversity through the promotion of sustainable development. The website is divided into eight main sections:

- Home;
- About us;
- Members;
- Work Areas;
- Library;
- News & Events;
- Job Offers;
- Contacts.

By entering the "Work Areas" section, users can find the two sub-sections "Working Groups" and "Priority Areas", in turn organized by topics. For example, the "Working Groups" section is divided into four groups: NATURA 2000, Sustainable Tourism, Rural Development, Cities and Policies.

By clicking on the sub-section "Natura 2000", users can access the page created with the aim of encouraging the introduction and management of Natura 2000 in the CEE region; in fact, the group's primary aim consists in the information and experience exchange on the subject. Within the page, users can find several links that give access to various information, such as Meetings, Resources, Members, Activities, etc. By clicking, instead, on the section "Sustainable Tourism", users can access the area dedicated to tourism and biodiversity; in fact, the objective of the Working Group is precisely to make tourism sustainable in the countries of Central and Eastern Europe. In this context, the Working Group contributes to the work of NGOs for the conservation of nature, ministries and other institutions. In addition, users can consult several links in the same page to deepen their knowledge on the subject. The "Rural Development" section is dedicated to enhancing the soil role in the maintenance of valued cultural landscapes, in order to identify the threats that may compromise nature, such as land intensification and abandonment.

The second sub-section of the "Work Areas" section, called "Priority Areas", is divided into ten groups, in turn articulated into sub-groups. The groups of greater interest are certainly those dedicated to green infrastructure, sustainability, use of resources and other activities, which include projects, ideas and insights about climate change. An interesting article on the special role played by soil in the processes of mitigation and adaptation to climate change can be consulted in the area "Other Activities". From the list of titles, users can choose the article of interest and access it with the click of a mouse; scrolling the page down, then, they can freely download the pdf version of the article. As for the previous website, also in this case it is possible to do a quick search by entering keywords in the box located in the upper right corner of the page. At the bottom right side of the home page, there are links to social networks like Facebook, Twitter, LinkedIn and YouTube. This webpage is financed by the European Union, the International Fund and the Ministry of Foreign Affairs of the Republic of Korea

State of the Planet
EARTH INSTITUTE | COLUMBIA UNIVERSITY

State of Planet
https://blogs.ei.columbia.edu

State of the Planet is a blog of the Columbia University's Earth Institute, composed of scholars spread over more than two dozen research centers and programs at Columbia University, whose goal is to spread knowledge about the functioning of the Planet and how human activities are influencing natural systems. The studies published in the blog want to raise human awareness towards a sustainable management of economic growth to protect Earth from destruction.

The website is easy to consult: in the home page are featured the latest news uploaded, while at the top of the page users can find all sections organized by topics:

- Agriculture;
- Climate;
- Earth Sciences;
- Ecology;
- Energy;
- Health;
- Sustainability;
- Urbanization;
- Water.

By clicking on the section of interest, users can access the linked website, with a large number of scientific publications about the topic of the section, ready to be consulted. At the top right side of the home page and of each section, there is a search box, through which, by inserting keywords, it is possible to make a quick search. At the bottom of the pages (always on the right side), there are several drop-down menus that allow users to do a detailed search of the articles of interest, by inserting the topic, the research center, the authors and the year. Finally, at the top right of every page, it is possible to connect to social media like Facebook, Twitter and YouTube.

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IMAGE SOURCES

The images are from: https://www.cosepercrescere.it/la-desertificazione/; https: https: www.cmcc.it /; http:// www.ceeb.org /; https://blogs.ei.columbia.edu

02

THE TIMES THEY ARE A-CHANGIN' 1(2019)

REVIEW PAGES: BOOKS

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In this number

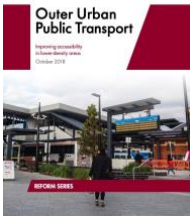
URBAN PLANNING CHANGES

The urban areas around the globe face increasing transport and land-use challenges linked to growing populations and are actively looking to finding potential solutions to meet these challenges as part of their planning agendas. The social and economic growth of cities provides immense opportunities for the nations. As cities grow, businesses take advantage of larger and more skilled labour markets, and workers are given opportunities to develop and broaden their skill base. However, the rapid growth of cities also brings into focus issues with how they are structured and how they function. Most governments are responding to these challenges with significant public investments. Billions of dollars are being spent by all levels of government acknowledging the importance of urban services to the equity and competitiveness of urban areas (Zali et al., 2016). 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 (Carpentieri & Favo, 2017).

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 chose (Angelidou, 2017). The ICT technologies, greater availability of data and the emergence of new trends in shared consumption offer the opportunity to break the cycle of under-provision of public transport at the urban fringe. In addition, the integration of land use and transport is critical to ensuring the reach and service levels of our transport networks reflect community needs.

Reduction in car dependency and the growth of public transport use will require strong engagement with the community to ensure their needs are met. Governments should seek the support of communities to undertake reviews of long-established transport services with a view to major changes. Many existing public transport services have not been updated for decades, or worse rely on the corridors of century-old former tram networks. The transport network design and land-use planning should involve a collaborative approach among the different authorities and companies.

According to these themes, this section proposes three works that help to better understand the topics of this number: Outer Urban Public Transport. Improving accessibility in lower-density areas; Autonomous vehicle ride-sharing services; and Environmental and territorial modelling for planning and design.



Title: **Outer Urban Public Transport. Improving accessibility in lower-density areas**
Author/editor: Energy Efficiency Unit Department
Publisher: Infrastructure Australia
Publication year: 2018
ISBN code: 978-1-925352-35-1

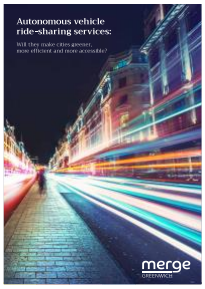
Australia's cities are growing rapidly. Over the next 30 years, Australia will grow by over 11 million people. The 80% of this growth will be in the five largest cities: Adelaide, Brisbane, Melbourne, Perth and Sydney. Close to half the population of five largest cities live in the outer suburbs. It is critical that they have access to the services and opportunities that inner-city residents enjoy. Much of this growth will be accommodated at the fringes of cities and in low-density developments. Australia's cities are generally defined by a central core surrounded by low-density suburbs. While they began as small trade and agricultural hubs, usually based around a port, the cities have gradually expanded outwards. This growth was initially along public transport routes. However, in the post-war era, as car ownership grew sharply, the outer parts of cities expanded rapidly. This report focuses on one of the key enablers of access: public transport. It presents a new spatial analysis of our five largest cities in order to: investigate the challenges in delivering outer urban public transport; quantify the extent of public transport disadvantage; recommend a range of policy responses for the government.

This analysis assesses the quality and accessibility of public transport services in our five largest cities: Sydney, Melbourne, Brisbane, Perth and Adelaide. It revealed the extent of disadvantage in some areas compared to others, and the impact on travel patterns and liveability. Two key trends emerged:

- Public transport disadvantage in outer suburbs is significant. Access to public transport services and service frequencies are lower, while travel times and distances to major employment centres are longer in outer suburbs;
- Public transport use is lower for people living and working in the outer suburbs. Fewer people use public transport in outer suburbs than other areas, and those who do are more likely to drive to reach local services. As a result, car operating costs are higher in the outer suburbs.

The report provides seven recommendations to governments on how to improve public transport and accessibility in outer urban areas. Governments have a range of transport and land use options. While building more public transport is desirable and we recommend governments continue investing in new infrastructure, there are other actions that can improve and augment the efficiency of existing networks at a lower cost.

The first, the state and territory governments should prioritize the seamless integration of transport networks for users by coordinating service planning, timetabling, fare policy, digital tools and operations. The second, the governments should embrace new transport modes, such as on-demand services, which are well suited to low-density areas. The third, state and territory governments should implement a coordinated policy approach to encourage interchanging within an integrated transport network. The fourth, State, territory and local governments should improve the physical integration of the public transport network with private, active and emerging transport modes. The fifth, the governments should openly embrace technological innovation in transport, working with third-party operators to improve the user experience. The sixth, governments should undertake integrated land use and transport planning to examine opportunities for employment and residential densification at key sites adjacent to public transport. The last recommendation, governments should support the development and growth of suburban and outer urban employment centres to improve job accessibility.



Title: **Autonomous vehicle ride-sharing services**
Author/editor: MERGE Greenwich Consortium
Publisher: -
Publication year: 2018
ISBN code: -

The urban population increased, cities face the challenge of making sure the availability of transport keeps up with the increasing demand. New technologies, such as autonomous vehicles (AVs), and emerging business models, such as ride-sharing, are often cited as two ways to solve this mobility challenge.
This report collects a year of laborious research, testing, simulations, evaluation, analysis and much more to provide a plan for the delivery of autonomous vehicle ride-sharing services that offer citywide benefits. This contribute provides what to be important insights into the next steps required by the government, operators, tech providers and vehicle manufacturers to drive us forward to a successful future.
The potential benefits for citizens of new technology and services are huge such that autonomous vehicles and ride-sharing could help to solve many of the most pressing issues faced by cities including congestion, emissions and accessible transport for all. So, this research considers how such services could be commercially launched and the necessary customer service offering required to ensure the delivery of a service that can be trusted by consumers. The Mobility as a Service (MaaS) vision for urban environments sees people shifting away from using personally owned cars in favour of using multiple modes of transport. These involve shared trips, which are consumed as a service through a single, unified digital booking and payment interface acting like a 'personal travel assistant'.
The MERGE Greenwich project brought together a consortium of industry and public sector transport experts to build a sophisticated simulation of autonomous and electric vehicles providing ride-sharing services alongside current traffic patterns in a geo-fenced area.
The aim of this project was to explore how a new service could be designed and implemented to complement, rather than compete with, public transport. A complex transport model and fleet simulation were developed, based on the target year of 2025, which positioned the AV ride-sharing service in the Royal Borough of Greenwich, London. The project explored whether such a service could be viable within that time-frame and, if so, how it could be achieved. It is chosen 2025 as the year in which AV ride-sharing could, theoretically, be widely available, accepted and used in major, complex urban centres. Basing the simulation in this year allowed MERGE Greenwich to evaluate the AV ride-sharing service as if it were an integrated part of the mass transport system. The research methodology, tools and lessons learned by MERGE Greenwich can be applied to other boroughs and cities in the UK as well as overseas.
The recommendations in this report aim to highlight the key considerations for government and industry with regard to the introduction of AV ride-sharing. MERGE Greenwich simulations have illustrated that the way services are designed can significantly influence their societal and commercial impact. For this reason, the suggestion is to accelerate the collective learning in this area in order to ensure that next generation mobility services are developed and delivered in a way which helps, rather than hinders, cities.
Three distinct strategies (AV ride-sharing services) were designed to specify the input parameters. Each service aimed to achieve different objectives from operating an AV ride-sharing service. The strategies differed by fare and service level criteria, such as waiting time and detour time. The first aimed to optimise the service for mass availability and accessibility; the second prioritised customer service and convenience, at higher cost; and the third aimed to combine attributes of both. These strategies and their impact are discussed in detail later in this report.

Title: **Environmental and territorial modelling for planning and design**
Author/editor: Antonio Leone, Carmela Gargiulo
Publisher: FedOA Press (Federico II Open Access University Press)
Publication year: 2018
ISBN code: 978-88-6887-048-5

This book collects seventy-four scientific contributes presented at the tenth edition of the INPUT 2018 conference took place in the city of Viterbo, Italy. The volume is articulate in eight ordinary section (Territorial modelling: state-of-art and future development; Environment, planning and design: the role of modelling; Rural landscapes and well-being: towards a policy-making perspective; Smart planning; Maintenance, upgrading and innovation in cultural heritage; Urban and environmental planners: who is the client? The planners jobs in a new millennium; Big data and data mining; ICT & models: planning for communities;) and in three Special Section (Did we learn lessons? Following the paths of Giovanni Rabino; Ecosystem-based and performance-based approaches for spatial planning; Geodesign).

The INPUT conference is managed by an informal group of Italian academic researchers working in many fields related to the exploitation of informatics in planning. This Tenth Edition pursed multiple objectives with a holistic, boundary-less character, to face the complexity of today socio-ecological systems following a systemic approach aimed to problem solving. In particular, the Conference will aim to present the state of art of modelling approaches employed in urban and territorial planning in national and international contexts. This 10th edition was focused on Environmental and Territorial Modelling for planning and design. It has been considered a fundamental theme, especially in relation to the issue of environmental sustainability, which requires a rigorous and in-depth analysis of processes, a theme which can be satisfied by the territorial information systems and, above all, by modelling simulation of processes. In this topic, models are useful with the managerial approach, to highlight the many aspects of complex city and landscape systems. In consequence, their use must be deeply critical, not for rigid forecasts, but as an aid to the management decisions of complex systems.

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03

THE TIMES THEY ARE a-CHANGIN' 1(2019)

REVIEW PAGES: LAWS

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In this number

CLIMATE CHANGE ADAPTATION: AN OVERVIEW ABOUT THE ITALIAN CONTEXT

In 2013, the European Commission adopted the EU Strategy on Adaptation to Climate Change. One of the aims of the EU Strategy is to encourage all the Member States to develop policies and "climate-proof" actions for their territories by the development of National Adaptation Strategies (European Union, 2013).

The National Adaptation Strategy is a document that usually aims at highlighting the importance of the adaptation on the national policy agenda and coordinating the adaptation process in terms of risk and vulnerability assessment, including also awareness and stakeholder involvement. However, in order to guarantee the implementation of the main "climate-proof" policies and actions defined by each National Adaptation Strategy, a further tool – named National Adaptation Plan – has been introduced. In particular, the National Adaptation Plan defines interventions to implement in order to reach the National Adaptation Strategy's objectives.

To date the majority of EU Member States have developed their own Adaptation Strategy. However, the implementation of these strategies by specific National Adaptation Plans is still in progress. Indeed, although 25 EU countries have adopted a National Adaptation Strategy, only 15 of them have also developed a National Adaptation Plan (European Environment Agency, 2018). Italy is one of the 25 countries that have approved its own National Adaptation Strategy – named National Strategy for Adaptation to Climate Change (SNACC) – in 2015. Despite this, the corresponding National Plan for Adaptation to Climate Change (PNACC) is still being discussed since 2016.

Indeed, the SNACC provides an overview of the national issues due to future impacts of climate change and identifies the necessary adaptation actions to implement in the Italian context.

In light of this, in May 2016 the PNACC was started. The PNACC is the result of a stakeholder engagement that involved institutions, policy makers, experts and researchers in order to identify a set of interconnected activities of adaptation to climate change (CMCC, 2017). It is a support tool for national, regional and local institutions for identifying and choosing the most effective actions to implement at the national, regional and local level in the different Italian climatic areas.

Its main purpose is composed of four specific objectives:

- limiting the vulnerability of natural and socio-economic systems to the impacts of climate change;
- increasing the adaptive capacity of natural and socio-economic systems;
- improving the capacity of taking advantages of any opportunities;
- coordinating actions and interventions at different territorial levels.

The PNACC is divided into three parts. The first part contains an analysis of the current climate conditions in Italy. Starting from this analysis, the Plan also describes the future climate scenarios and provides a mapping of the Italian territory in macro-regions for homogenous climate characteristics. This articulation is integrated to the analysis of territorial characteristics in order to identify the future impacts and vulnerability for each sector that the SNACC has identified as sensitive one to climate change and the PNACC takes into account for the definition of the adaptation actions to implement. Among those sectors, there are also Urban Settlements that are identified as "hot spots" for climate change action. Indeed, due to the urbanization process over the last century, the increasing of the imperviousness degree has contributed to increase the hydrogeological risk in urban areas. Furthermore, the lack of green areas and the high building density have intensified the vulnerability due to the increase of temperature with negative effects on human health. Therefore, the Plan identifies three types of impacts related to the increase in average urban temperature and higher frequency and intensity of heat waves.

The second part of the Plan defines the adaptation actions to implement for each climate-sensitive sector. Starting from the vulnerability assessment for each macro-region and considering the Italian policy context, for each sector, a set of adaptation actions is identified. These actions are articulated into three categories, the green actions that are "nature-based" one interventions, the soft actions that include no-structural interventions and aims at improving the adaptive capacity of natural and socio-economic systems, and finally the grey actions that include all the infrastructural interventions, especially on the built environment. Furthermore, the Plan associates each action with climate impacts, objectives to which they answer, and the main climate macro-regions where they should be implemented. For example, considering the adaptation actions provided for Urban Settlements, the Plan identifies four types of impacts. While the first type includes all the possible impacts that can be mainly faced by the implementation of soft actions (for example, the promotion of scientific research on the drivers and impacts of climate change in the urban context and its risk assessment), the other three types of impacts refer to the built environment and consequently their corresponding adaptation actions belong to the category of green actions. For example, in order to reduce the impacts due to urban flooding, the Plan provides experimental interventions, both in central areas (e.g. historical centres and public spaces), and in peripheral areas that increase the amount of soil permeability and improve the efficiency of the urban drainage system.

Finally, the last part of the PNACC identifies all the tools and the actions for guaranteeing an effective population involvement and stakeholder engagement in the implementation process of the adaptation activities. Furthermore, in this part, the PNACC also defines the criteria for selecting indicators of monitoring of these actions and provides a set of possible monitoring indicators for their evaluation.

Despite the adoption of the SNACC and the PNACC, it emerges instead that the actions in this area are still not widespread in the Italian territory (Pelorosso et al., 2018). Even if the SNACC highlights the need to promote an integrated approach between risk reduction and climate change adaptation, however the policy proposal of climate change adaptation does not seem to be integrated with those related to the mitigation of hydrogeological risk that is widespread on the Italian territory and further exacerbated by climatic variability (Legambiente, 2017).

However, the PNACC represents a reference for the development of new tools, especially at regional and local level. Therefore, starting from the adoption of the SNACC some Italian regions have undertaken individual paths for responding to the opportunity to make their territories more resilient. In particular, in this issue the experiences conducted by the Lombardy Region and the Emilia-Romagna Region. While the Lombardy Region is one of the first Italian regions to develop a Regional Adaptation Plan that provides an important reference for other Italian experiences in progress (e.g. in Abruzzo Region), the Emilia-Romagna Region has recently adopted a strategy that integrates adaptation and mitigation to climate change in a univocal way.

REGIONAL PLAN ON ADAPTATION TO CLIMATE CHANGE IN LOMBARDY REGION

In 2012 the Lombardy Region supported by the Lombardy Environment Foundation (in Italian Fondazione Lombardia per l'Ambiente) developed the "Linee Guida per un Piano di Adattamento ai cambiamenti climatici (PACC)". In particular, this document contained all the main information for the definition of a Regional Adaptation Plan of Lombardy. In 2013 and 2014, based on the aforementioned Guidelines, the Lombardy Region drew up the Regional Strategy for Adaptation to Climate Change (SRACC). The Strategy, elaborated in collaboration with the Lombardy Environment Foundation, not only defines the role of the regional institutional stakeholders in the adaptation process by means of specific consultation mechanisms but also illustrates the regional context and its climate profile, including data on the past and the current climate conditions and scenarios on the future climate variability, and vulnerabilities to climate change of eight regional key sectors that include "Built Environment, Environmental Protection, Transportation and Urban Planning".

Starting from these analyses, the Strategy identifies for each one of these sectors adaptation objectives and specific actions taking into account the sectoral and inter-sectoral policies and interventions already undertaken or in progress by the regional administration. Based on the Regional Strategy, in 2015 the Region started to work on the "Regional Plan on Adaptation to Climate Change" that was approved in 2016. The main aim of the Regional Adaptation Plan is to provide a tool based on a mainstreaming approach for defining, from one hand, the priority action areas for each sector in relation to the climate impacts, and, on the other one, identifying interventions that minimize risks and impacts on population, goods and natural resources and increase territorial resilience in a sustainable way. In particular, the actions are defined according to three levels of intervention:

- actions to create appropriate governance conditions for implementing the adaptation process (e.g. laws);
- actions to sustain the adaptive capacity through the dissemination of knowledge and the awareness on climate change impacts;
- actions to provide technical, green and methodological solutions of climate change adaptation.

Considering the impacts, objectives and adaptation actions that were defined in the Regional Strategy, the actions of the Regional Adaptation Plan are organized according to four classification criteria, which are:

- impact relevance;
- consistency and continuity with regional policies that are useful for the adaptation process;
- effectiveness in relation to the objectives of adaptation;
- ecological and economic sustainability (adoption of green, nature-based and ecosystem-based actions).

Furthermore, the actions were also classified according to the time horizon of implementation (shortest term, short term, medium term and long term). These actions are articulated into four macro-sectors, among which there is Environmental Protection and Water Management that includes actions related to Urban Planning. In particular, the Regional Adaptation Plan highlights the need to promote sustainable development of the region and increase its resilience, but also to integrate the interventions for the disaster risk reduction with those ones for climate change adaptation. Therefore, among the priority actions, the Lombardy Region will review the main regional tools for risk management according to the future climate scenarios. Moreover, a resilience and vulnerability index will be developed for monitoring the socio-economic dynamics of the regional territory.

REGIONAL STRATEGY OF MITIGATION AND ADAPTATION TO CLIMATE CHANGE OF THE EMILIA-ROMAGNA REGION

In December 2018, the Emilia-Romagna Region approved the Mitigation and Adaptation Strategy for Climate Change. By means of an innovative approach, this regional strategy provides a regulative framework for the regional institutions, public administrations, and organizations for assessing the effects of climate change in the various regional key sectors.

In particular, the strategy aims at:

- enhancing the actions, Plans, and Programs of mitigation and adaptation to climate change promoted by the Emilia-Romagna Region through the identification of the actions already undertaken at the regional level for the reduction of CO2 emissions and the adaptation to climate change impacts;
- contributing to the identification of further interventions and actions to implement in the most climate-sensitive sectors according to the mitigation and adaptation purposes;
- defining monitoring indicators (among those already in use by the different plans both for the SEA and for the operational programs of the Structural Funds 2014-2020);
- instituting a regional and local Observatory for monitoring the implementation of the climate change policy;
- identifying and promoting a participatory process that involves local stakeholders in order to integrate the two action fields of adaptation and mitigation into all the regional sectoral policies;
- coordinating local initiatives (that are implemented by municipalities and union of municipalities) in relation to the Covenant of Mayors.

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IMAGE SOURCES

The images are from: Fig.1 https://en.wikipedia.org/wiki/Flag_of_Italy; Fig.2 https://en.wikipedia.org/wiki/Lom; Fig. 3 https://en.wikipedia.org/wiki/Emilia-Romagna.

04

THE TIMES ARE a-CHANGIN' 1 (2019)

REVIEW PAGES: URBAN PRACTICES

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In this number

PLANNING FOR DIGITAL TRANSFORMATION AT THE MUNICIPAL LEVEL: TWO CASE STUDIES

Over the past few decades, the challenges faced by local governments have become increasingly complex and interrelated. In addition to traditional land-use regulation, urban maintenance, production and management of services, today local governments must meet with new demands coming from different urban actors regarding resources sustainability (Gargiulo & Lombardi, 2016), social inclusion (Zalii et al., 2016) and economic development (Visnjic et al., 2016).

In this context, many scholars agree that in order to successfully cope with these new challenges, local governments must innovate, become smarter, and capitalize on the emerging opportunities provided by the so called "digital transformation" (Fistola, 2013; Höjer & Wangel, 2015).

Digital transformation can be defined as the application of digital technologies to processes, products, and assets to improve efficiency, enhance value, manage risk, and uncover new opportunities (Heavin and Power, 2018). Digital transformation is a central element of modern business management: firms in almost all industries have indeed conducted a number of initiatives to explore new digital technologies and to exploit their benefits (Matt et al., 2015). While digital technologies are literally transforming the private sector, public local authorities seem to be less prone to embracing such transformation and, for this reason, sometimes they have been called "the dinosaurs of the digital age" (World Economic Forum, 2017). Digital technologies however have the potential to deliver enormous benefits in the public sector, helping local governments to (Bertrand, 2019):

- better understand citizens' needs;
- provide services more effectively and efficiently;
- find new solutions to policy challenges;
- engage with external partners to develop new delivery models and
- commercialize some public services and develop fresh sources of revenue.

An important step to capitalize on the emerging opportunities offered by the digital technologies is to develop a digital transformation strategy, a roadmap defining the steps to follow for successfully embracing new technologies, adopting new approaches to collaboration and partnerships, and making a commitment to address transformation holistically. This contribution presents two relevant case studies of local government that have recently moved in this direction:

- The municipality of Barcelona (Spain) and
- The municipality of Baltimore (US).

BARCELONA

Whit 1.6 million inhabitants, Barcelona is the capital and largest city of the autonomous community of Catalonia, as well as the second most populous municipality of Spain. The city has long been a leader in the smart city movement. Sometimes ranked number one (Juniper Research, 2017) – and usually in the Top 10 (Eden Strategy Institute, 2018) – it is part of an elite group of intelligent urban-planning pioneers along with such cities as Singapore, Vienna, San Francisco, and Copenhagen.

In September 2016, the Barcelona City Council embarked on an important digital transformation process, announcing that public services must be provided through digital channels from the outset, following new guidelines oriented towards citizens and the use of open standards and open software and in accordance with an ethical data strategy that puts privacy, transparency and digital rights at the forefront. To meet these priorities, the City Council launched the *Digital Transformation Plan*, a strategic document aimed at defining the roadmap that the Catalan city will follow in the forthcoming years to become a world-leader city in providing digital services to citizens, while making government more transparent, participative, and effective. The Plan is structured around seven themes and, for each of theme, a detailed operational document has been elaborated between 2016 and 2019:

- *Theme 1: Digital services standards.* This document defines a set of criteria for the development and management of digital services for citizens, in an agile, open and user-centered way. The main idea behind this theme is that public services should be tailored and based on real citizen needs that may change from one citizen to another. In this context, public data are considered a fundamental aspect for better mapping, understanding and integrating citizens' demands and needs in the design and delivery of public service strategies.
- *Theme 2: Technology code of practice.* This measure includes a set of tech policies and directives mandating the use of open standards, open source and ethical data management. It helps municipal bodies in designing, building and buying technology. It's used as a cross-departmental standard in the spend controls process.
- *Theme 3: Agile methods*. This theme has the main objective to provide managers in public municipal bodies with the main principles and practices of agile methodologies. The document demonstrates how the agile life-cycle software development differs from traditional approaches and provides guidelines on how it can be implemented and integrating into existing framework developed by the city to manage public services projects.
- *Theme 4: Technological sovereignty*. This measure puts the concept of technological sovereignty in the spot and talks about data commons, digital rights and free programming. It main aim is to rethink technology from the angle of the common good. Thus, this theme focus on the development of digital technologies aimed at involving citizen in the process of decision making. At the same time, it is aimed at reinforcing the practice of open software and open standards, in contrasts to the practice of using proprietary software and standards.

- *Theme 5: ICT Procurement Handbook.* This measure defines a new model of relation and partnership with technology suppliers, based on the Code of Technological Practices.
- *Theme 6: Innovative Public Procurement*. This document sets the guidelines for the transformation of procurement to obtain solutions that are tailored to the real needs of society, while helping companies to be more innovative. It regulates public procurement for IT services in a strictly way, as it consider public procurement as the main tools for municipal economic policy.
- *Theme 7: Government measure concerning ethical management and accountable data*: This theme is centered on the idea that Barcelona city residents leave a digital footprint in their everyday lives and this footprint is getting larger and larger, and it can be used for various purposes. It establishes how this resource should be used in a democratic, open, transparent and regulated manner.

BALTIMORE

The City of Baltimore, Maryland is the 30th-most populated and largest independent city in the United States. The city is home to over a dozen of colleges and universities and has a longstanding tradition in innovation politics. However, decades of decentralized information technology management and insufficient enterprise investment has led to a system that struggles to support city priorities and deliver service improvements for both residents and businesses. Furthermore, many of the city's IT capabilities are outdated and lack the modern-day range of capabilities offered by comparable cities. To combat this trend, in 2018, the City of Baltimore has developed this first ever *Inclusive Digital Transformation Strategic Plan,* which details a five-year roadmap to build the city's IT enterprise capability. The Plan is based on three main pillars:

- *Pillar I: Change the IT culture and improve IT services.* This pillar is aimed at developing strategies and implementing programs to create an integrated enterprise that adapts to the changing needs of its citizens and makes the city a better place to live and work. Main lines of actions under this pillar include: i) centralize various IT operations and functions, when appropriate, to reduce cost, improve efficiency and streamline operations; ii) improve training for municipal employees and increase IT staffing levels; iii) establish a structure that promotes cross-agency collaboration, strategic alignment, and continuous change for IT initiatives and iv) integrate software development to strengthen enterprise operations, service delivery, and customer experience.
- *Pillars II: Support and secure critical operation IT infrastructures*. This pillar concerns with developing strategies and implementing technologies that increases the city's ability to fully support employee and citizen's needs, improves the network's infrastructure and expands the city's use of modern and integrated systems. The pillar is structured along three main axis, as follow: i) Cloud Services: increase the use of cloud services to rapidly deploy platforms and software without the need to build physical infrastructure: ii) Data Telecommunications: increase investment in next-generation network infrastructure to connect the city with high-volume, high-velocity data communications that supports demand; iii) Enterprise Resource Planning: develop a modern and integrated system to streamline the complexities of public procurement.

– *Pillar III: Built IT partnerships and increase community engagement around technologies*. This pillar is aimed at developing strategies and implementing programs to improve the city's physical data center infrastructure and handle enterprise needs such as data integration and analytics, IoT-Enabled Smart City, and other mayoral objectives. It focuses on three main domains: i) Data and Analytics Hub: expand the city's capacity to combine data residing in different sources and provide users with the ability to access, use, and benefit from the data; ii) IoT-Enabled Smart City: deploy new technology that improves the quality of life and service delivery for all city residents, businesses and visitors; iii) Baltimore Tech Center: create a physical and virtual space for people to view and experience immersive technology environments and iv) P3 Partnerships: encourage stakeholders in the public, private, education and non-profit sectors to partner with the city and leverage their technology resources for the betterment of all city residents and businesses.

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05

THE TIMES THEY ARE A-CHANGIN' 1(2019)

REVIEW PAGES: NEWS AND EVENTS

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In this number

PLANNING IN AN UNCERTAIN FUTURE

The world is evolving at a rapid pace. Never before we have witnessed so many changes happening in a such short period of time. Economic, social, technological and political shifts are reshaping the world very quickly and new challenges arise for nations and particularly for cities. That's why urban issues have risen high on many agendas that deal with global questions.

If the urban development is so strategic to deal with global issues, it is common to expect that urban planning, supported by the most advanced technology, assumes a central role to face with the new challenges (De Gregorio et al., 2015). Simply postponing action until there is perfect evidence will increase the risks facing urban centers, their populations, industries, and those who depend on them. Planning today therefore requires managing more than in the past the uncertainty inherent in future projections.

In the modern theories of spatial planning uncertainty is related to many different things such as data quality, theory and conceptualization, model formulation, decision making and of course error and risk issues in each of these (Antrop, 2004). Essentially, urban planning is a complex of actions that aim to steer ongoing processes that structure our environment, and so our landscapes. Basically, the actual situation or trends are considered as unsatisfactory and should be improved. Scenarios of the future development can be defined and visions for the future are formulated. Decision-making implies making choices between the possible outcomes that are proposed or expected. As a complex process dealing with a hardly predictable future, a lot of variables and stakeholders, planning implies a lot of uncertainty.

According to Mitchell (2002), adequately dealing with uncertainty is applying the precautionary principle. Synthetic forecasting models, which can be implemented and updated in real time for scenario simulations, monitoring for the verification of the repercussions of the plans and for the calibration of the models, databases suitable for comparing situations and for use in the models, seem to be the most common tools suitable for the formation of plans that are able to indicate strategies and management methods, while maintaining the indispensable flexibility that complex systems with high dynamism require.

After all, uncertainty is in itself also a guarantee of survival; it is an essential part of life and is an essential characteristic in landscape change and planning. According to Saskia Sassen, professor of sociology at Columbia University in New York: "One of the reasons that cities have outlasted all these other more powerful and organized system of power is their incompleteness that gives them a longevity because no tyrant can truly run a city, it's too diffuse – the city will always fight back".

THE PARADIGMATIC CITY (VI): TRANSFORMING CITIES

Where: Istanbul, Turkey
When: 8-10 May 2019
https://bau.edu.tr/icerik/13322-the-paradigmatic-city-2019

Cities and towns have not only become the primary human living space, they also live in the collective memory. How do cities respond to the challenges that threaten their ability to become viable pillars of sustainable development? What are the characteristics of future cities? How will urban designers, architects and policy makers reconcile the old with the new, the sustainable and the smart?
The conference aims to question cities, in the past, present and future in an inter-disciplinary approach. Therefore, the cross-topics are selected as city & transformation, city & memory, city & sustainability and city & future. In particular, the cross-topic City & Future presents the following themes:

- Representation of space in the fictional narration
- Digital cities
- Smart cities
- Cities of the future / future of the cities
- Media representation
- City Branding
- Industry 4.0

EURA – UAA CONFERENCE: CITY FUTURES IV

Where: Dublin, Ireland
When: 20-22 June 2019
http://cityfutures2019.com/

Taking inspiration from the UN's Sustainable Development Goals the conference topic focuses on the challenges that we are currently facing to create cities and communities that are just, inclusive, safe, resilient and sustainable, while reducing poverty and inequality. Following a decade of crisis and austerity, inequalities are becoming ever more apparent at local, regional and global scales, with our current economic models increasingly being questioned and trust in formal politics declining. Violence and extremism lead to enforced migration and the post war geopolitical map is being shaken. Urban areas are often the sites where the contrasts between wealth and poverty are most stark, where inequalities become expressed spatially, where environmental degradation is most pronounced, and where the disenfranchised and disillusioned look for solutions in entrenchment and fear of 'otherness'.
Despite such challenges, urban areas, as they have been for millennia, are often the fulcrum of hope and innovation. The Conference theme asks scholars to reflect on how we can move towards more socially just, diverse, democratic, environmentally rich cities and city region.

2019 URBAN RESILIENCE SUMMIT

Where: Rotterdam, Nederland
When: 8-11 July 2019
https://www.100resilientcities.org/summit/

In July 2019, 100 Resilient Cities – Pioneered by The Rockefeller Foundation (100RC) will bring together the network of urban resilience practitioners from cities around the world in Rotterdam to celebrate the impact of the global movement, share best-in-class practices and innovations in the field, build personal and professional relationships, and identify opportunities for partnerships and collective action. Rotterdam, a city with extensive expertise in building resilience (Errigo, 2018), is the best place to represent a new vision of the future because its core is an incubator of ideas, innovation and experimentation. As a post-industrial portside city in the process of rapid social, economic and physical transformation, Rotterdam provides an ideal setting in which to experience resilience in practice and demonstrates a spirit of openness to fostering critical cross-cultural conversations.

OSLO URBAN ARENA

Where: Oslo, Norway
When: 12-13 September 2019
www.oslourbanarena.com

Oslo Urban Arena (OUA) is a collective of architects, planners, developers and urban activists from a multidisciplinary background with on a mission to launch a conference, debate and lecture arena every year, on urbanism and urban development from the heart of the centre of Oslo.
The conference strive to identify urban solutions connected to a variety of urban topics, pushing the conversation on urbanism forward, shooting out progressive themes and topics. In addition to an extended conference program that hosts renowned speakers, it will also contribute to the public debate on urban development by organizing exhibition spaces. Oslo Urban Arena strives to connect individuals from various backgrounds and disciplines and provides several platforms for them to socialise, exchange ideas and expertise, share experiences and knowledge in the field of urbanism and the interests attached to it.

9TH EUROPEAN CONFERENCE ON SUSTAINABLE CITIES & TOWNS

Where: Mannheim, Germany
When: 30th September – 2nd October 2019
http://conferences.sustainablecities.eu/mannheim2020/

Hosted by the City of Mannheim, and ICLEI Europe, the Conference aims to demonstrate the urgent need for local governments to assume responsibility for urban transformation and lead the way in guiding Europe

towards a secure and sustainable future. The conference invite to endorse the Basque Declaration, a document that aims to support and accelerate socio-cultural, socio-economic and technological transformation. It is targeted at city leaders in Europe, including mayors and city governments, and can also be signed by individuals. It outlines pathways to help city leaders shape the development of their own municipalities, and ultimately aims to accelerate socio-cultural, socio-economic and technological transformation. The Declaration is based on the understanding that a diversity of local initiatives is required to address social, environmental and economic challenges. It recognises the importance of things such as protecting biodiversity, decarbonising energy systems, creating more sustainable mobility systems, protecting water systems, adapting to climate change, promoting social inclusion and strengthening local economies, among other things. Although focusing on action at the local scale, the Declaration is underpinned by the idea of cooperation, sharing and replication of solutions adapted to the local context. A strong theme of the Declaration is to have a highly engaged civil society, where participation is a key ingredient in both developing and implementing local transformative actions.

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EDITORIAL PREFACE: TEMA JOURNAL OF LAND USE MOBILITY AND ENVIRONMENT 2 (2019)

THE TIMES THEY ARE A-CHANGIN'

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According to the National Research Council of the United States, resilience is the capacity of defining and programming operations to resist and/or to recover, or to adapt, in the most proper way, as regards disruptive events, whether they be actual or merely possible (Gilbert et al., 2015). Particular attention is paid to horizontal and vertical technical cooperation within the different bodies of the public administration and to participatory processes which involve representatives and stakeholders of the local communities, enterprises of the profit and non-profit sectors, civil society groups and so on.

The "PEOPLES Resilience Framework" (PRF) (Renschler et al., 2010), where PEOPLES stands for "Population and demographics, Environmental/ecosystem services, Organized governmental services, Physical infrastructure, Lifestyle and community competence, Economic development, and Social-cultural capital," states that resilience of the urban contexts is characterized, in terms of resistance, adaptation and recovery, as the long-run conservation of adequate performances as regards population density and structure, environmental resources and ecosystem services, basic and intermediate services and infrastructure provided by the public administrations, social and economic sustainability, local development and progressive increase of the social and cultural capital. Under this perspective, the system of the "Baseline indicators for communities" (Cutter et al., 2014) identifies 49 performance indicators whose benchmarks are related to social structure, economic situation, conditions of the built environment (housing and infrastructure), institutional framework, human capital, and environmental and social quality of the urban contexts. Similarly, the "City resilience framework" (CRF) assesses the size of urban resilience by twelve objectives and 52 indicators, concerning the local governance framework and related leadership, the quality of urban life and of social welfare and relationships, the public services and infrastructure, and the state of health of the urban economy (Arup, 2014).

From this point of view, the resilience of urban fabrics not only is related to consistent use of technologies effective in hindering dangerous impacts on the quality of life of the communities or in catalyzing quick recovery from disruptive shocks, but also, and above all, is connected to the implementation of virtuous cooperative processes which involve public administrations and members and groups of the local societies. Resilience builds upon implementing public policies into spatial planning through the participation of stakeholders endowed with the proper expertise to improve substantially the quality and the effectiveness of decision-making processes through cooperation with public bodies who provide the communities with a sound and proactive commitment towards the common good.

A relevant aspect which characterizes resilient communities is their self-assessment expertise, whose an important paragon, in terms of capacity building is represented by the "Communities advancing resilience toolkit" (CART) (Pfefferbaum et al., 2013). The CART provides a guidelines handbook and a self-assessment toolkit addressed to local communities which can be used in several local planning fields (Gilbert et al., 2015). The "Community resilience system initiative" (CRSI) (CARRI, 2011) focuses on the same target, with the aim of improving public awareness concerning resilience-related themes, which should become public wealth of knowledge. The implementation of capacity building in terms of community self-assessment and

wealth of knowledge. The implementation of capacity building in terms of community self-assessment and public awareness not only drives the local societies towards resilience-oriented adaptation and recovery planning practices, but also towards implementing spatial planning based on visions embedded in a resilience-oriented public policy framework (Gilbert et al., 2015).

The CARRI's report (2011) is particularly rich in directions concerning good and best practices on urban resilience based on self-assessment of the local societies. The Annex 3 of the report analytically presents the outcomes of a partnership process between CARRI and the communities of three counties of the United States, namely, Charleston Tri-County Area (South Carolina), Gulf Coast of Mississippi and Memphis/Shelby County (Tennessee). Three action plans were implemented by partnerships involving the county administrations and CARRI, which focused on urban resilience, and were translated into concrete operations related to the urban contexts of the three counties. In the case of the Tri-County Area, the plan consisted of a complex and articulated set of operations aimed at improving the local transportation system, and, in particular, the road traffic, the railway organization and the commuting opportunities. The Gulf Coast County and CARRI studied and implemented a set of operations to mitigate the environmental damages generated by the Deepwater Horizon oil spill coming from the BP platform located in the Macondo Prospect, in the United States Exclusive Economic Zone of the Gulf of Mexico. The plan action of the Memphis/Shelby County focuses on a system of initiatives which implement urban economic development based on cooperation of locally-based small enterprises and family-run businesses. The planned operations entail a set of interventions concerning building urban resilience against seismic events.

The good practices based on CRF, CART and CRSI are highlighted by the scientifically and technically qualified, intersectoral approach to the implementation of urban resilience-oriented operations. Incremental, bottom-up processes of capacity building and self-assessment which involve the urban societies characterize the exportability of these methodologies to other international contexts.

The seven articles proposed in this issue of TeMA are drawn from studies presented at the INPUT aCAdemy 2019 Conference held in Cagliari on 24-26 June 2019, titled "Planning, nature and ecosystem services." The issue of urban resilience-oriented spatial analyses and planning practices was one of the themes treated and discussed throughout the Conference sessions, and a selection of these studies is presented through the articles of this issue of TeMA, which are consistent with the scientific and technical lines discussed in this editorial preface. The question of local transportation system, which is one of the main issues addressed by the action plan which implements the CRSI into the Tri-County Area, is treated by Santos and Moura and by Di Ludovico and Rizzi, who focus on the mobility system and preferences related to walkability with reference to the Belo Horizonte urban context and to the post-earthquake urban environment of the Italian City of L'Aquila. In the case of L'Aquila, the theme of walkability merges with the resilience-related question concerning recovery after a critical natural disaster. The spatial organization related to the urban functions concerning the Mustapha Pacha Hospital within the North African metropolitan context of Algiers, discussed by Ghida et al., and the assessment of the implementation of a green infrastructure in the Turkish Pendik District, described by Ustaoglu and Aydinoglu, propose planning tools and methodological approaches consistent with capacity building and public awareness processes. Ladu et al. assess the ongoing process of the implementation of a big project within an Italian medium-sized metropolitan area, the new soccer stadium of Cagliari, whereas Pilogallo et al. discuss the implementation of renewable energy plants into the spatial context of the Melfi area, located in the Southern Italian Region of Basilicata. Both studies are closely related to the theoretical and technical approach to urban resilience entailed by the action plan of the Memphis/Shelby County, quoted above. Finally, the strategy concerning the implementation of the sustainable development paradigm into the planning policies of medium-sized cities of the Italian regional context of Western Sicily, presented by Vinci and Cutaia, is in line with the PRF's statements.

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XXIV International Conference
"Living and Walking in Cities"
12-13 September 2019, Brescia (Italy)

The International Conference "LIVING AND WALKING IN CITIES" (LWC) traditionally looks at different themes concerning the quality of life in urban areas. The goal of this event is to gather researchers, road users, administrators, technicians, city representatives and experts aiming to discuss problems that affect the safety of pedestrians in the city, especially of children and persons with reduced mobility. The conference attracts practitioners and researchers who can find detailed presentations on policy issues, best practices and research findings across the broad spectrum of urban and transport planning. The conference covers international issues, national and local policies and the implementation of projects at the local level. The conference presents a great opportunity for networking and forming career-spanning professional relationships. Although sessions at the Conference can be challenging in discussing matters of policy at the highest level, they can also provide good, basic education and training opportunities. The Conference "Living and Walking in Cities" provides a forum to discuss the challenges of economic growth, social and demographic changes to become more sustainable. Planners and practitioners are being asked to improve and retrofit towns, transportation infrastructure and public spaces. They are finding solutions for resilience in the face of threats posed by climate change, energy and infrastructure security; At the same time, they need to develop hard and soft measures to improve the safety of walking and cycling which affects health and fitness. This is desirable to be done through research and studies that are innovative, interdisciplinary and cross-border.

TeMA
Journal of
Land Use, Mobility and Environment

TeMA 2 (2019) 127-138
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6117

review paper received 21th May 2019, accepted 29th July 2019

www.tema.unina.it

How to cite item in APA format:
Pilogallo, A, Saganeiti, L., Scorza, F. & Murgante, B. (2019). Ecosystem services' based impact assessment for low carbon transition processes. *Tema. Journal of Land Use, Mobility and Environment*, *12*(2), 127-138. doi: http://dx.doi.org/ 10.6092/1970-9870/6117

ECOSYSTEM SERVICES' BASED IMPACT ASSESSMENT FOR LOW CARBON TRANSITION PROCESSES

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ABSTRACT

Low carbon transition represents one of the main challenges engaging territorial governments in a multi-scale structure of planning and actions. The thematic focus on renewable energies sources (RES) development prevailed on an integrated approach to plan such relevant process in a more integrated and systemic view based on multiple territorial values estimation and the assessment of potential conflicts depending on technological and landscape impacts

RES transition implies extensive territorial transformations and, in the case of Italy, the public management spent more effort in targeting RES installation objectives more than proposing a territorial plan of suitable area where such a process might be development preserving local territorial structure and values.

This paper presents the results of an ex-post analysis carried out to assess the effects of the rapid advent of renewable energy plants in a specific territorial context: Melfi area in Basilicata (Italy). Such a context is characterized by agricultural vocation and high natural values, but also representing the settlement place of the biggest industrial automotive center in the south of Italy.

The research approach is based on ecosystem services assessment through selected INVEST tools according with the presence of relevant specific features in the investigation area: carbon stock and storage, crop production, crop pollination and habitat quality.

Results allow to quantify an extensive territorial impacts generated by photovoltaics plants and wind-farms compared with production potential. Consequently policy recommendation are proposed in order to improve the governance model for future development of the sustainable energy sector in Basilicata.

KEYWORDS:
RES; Ecosystem services; Low carbon; Energy transition

TeMA
有关土地使用、交通和环境的杂志

TeMA 2 (2019) 127-138
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6117

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针对低碳转型过程、基于生态系统服务的影响评估

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摘要

在各种需要地域政府开展多尺度结构规划及行动的各种主要挑战中，低碳转型是典型的一种。这一课题关注与可再生能源（RES）的开发，因此需要寻求一种综合方法，来从一个更加完整和系统性的角度、基于多种地域价值观的估量和对取决于技术和景观影响的潜在冲突的评估，进行相关过程的规划。

RES转型意味着大量的地域变化；而在意大利，公共管理方在实现RES装置目标方面投入的工作超过了为适当地区制定地域计划的努力——在这样的地区，这一过程可能是保护开发的当地地域结构和价值观。

本文介绍了旨在评估特定地域环境下迅速出现可再生能源植物的影响的事后分析的成果：意大利巴斯利卡塔大区的梅尔菲地区。该地区的特征为农业职业和较高的自然价值，其同时还是意大利南部最大的汽车工业中心所在地。

研究的方法是基于通过选定的投资工具进行的生态系统服务评估，根据调查地区有关具体特征——碳储量、作物生产、作物授粉和栖息地质量等的情况确定。

研究结果可以将光伏发电厂和风力农场产生的广泛地域影响对比生产潜力，并进行量化比较。并据此提出了政策方面的建议，以期改善巴斯利卡塔将来在可持续能源领域谋求发展所采用的治理模式。

关键词:
可再生能源RES; 生态系统服务; 低碳能源; 能源转型

1 INTRODUCTION

The hoped-for energy transition to renewable sources of supply has had a major boost in recent years. Incentive policies and simplified authorization have led to the widespread presence of RES plants that in some contexts have radically changed the landscape. It is the task of urban and territorial planning to define a methodological framework and significant criteria for assessing the sustainability of these measures for the transformation of the territory.

1.1 ECOSYSTEM BASED PRO-VOCATION

The 2005 Millennium Ecosystem Assessment (MA) could be considered one of the main efforts to promote worldwide effective environmental assessment approaches, sponsored by the United Nations. The most provoking contribution promoted by MA is based on the concept that the ecosystem values in decision-making should be grounded on the idea of services provided to humans. This requires new interpretative parameters and computational tools in order to produce the required additional knowledge to reinforce the rational 'decision makers' in making 'better' decisions and policy choices (Owens, 2005; Sanderson et al., 2002).
Compared to that, "sustainability" has become a main policy concern both domestically and internationally, with increasing prominent place in decision-making processes concerning environmental issues (Bulkeley & Jordan, 2012). However, such a rising awareness in political debate produced strong thematic commitments: i.e. RES transition as a way to reduce CO_2 emissions. We are in the case of a conflict between human activities and the environment (fossil energy production, mainly) had been addressed through a generalized technological settlement of new systems which strongly reduced impacts of energy production in terms of CO_2 emissions, but generates other externalities affecting territorial values and landscape identities in a context of de-regulation in urban and regional planning.
Ecosystem services allowed to oppose a quantitative assessment of eco-systemic values in the procedure of environmental impacts assessment for RES plants settlement process. It becomes a tool for decision makers to govern more effectively territorial transformation even urban plans are not suitable to face the issue of RES installation according with the current normative system.
In order to demonstrate such conflictual situation we refer to a specific case study area: Melfi municipality in Basilicata (Italy). We consider the achieved results as a contribution in developing understanding of ecological knowledge use in policy driven processes that are more sensitive to the issues of power and control (Cowell & Mick, 2014; McKenzie et al., 2014; Scorza, Pilogallo & Las Casas, 2018), the ambition is to provoke strong advances in territorial governance by the mean of the new paradigm of ecosystem services based planning.

2 CASE STUDY AREA DESCRIPTION

The research has been structured on the municipal scale. In facts the study area includes the territory under the administrative jurisdiction of Melfi municipality. Melfi is located in the Basilicata region in southern of Italy (Fig. 1). Melfi is the third largest municipality in the region for resident population and territorial extension. The territory is characterized by the presence of San Nicola industrial area. An extended industrial area where most important plant for car production in the South of Italy where established by Fiat Chrysler Automobiles group (FCA). On the natural and landscape point of view the study area presents a strong agricultural vocation with relevant sites characterized by considerable naturalistic and environmental features. The area is significant because it has a peculiar land uses structure and, since 2010, it has been affected by numerous installations of RES plants. In 2018, in the study area, we mapped 66 installations of large wind farms (power of each wind tower greater than or equal to 1 MW) and 113 concerning small wind farms (power less than 1 MW). The estimation of total installed wind-power production capacity is around 219 MW. Moreover, for the photovoltaic sector there are 7 photovoltaic fields for a total occupied area of about 140.000 square metres.

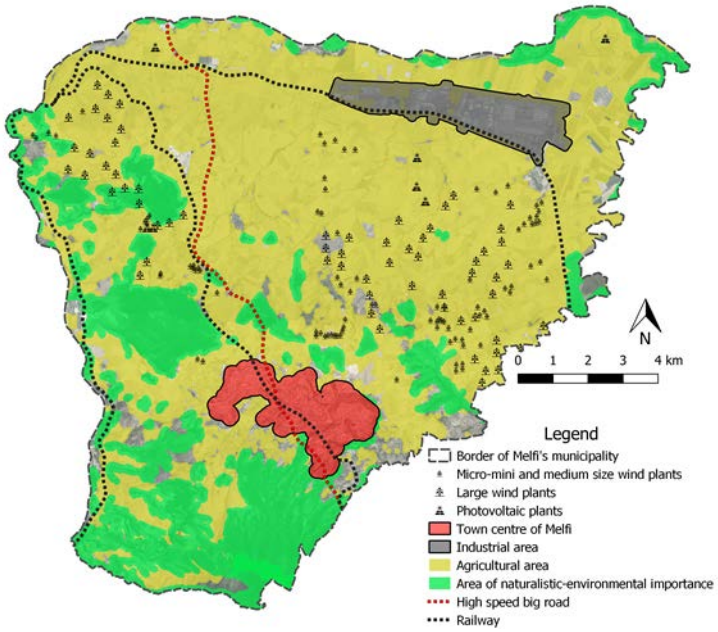


Fig. 1 Geographical overview of the study area, major land use classes, wind-power plants and main mobility infrastructures

3 METHODOLOGY AND RESULTS

This research aims to describe the impacts of a widespread growth in the renewable energy production plants in terms of loss of ecosystem services. For this purpose, considering the specific territorial features synthetically described in the previous paragraph, the analytical process had been based on four ecosystem services: Carbon Storage and Sequestration, Crop pollination, Crop production and Habitat Quality.

The analytical models used are included in the InVEST (Integrated Valuation of Ecosystem service and tradeoffs) suite (Nelson et al., 2018); territorial analyses were then produced in order to obtain a representation of the spatial distribution of the thematic and cumulative impacts depending on RES installation with consequences on the territorial capacity to provide ES.

3.1 CARBON STORAGE AND SEQUESTRATION

The assessment of the carbon stored within the study area was carried out using the tool "Carbon Storage and Sequestration" which returns a raster map which, pixel by pixel, is associated with the value of carbon stored in Mg/ha.

Input data are land use/land cover (LULC) map and a corresponding table with the four values of carbon pools. The resulting raster maintains the same resolution as the input cover map. The pixel size is 5x5 m and this allows a higher spatial accuracy including also the contribution in terms of carbon stored by urban green areas. The Tab. 1 shows the values used for each LULC class. The carbon pools estimation includes values provided by INFC (Gasparini & Tabacchi, 2011) for wooded classes plus IPCC (international panel of Climate Change) (IPCC, 2006) for the remaining ones.

The working hypothesis is to assimilate the areas affected by RES plants to the urban environment or, more generally, to a process of "land take" that cancels the contribution of these surfaces in terms of ecosystem services.

LUCODE	DESCRIPTION	C_ABOVE	C_BELOW	C_SOIL	C_DEAD
11	Residential buildings in compact urban centres	0.00	0.00	0.00	0.00
12	Residential buildings in dispersed urban centres	0.00	0.00	0.00	0.00
13	Buildings for industrial and commercial use	0.00	0.00	0.00	0.00
2	Road network (roads and railways)	0.00	0.00	0.00	0.00
3	Quarries and landfills	0.00	0.00	0.00	0.00
4	Gardens and urban greenery	15.00	0.00	0.00	0.00
511	Orchards	63.00	7.85	1.00	0.00
512	Vegetable gardens	0.00	4.7	62.57	0.00
513	Arable land	0.00	4.7	62.57	0.00
514	Olive groves	63.00	7.85	1.00	0.00
515	Vineyards	63.00	7.85	1.00	0.00
53	Fallow pasture	0.00	4.7	64.50	0.00
54	Woods	160.00	58.00	64.50	20.50
541	Coniferous woods	160.00	52.00	64.50	20.50
542	Broadleaf woods	160.00	59.80	64.50	20.50
62	Watercourses	0.00	0.00	0.00	0.00
7	RES plants: wind farms and photovoltaic fields	0.00	0.00	0.00	0.00

Tab. 1 Summary table of carbon pools values used for the study area

3.2 CROP PRODUCTION

The "Crop production - percentile" was developed to carry out trade-off analyses where the transformation hypotheses concern changes in land use in favor of or starting from agriculture.
On the basis of a global scale climate model, it is possible to make productivity estimates of 175 kinds of crops. Data used by the model comes from the FAO database supplemented by national and regional datasets.
In order to assess tradeoffs between an increase in agricultural profitability and expected loss of ecosystem services, calculations make it possible to predict and to estimate the productivity of an area in relation to certain types of crops and their relative economic benefits, while neglecting the impact of different management practices.
An alternative field of application is that of the present work, which has instead aimed to estimate the effect of policies and phenomena of territorial transformation on agricultural productivity in the area under consideration. The result is a spatial distribution of the yield expressed in tons per pixel.
Required input data consists of a land use map and a corresponding table of crops. A further table is required containing the values in kg/ha of the nitrogen, phosphorus and potassium compounds on average used throughout the study area. For the purposes of this work, values indicated in the Integrated Production specifications of the Basilicata Region for wheat and vineyards have been adopted.

CROP NAME	NITROGEN RATE	PHOSPHORUS RATE	POTASSIUM RATE
Grape	80.0	100.0	125.0
Wheat	110.0	35.0	30.0

Tab. 2 Summary table of fertilizers compounds values used for the study area

The territory of Melfi is in fact one of the areas of cultivation included in the DOCG regulations of the *Aglianico del Vulture Superiore*. Wheat, on the other hand, has been selected as an example of the numerous and extensive non-irrigated arable crops present.

As far as non-irrigated arable crops are concerned, they cover about 20,174 hectares, with a much more advantageous distribution compared to the vineyards. Not having detailed information regarding type of crops actually present, analyses were carried out considering all the arable crops cultivated with wheat.

3.3 CROP POLLINATION

Among regulation ES, the aptitude of study area to host pollinating species was investigated by using "Crop pollination" tool of INVEST that allows to map cell by cell potential presence based on a model that evaluates appropriate environmental conditions in terms of presence of suitable places for nesting and food availability. The necessary data consist in: LULC map; a table reporting indicators of suitability for nesting and/or for hosting floristic species that serve as food sources for pollinators for each LUcode; a table summarizing main characteristics of each pollinator species (maximum range, seasonality, food preferences).
Elaboration results consist in two kind of maps for each pollinator species and for each season of the year. The first kind represents an index of "pollinator supply" that expresses a measure of the availability of pollinator species considering both the accessibility to food resources and the usability of sites suitable for nesting. The second one is a "pollinator abundance" map, that is the potential presence of pollinators per pixel.
In other words, while the first map represents sites where pollinators originate, the second type of map gives indications on the places where pollinators carry out their activity by considering jointly both the available food resources that attract pollinators in individual cells, and the availability of insects that have access to the same cells.
The INVEST model was applied by considering a generic pollinator and assigning the maximum values for the availability of suitable nesting sites and food resources to wooded areas and uncultivated pastures. Intermediate values were considered for the classes of land use reserved for agricultural use, favoring the role of orchards, olive groves and vegetable gardens over that of non-irrigated arable land and considering minimum values but not zero along the riparian strips and within urban gardens and green areas. The reference year against which the changes have been evaluated is 2010, when no RES plant is recorded.

3.4 HABITAT QUALITY

The ecosystem service related to habitat quality is considered as an index of overall biodiversity, and falls within the category of supporting services. It has been estimated using the "Habitat Quality" tool of INVEST. This tool returns two raster maps of the territory under examination, one relating to the quality of the habitats and another, complementary to it, relating to the degradation of the habitats. These maps are created by combining and crossing information from Land Use/Land Cover (LULC) and threats to biodiversity. Therefore, the tool allows to model geographically the variations of the quality of the habitats and to evaluate, the positive and negative interactions between the natural environment and the anthropic activities or on the practices of use of the land.
It estimates the effect of each threat considered on the habitats analyzed, also considering the indirect effects induced by a considered combination of all the threats. Threats are to be considered as explicit spatial variables that could cause the local extinction of one or more animal or plant species. To better explain the spatial variability of the effects induced by the threats, the distance between the habitats and the source of degradation is considered. Finally, the model assesses the sensitivity of each land cover class considered as habitat to each individual threat, with a different weight.
The input data required by the tool are: (1) LULC Map; (2) Threat table: containing all the threats that the model must take into account with their weight (between 0 and 1) and impact in space (in km); (3) Threat maps: binary type 0-1 raster maps where the value 1 indicates the presence of the threat and the value 0 indicates absence; (4) Sensitivity matrix: containing for each LULC class a number between 0 and 1

representing the suitability of that land use to be a habitat and the sensitivity of each habitat to each threat considered.

The elaboration (on a rater with a resolution of 5x5 meters) was carried out for three time intervals: 2010-2014; 2015-2017; 2017-2018. Those intervals are consistent with data availability on RES plant distribution. Moreover we included as as additional land use class the one concerning the areas occupied by RES plants. The categories set out in Tab. 3 have been taken as the source of the threat on the basis of comparisons between different attributes in a variety of scientific articles (Chu et al., 2018; Sharma et al., 2018; Salata, Ronchi & Arcidiacono, 2017).

LUCODE	DESCRIPTION OF THREAT	THREAT	MAX DISTANCE [KM]	WEIGHT [0-1]
From 511 to 515	Agricolture	AGRI	0.3	0.4
11-12	Residential buildings in compact urban centers and scattered urban centers	BUILD	1	0.85
13	Buildings for industrial and commercial use	IND	1.5	1
3	Caves and dumps	CADI	1.5	0.65
7	Wind and photovoltaic systems	RES	1.5	1
2	Main high-speed link roads and railways	BROAD	2	1
2	Local roads	SROAD	0.4	0.3

Tab. 3 Table of threats acting on the territory with their weights and distances of impact. Each threat represents a single class of land use (lucode) or an aggregation of several classes

For the sensitivity matrix (Tab. 4), maximum habitat values were assigned to the land use classes for forests and watercourses, and zero values were assigned to the anthropic land use classes for buildings and RES installations. For each LULC, a score of 0 to 1 was assigned corresponding to the sensitivity of that habitat to the relevant threat (Polasky et al., 2011; Sallustio et al., 2017; Terrado et al., 2016).

LUCODE	HABITAT TYPE	HABITAT SUITABILITY [0-1]	AGRI	BUILD	IND	CADI	RES	BROAD	SROAD
11; 12; 13; 2; 3; 4.	Anthropized urban area	0	0	0	0	0	0	0	0
4	Gardens and urban green areas	0.3	0.3	0.4	0.4	0.1	0.3	0.3	0.5
511	Orchards	0.5	0	0.3	0.5	0.2	0.5	0.4	0.5
512	Gardens	0.5	0	0.3	0.5	0.2	0.5	0.4	0.5
513	Arable land	0.4	0	0.5	0.6	0.2	0.8	0.4	0.5
514	Olive groves	0.5	0	0.3	0.5	0.2	0.5	0.4	0.5
515	Vineyards	0.5	0	0.3	0.5	0.2	0.5	0.4	0.5
53	Pasture or uncultivated areas	0.6	0.4	0.7	0.6	0.3	0.9	0.6	0.4
54	Mixed forests	1	0.8	0.8	0.7	0.5	0.5	0.7	0.5
541	Conifer woods	1	0.8	0.8	0.7	0.5	0.5	0.7	0.5
542	Broadleaf forests	1	0.8	0.8	0.7	0.5	0.5	0.7	0.5
62	Watercourses	1	0.5	0.4	0.8	0	0.3	0.8	0.4
7	Renewable energy production plants: Wind and Photovoltaic	0	0	0	0	0	0	0	0

Tab. 4 Sensitivity matrix where the habitat grade [0-1] is reported for each land use class (or group of classes) and the sensitivity of each habitat to the individual threat [0-1]

3.5 RESULTS

The Carbon Stock assessment allowed us to estimate in 2013 a total amount of 10,3 kTons in the study area. This value, considering only the transformations induced by RES energy production plants, undergoes a decrease of 0.31% corresponding to about 32 tons of carbon previously stored.

The agricultural productivity - Crop Production - was analyzed considering high value-added crops (viticulture) and cereal production. The RES plants almost exclusively concerned cereal production areas. Results show the presence of three climate zones within the study area, which involve the division into three classes of productivity. Regarding vineyards, values range into following three classes: low (up to 37.2 q/ha), medium (from 37.2 to 68.4 q/ha), high (greater than 68.4 q/ha).

Cereal production had been more affected by RES plants development: as can be seen from the Fig. 2, the area of greatest concentration of RES plants overlaps "Non-irrigated crops".

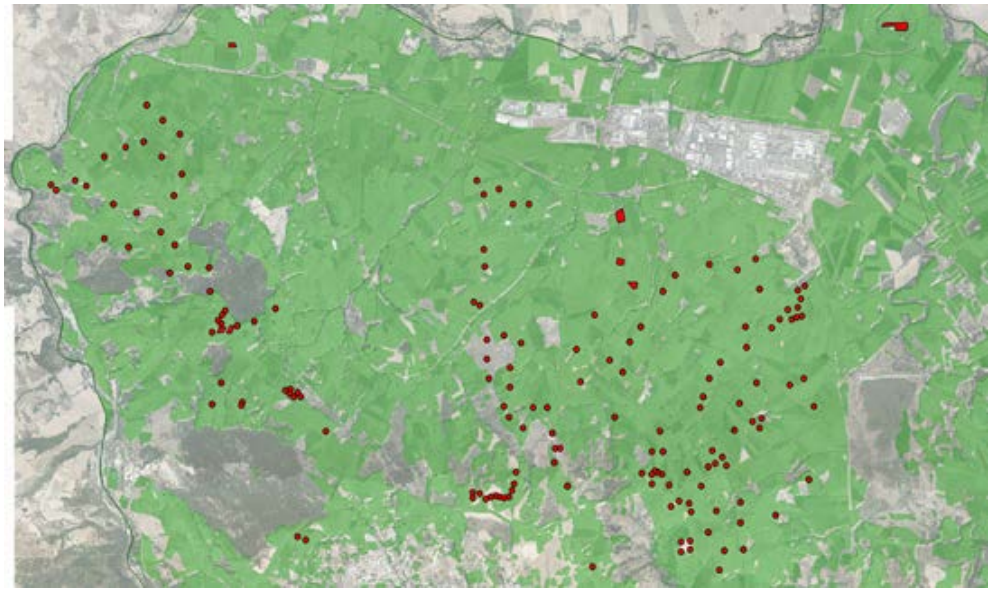


Fig. 2 Location of RES systems located in non-irrigated arable areas (in green)

Results as regards the ability to provide adequate habitats for pollinating species highlights the crucial role of wooded areas (dark red in Fig. 3) but also the variability that characterizes non-irrigated arable land on the basis of distance from urban areas.

This is particularly evident in the area immediately south of the industrial area where, although the dominant land use class is "non-irrigated arable land", the index decreases as urbanized areas come closer.

In order to evaluate the alterations INVEST has been run considering for every temporal step, plants to be added to the pre-existing ones. The following image is intended to represent precisely the loss with respect to 2010 of the index recorded by the model at the end of 2018. By overlapping RES plants to 2018, it can be seen that the ecosystem service in question is strongly affected by the density of the installations.

Concerning Habitat Quality the results were grouped into 4 macro-classes: "no-habitat", "low quality/degradation", "medium quality/degradation" and "high quality/degradation". On the habitats quality, in the time phases analysed, the percentages of land classified as "no-habitat" and "low quality" increased by 0.46% to the detriment of those classified as "medium quality", which on the contrary decreased by 0.45%.

For habitat degradation (Fig 5), in the time phases analysed, the area classified as "low degradation" decreases considerably, by 18%. In addition, the areas classified as "medium degradation" and "high degradation" together increase by about 18%.

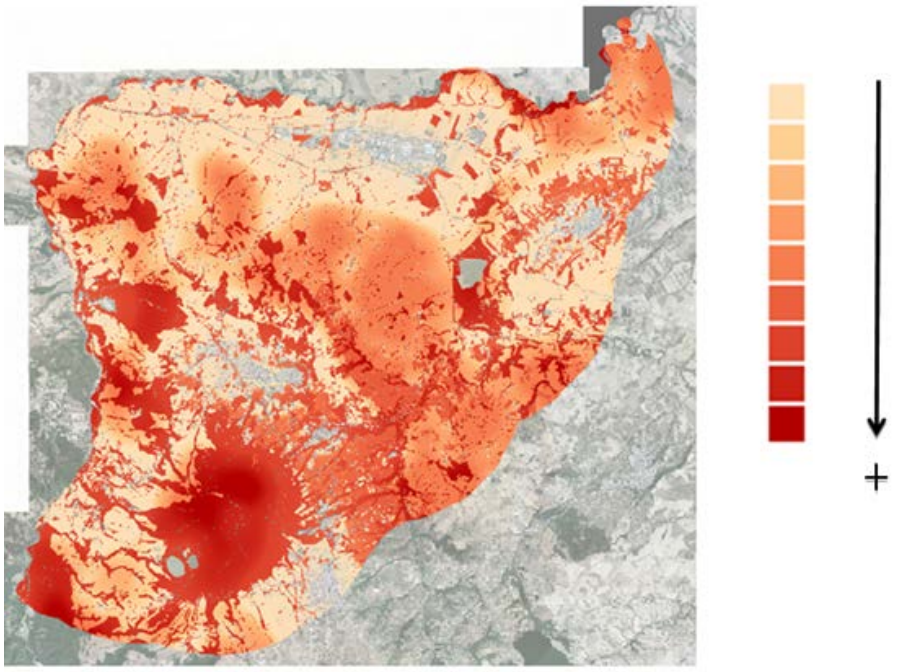


Fig. 3 Pollination supply index map for the year 2010

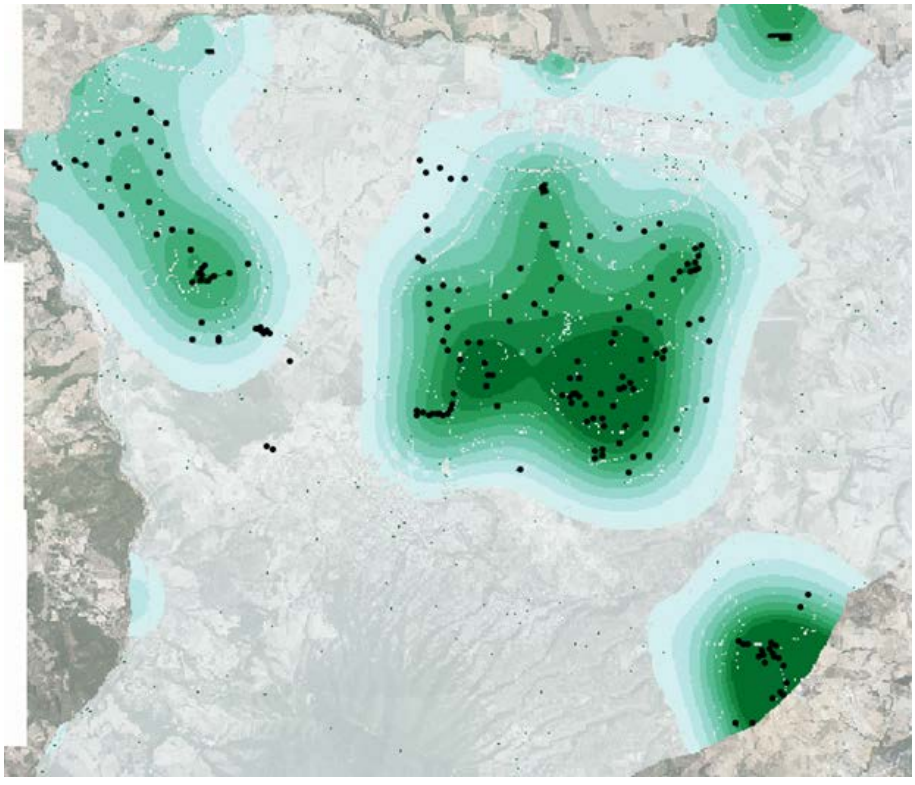
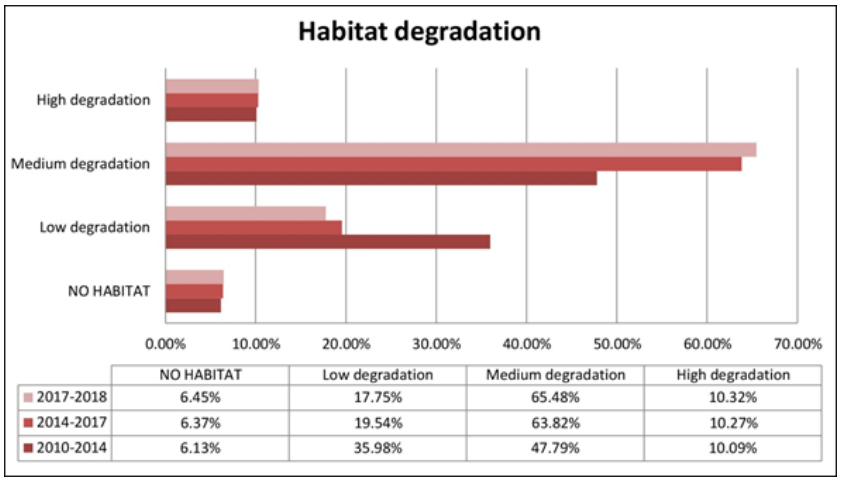


Fig. 4 Overlay between RES implants in 2018 and the evolution of the "Pollination abundance" index between 2010 and 2018

In order to provide a comprehensive estimation of the impacts produced by RES installations ore 2010 - 2018 time frame a synthetic map (Fig. 6) was delivered combining the results discussed before in a linear combination model. Such map represent the general loss of ecosystem services. Lighter colors correspond to less loss and vice versa. As it is possible to see, there are two areas that have been most altered: the first located north-west of the town, the second between the town and San Nicola industrial area.



	NO HABITAT	Low degradation	Medium degradation	High degradation
2017-2018	6.45%	17.75%	65.48%	10.32%
2014-2017	6.37%	19.54%	63.82%	10.27%
2010-2014	6.13%	35.98%	47.79%	10.09%

Fig 5 Graph of habitat degradation representing on the abscissas axis the amount of surface in percentage and on the ordinates axis the level of habitat degradation identified. The table under shows the percentage value for each time interval analysed

The first one is characterized by a low heterogeneity of the existing plants. In fact, there are mainly wind turbines with a generating power greater than 1 MW with two photovoltaic fields. The opposite situation is found in the second area in which there are wind and photovoltaic systems heterogeneous for power capacity, height of the tower and rotor diameter.

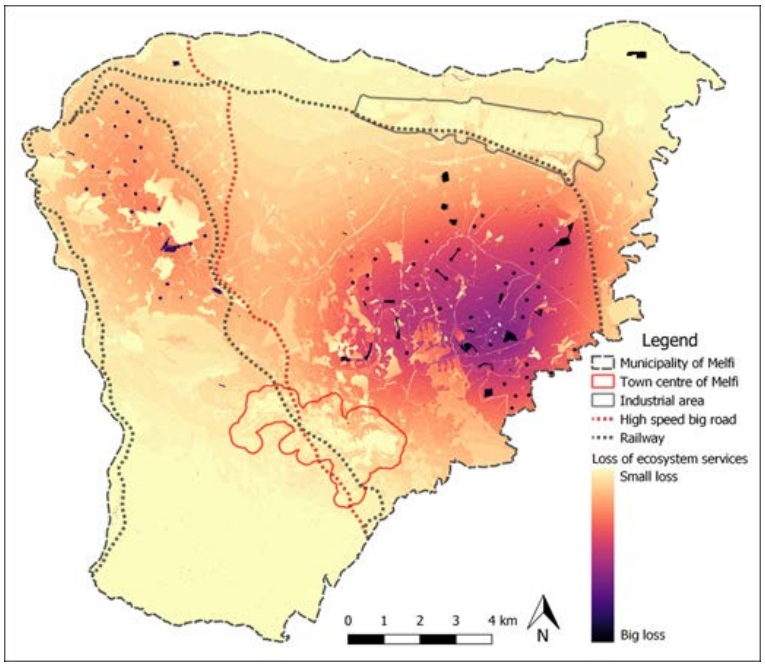


Fig. 6 Map representing the general loss of ecosystem services in the study area between extreme time intervals (2010-2018)

Such elaboration allowed to understand how the greatest cumulative impacts depends on the distribution of plants in those territories with higher density of wind-towers and photovoltaic plans. It is remarkable how the environmental assessment of a RES plants has to consider existing baseline and cumulative effects for the estimation of impacts scenario.

4 CONCLUSIONS

The aim of this work is the application of a method to evaluate territorial transformations induced by the installation of renewable energy production plants through the approach of ecosystem services (Scorza et al., 2019). The ecosystem services analyzed are those that best describe the identity characteristics of Melfi

territory, capturing the aspects of natural and environmental value and the strong agricultural vocation that is characterized both by the large extension of cereal areas and for some valuable products such as vineyards of Aglianico. A cumulative effects comes out as a comprehensive assessment of the sectoral estimation as a form of territorial sustainability performance assessment (Dvarioniene et al., 2017). Such results has to be improved in terms of more detailed estimation of the parameters selected as INPUT in INVEST models and, mainly, in the estimation of effects combination calibrated on specific on-field evidences.

However it is possible to affirm how the current procedure of environmental impact assessment for big RES plants (ore that 1 MW power capacity) is un-effective in considering the cumulative effects of the new plants in the comprehensive settlement scenario. Furthermore the small plants are authorized even without such environmental assessment procedure and their effects may be even more disruptive and uncontrollable.

It is necessary to start a process of territorial transformation monitoring (i.e. starting from effective procedures of land take and urban sprawl detection) (Saganeiti et al., 2018) to support the elaboration of sustainable energy policy at regional and municipal level based on an integrated assessment of territorial values with the global issue of reducing CO_2 emission. The ESs combined with remote sensing and advanced spatial analysis techniques could balance conflicting objective of sustainability: low-carbon energy transition, preservation of natural resources, reinforcing agriculture and food production.

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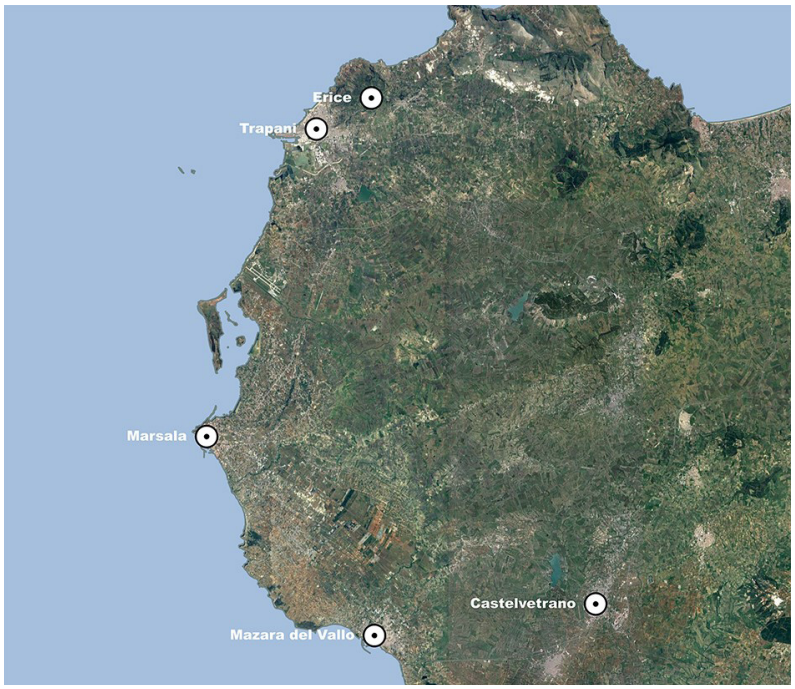
TeMA Journal of Land Use, Mobility and Environment

TeMA 2 (2019) 139-146
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/5682

review paper received 10th June 2019, accepted 18th July 2019

www.tema.unina.it

How to cite item in APA format:
Vinci, I. & Cutaia, F. (2019). Implementing the environmental dimension of the EU's urban agenda 2014-2020. *Tema. Journal of Land Use, Mobility and Environment, 12*(2), 139-146. doi: http://dx.doi.org/ 10.6092/1970-9870/5888



IMPLEMENTING THE ENVIRONMENTAL DIMENSION OF THE EU'S URBAN AGENDA 2014-2020

THE STRATEGY FOR SUSTAINABLE DEVELOPMENT IN THE MEDIUM-SIZED CITIES OF WESTERN SICILY

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ABSTRACT

This work illustrates the planning experience carried out by five municipalities of Western Sicily (Italy) in the the framework of the EU's urban agenda 2014-2020. The planning process has led to the definition of a Strategy for Sustainable Urban Development (SSUD), whose general objectives are strengthening territorial cohesion and to increase accessibility to the local resources. The SSUD action plan, being funded with around 70 millions euro, gives specific importance to sustainable mobility as a mean through which such objectives can be better achieved and reciprocally integrated.

After a brief description of the territory targeted by the SSUD (section 1), the paper focuses on the greenway concept within the broader debate on sustainable mobility. In section 3, a series of evidences are provided to identify the demand and potential for the development of sustainable mobility infrastructures in the five cities. In the fourth section, after describing the expceted results of the action plan in the field of sustainable transport, it is suggested why in this area a greenway is the better solution to increase accessibility to a broad range of natural resources and functions (natural sites, landscapes, cultural heritage, urban functions).

KEYWORDS:
EU's Urban Agenda; Sustainable Mobility; Greenways

TeMA
有关土地使用、交通和环境的杂志

TeMA 1 (2019)139-146
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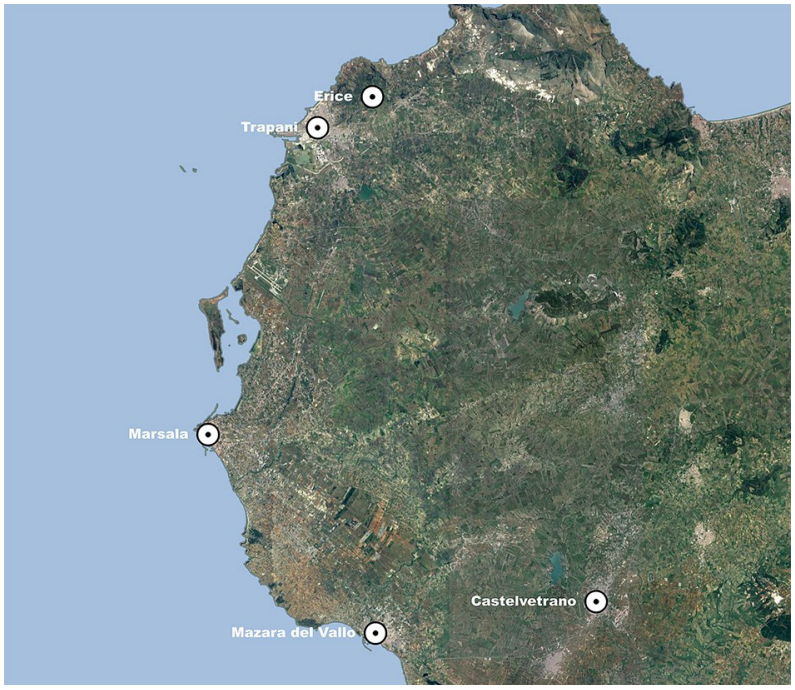

欧盟2014-2020年城市议程环境内容的实施 西西里岛西部中型城市的可持续发展战略

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摘要

本研究介绍了西西里岛（意大利）西部地区的五个自治市在欧盟2014-2020年城市议程的框架下进行规划的经验。作为该规划过程的成果，定义了一项可持续城市发展战略（SSUD），其总体目标是加强地域的凝聚力，以及提升当地资源的使用无障碍程度。该SSUD行动计划的经费投入为约7000万欧元，体现了可持续出行作为有助于更好地实现上述目标并使它们相互集成的一种手段的特殊重要性。
在简短描述SSUD针对的地域目标（第1章）后，文章通过对可持续出行的广泛讨论，着重介绍了绿色通道概念。第3章提供了一系列论据，确定了这五个城市在可持续出行基础设施开发方面的需求和潜力。第4章先是描述了在可持续交通领域行动计划的预期结果，然后又讨论了为什么对于这些具体的地域而言，绿色通道是提高大范围的资源和功能（自然遗址、景观、文化遗产，城市功能等）的使用无障碍程度的最佳解决方案。

关键词:
欧盟城市议程；可持续出行，绿色通道

1 INTRODUCTION

The territory of Italy presents a clear polycentric structure and medium-sized cities are spread across the whole country (Bonavero et al., 1999). The reason for this type of spatial organisation lies in the country's long history but also, as in other European contexts, in the capacity of medium-sized cities to offer a range of accessible services, environmental qualities and other amenities that often make these places more attractive to citizens respect to the largest urban agglomerations (ESPON, 2014; Hristova et al., 2015; Servillo et al., 2017). In this context, Sicily is one of the Italian regions with a more polycentric territorial organisation: this is witnessed, on the one side, by the number of medium-sized cities spread across the regional territory (30 towns with a population between 30,000 and 100,000 inhabitants); on the other, for the role that urban proximity plays in creating functional synergies in certain part of the region. This is particularly the case of Western Sicily, where in a range of 90 kilometres of coastline there are five medium-sized cities (Trapani, Erice, Marsala, Mazara del Vallo, Castelvetrano), home of around 250,000 inhabitants, which share relevant resources for sustainable development: infrastructures, such as an international airport, commercial ports and marinas; natural sites of community importance and distinctive landscapes; cultural amenities of international relevance (i.e. Erice old town, Selinunte archaeological site).

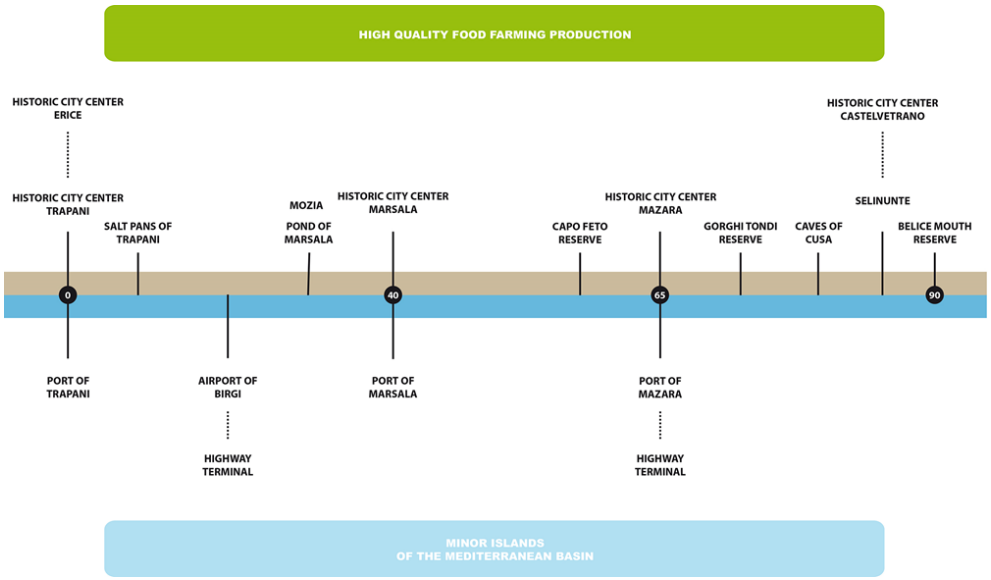

Fig. 1 The distribution of urban and environmental resources along the coastline of western Sicily (Source: authors)

In the framework of the 2014-2020 EU's programming cycle, in 2016 the above mentioned five municipalities started a cooperation process to carry on a joint Strategy for Sustainable Urban Development (SSUD), responding to the following overall objectives: (a) promoting territorial cohesion and increased functional synergies among the cities; (b) to increase accessibility to the urban and environmental resources; (c) improving the availability and efficiency of local services, particularly in the fields of sustainable mobility and social inclusion. The strategy, being funded with around 70 million euro from the European Regional Development Fund (ERDF), will be implemented through an action plan with a specific focus on the urban waterfronts, places still characterised by unsolved environmental problems, but where the three above mentioned objectives can be achieved with a larger impact in terms of sustainability, urban regeneration and local development. This paper aims to explain the methodology followed to quantify the SSUD targets in the field of sustainable mobility and to identify a greenway as an instrument to combine environmental and local development goals within the urban areas.

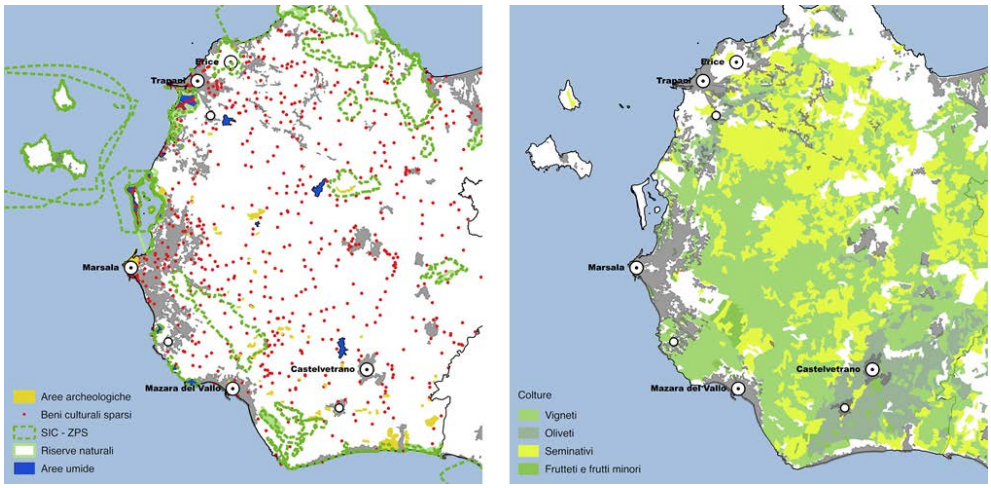

Fig. 2 Natural resources, cultural heritage (left) and farming land coverage (right) (Source: authors)

2 CONCEPTUAL FRAMEWORK

Over the last two decades, the sustainable mobility paradigm have dominated the planning debate, to the point that cities all over the world are committed to promote environment-friendly transport policies (Banister, 2008; Grieco & Hurry, 2012). Changes in the social behaviours, also, implicate the emergence of new ways people relate with the places and environment, with the consequence of creating a demand for new types of infrastructures and new challenges to urban planning and design (Bertolini, 2017; Hickman et al., 2013). These new demands for sustainable mobility can be addressed in an holistic way by reconceptualizing the concept of "green infrastructures". With ancient roots and analogies with the concepts of "parkway" and "green belt" in the landscape ecology literature (Fabos, 1995), green infrastructures can be interpreted as a set of interconnected natural spaces that, while preserving the values and functions of a natural ecosystem, provides also wider benefits to human population (Benedict & McMahon, 2006). Such renewed scenario requires a completely different approach to planning and design of mobility networks. Particularly, transport networks have to be conceived through multifunctional criteria, going beyond the administrative barriers and by reconsidering the landscapes and natural areas as sources for the provision of ecosystem services (Lovell & Taylor, 2013). From this conceptual perspective, slow-mobility infrastructures can be easily accommodated within the existing natural networks, achieving both the objectives of ensuring better accessibility to places and contributing to regenerate the environment (Steiner, 2010). Within the urban areas, greenways (that are part of the green infrastructure concept) can contribute to achieve a wide range of sustainable development goals, as for instance: (a) providing alternative transportation opportunities, reducing congestion and pollution; (b) mitigating the conflicts bewteen built and natural environments, enabling people to enter in contact with nature (Gill et al., 2007; Gobster, 1995); (c) increasing social interactions in the opena spaces (Kazmierczak & James, 2007; Shafer et al., 2000). Furthermore, greenways are recognised as an instrument to increase the resilience of urban environments, contributing to face issues such as storm-water management, seasonal flooding, and the 'heat island' effects (Chon & Shafer, 2009). Cycle pathways play a crucial role in the implementation of the greenway concept within urban areas, given their compatibility with the environment and the response they can give to the growing demand for safe and sustainable means of transport within the cities. It has been demonstrated (Hankey et al., 2012) that in urban areas bicycle traffic can be considerably increased by the presence of well designed bicycle facilities (+37%) and even more from the presence of off-street bicycle facilities (+32%). Consequently, the provision of integrated networks of walking and cycling pathways can provide a great impact on the overall urban mobility and on the home-work trips particularly (Buehler & Pucher, 2012). Moreover, there are evidence that a rise in the bike/pedestrian movements can be frequently associated to an increase in the use of public transport, especially where the "grey" infrastructures

are effectively interconnected with the "green" ones (Forman et al., 2003). Ensuring the creation of green infrastructures within urban areas, however, can be pursued only through a long-term sustainable development strategy, being implememted through integrated action plans able to affect different domains and policy-sectors (Ahern, 1995; Socco et al., 2007). It is with this conceptual framework on the background that the greenwway concept has been embedded within the Strategy for Sustainable Urban Development of Western Sicily. Bike pathways, particularly, have been identified as an instrument to combine a wide range of local development objectives, including urban regeneration in the coastal neighborhoods, a reduction of motorised trips by residents and a better access to the tourist destinations.

3 SETTING THE DEMAND FOR SUSTAINABLE MOBILITY

The mobility component of the SSUD have been supported by an exploratory study of the mobility flows within and among urban areas of Western Sicily. By applying a consolidated methodology, the analysis has taken into account the following variables: (a) the amount of movement between each urban area, (b) for which purposes these movements are generated, and (c) the related "modal split". By taking into account the least available data (ISTAT, 2011), we made an Origin-Destination Matrix (OD) for a sample of daily 'home-work' and 'home-study' trips within the five municipalities under consideration. As it is well known in the literature (Cascetta et al., 1993; Lo et al., 1996; Bierlaire, 2002; Wong et al., 2010), this approach uses procedures for processing categorical data, showing the frequency with which the subjects of a given class of origin are present in a given class of destination. In the case under analysis, the cross-section is constituted by 94,975 individuals, which generate 41,908 movements for study reasons and 53,066 for work reasons. Regarding the inter-municipality trips, the main flows are concentrated from Erice to Trapani and vice versa, two towns that are strictly interconnected from a spatial and functional points of view. Being the seat of the province, the city of Trapani is the largest pole of attraction also for the other municipalities, while Marsala ranks as the first urban area in terms of internal movements (Tab.1).

DESTINATION/ ORIGIN	Erice	Trapani	Marsala	Mazara del Vallo	Castelvetrano	Total
Erice	5,633	5,162	123	12	14	10,946
Trapani	2,935	22,876	339	55	27	26,234
Marsala	99	1,067	26,503	484	107	28,263
Mazara del Vallo	5	310	413	16,524	660	17,914
Castelvetrano	5	237	83	237	11,053	11,616
Total	8,679	29,654	27,462	17,315	11,863	94,975

Tab. 1 Origin-destination matrix of systematic movements in the SSUD area (Source: ISTAT, 2011)

	INCOMING FOR STUDY (2011)	INCOMING FOR WORK (2011)	INCOMING FOR TOURISM (2015)
Erice	461,074	742,388	84,526
Trapani	996,811	2.295,652	208,294
Marsala	186,541	515,174	170,301
Mazara del Vallo	80,654	351,634	65,077
Castelvetrano	245,182	295,085	353,662
Total	1,970,262	4,199,933	881,860

Tab. 2 Incoming flows for movement reasons (Source: ISTAT, 2011)

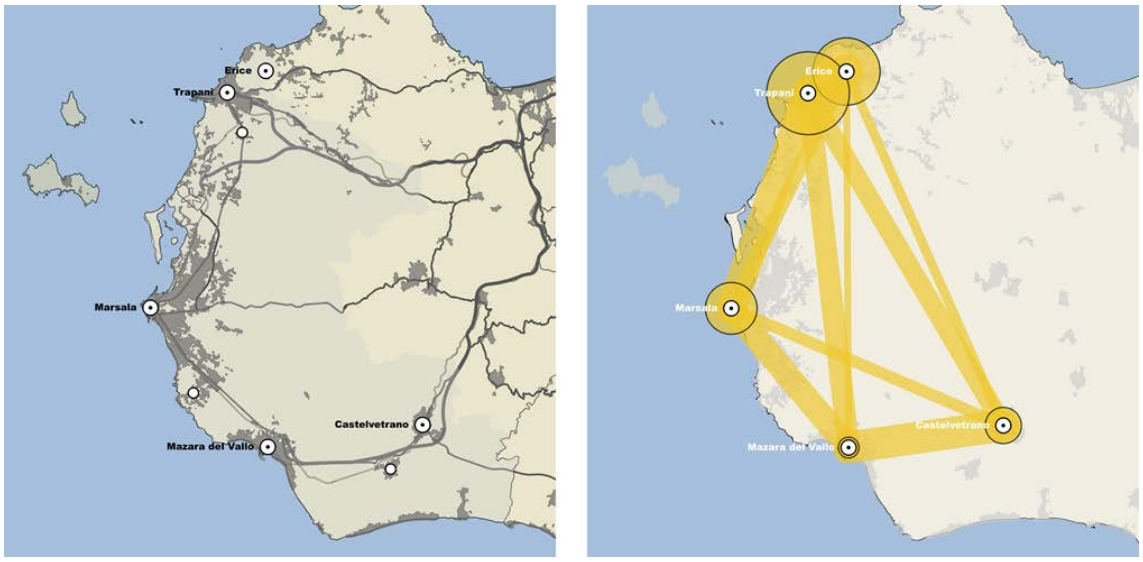

Fig. 3 Urbanisation, transport networks (left) and chart of the systematic movements among the five cities (right) (Source: Authors)

Alongside the movements for work and study reasons we took into consideration also the movements generated in the area by tourist activities. In fact, according to the data released by the Regional Tourism Observatory in 2016, from 2005 to 2015 the five cities are characterized by a considerable increase of tourist flows: +5% in terms of arrivals and +9,4% in terms of attendance, with an average permanence far above the regional level. As it is showed in Tab. 2, tourist flows are not always related to the demographic size of the cities, as in the case of Castelvetrano, where 13 kilometers far from the city centre is located one of the most attractive archeological site of the region (Selinunte). This specific situation has implied for policy-makers to consider sustainable mobility not only as a way to ensure cleaner transports within the urban areas, but also as an instrument to diversify accessibility to the cultural/natural landmarks of the area. As it will be better explained in the following section, therefore, the proposed greenway is constituted by 'urban' and 'suburban' sections. The analysis of the current transport modal split within the five cities clearly represents the distance with what can be defined as a 'virtuous' model of mobility (Bhat, 1995). Like in other southern Italian regions, in fact, the most common means of transport in the area are the private cars: these are preferred by users in the 72% of cases, 58.9% of which as a driver. On average, only 2.9% of trips are made through urban or suburban buses, while trains are used by only 0.4% of the travellers. Although the favourable geographical conditions, bicycle is used on average only for the 0.6% of trips, one of the lowest rate in Italy among the medium-sized cities. On the other hand, surveys made in the cities suggest a great potential for a mobility system based on the bicycle. For instance, in an analysis carried out within the Urban Mobility Plan of Mazara del Vallo, it is argued that the spread of the bicycle as a means of movement might be highly improved only by providing an infrastructure that satisfies the minimum standards of safety and security. In spite of that, the extent of the bike lanes network is extremely poor, as they amount to only 4 kilometers spread over three urban areas (Erice, Trapani, Marsala).

4 THE GREENWAY AS A SOLUTION TO MEET URBAN MOBILITY AND LEISURE

The very low use of bicycle for home-work trips, on the one hand, and the potential users deriving from tourist/leisure activities on the other, clearly justify a significant improvement of bike pathways network in the area. The approach adopted is explicitly addressed to integrate a greenway approach with the promotion of intermodality, a factor that could facilitate the greenway usage to several types of user. This is especially true in the case of the Marsala-Trapani itinerary, both for the advantageous morphologic profile, and for the density of urban/environmental resources that can be found in proximity of the existing transport infrastructures. Given the above mentioned considerations, and the budget availability (around 5.8 millions of euro), the SSUD

action plan has estimated at 26 kilometres the length of new urban cycle pathways to be implemented within the five urban areas. Whether they will be supported by other mobility infrastructures – i.e. intermodal transport nodes – it is expected that the new pathways may lead to an increase of trips by bicycle from the current 0.5% up to 1.5% of the total. In terms of changed modal split, it is expected that the implementation of the mobility part of the strategy could lead to a reduction of around 7% of users of private vehicles for the systematic trips within the urban areas. In the SSUD of Western Sicily, however, urban cycle pathways are understood as part of a broader territorial network to foster sustainable development in the logn term. In fact, the bike pathways being implemented within the urban areas are conceived as sections of a longer green infrastructure whose itinerary has been identified with the aim of creating a network among the resources showed in Fig. 1. Therefore, the bike pathways are divided into 'urban' and 'suburban' sections, whose length is 26 and 70 kilometers respectively. The urban sections are devoted, particularly, to increase the use of bicycle by citizens and to help the waterfront regeneration process. For the first aim, the action plan has allocated financial resources to the implementation of bike-bus-train interchange facilities, as well as the creation of bike sharing services in the city centres. In the suburban sections, the greenway aims to ensure better connections between the urban centres and between the tourist facilities and the cultural/natural sites spread over the territory. Furthermore, since the planned greenway frequently is joined to the railway line and intercepts stations, the strategy aims to promote bicycle-train intermodality. Consequently, infrastructures are conceived to meet demands from a broader range of potential users, such as people using bike for home-work trips, as well as others for leisure and tourist activities. From this perspective, the implementation of new bicycle pathways under the greenway concept within the SSUD of Western Sicily goes beyond the simple aim to improve sustainable mobility in the area. Rather, it is expected the new infrastructure may lead to a reshaping of territorial organisation, creating new grounds for an environment-led polycentric urban development.

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 2 (2019) 147-156
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6126

review paper received 2nd June 2019, accepted 20 July 2019

www.tema.unina.it

How to cite item in APA format:
Santos, A. & Moura, A.C. (2019). Mobility: Exploratory analysis for territorial preferences. *Tema. Journal of Land Use, Mobility and Environment, 12*(2), 147-156. doi: http://dx.doi.org/10.6092/1970-9870/6126

MOBILITY: EXPLORATORY ANALYSIS FOR TERRITORIAL PREFERENCES

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ABSTRACT

Urban mobility is a current challenge on modern life and has its implications not only on time misuse but also on citizens' health. Spending hours of a day on traffic, people interact with the environment they are susceptible to, which implicates on their manner of seeing, enjoying and living a city. To analyze this impact, an exploratory study was developed on the possibilities of using data composition and spatial analysis tools to select and combine main variables in order to diagnose characteristics of urban landscape on Pampulha Region, in Belo Horizonte (MG), Brazil. Territorial Analysis Units (UTA) were delimited and urban data were studied. First, the main characteristics were represented in categories of variables, and then they were recombined by utilizing Multi-Criteria Methods based on Weighted Sum to present results of suitability for walkability. For each step of spatial analysis, were generated Suitability (Multi-Criteria) and Sensitivity (Uncertainties) Evaluation Maps, proving the similarities of areas considered attractive and vulnerable with the goal to refine the partial results and select the main variables related to walkability. The case study presents the most significant characteristics that might be considered when planning quality of life on urban environments.

KEYWORDS:
Multi-criteria Method; Sensitivity Analysis to Suitability Evaluation; Urban Mobility; Urban Landscape; Pampulha Region

TeMA
有关土地使用、交通和环境的杂志

TeMA 2 (2019) 147-156
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6126

review paper received 2nd June 2019, accepted 20 July 2019

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摘要

城市出行是现代生活中我们面临的一个挑战，其影响不仅涉及到时间的浪费，同时也对人们的健康不利。人们每天在交通上花费数小时的时间；他们与居身于其中的环境互动，环境对人们对城市的感知、体验和居住方式也产生影响。以分析这种影响为目的，我们开展了一项探索性研究，探讨使用数据和空间分析工具对主要变量进行选择及组合、以便于判定巴西贝洛哈里桑塔（MG）潘普利亚地区城市景观的特点的可能性。其中，对地域分析单位（UTA）进行了界定，并对城市数据进行了研究。首先，将各种主要特征以不同类别的变量表示出来，然后利用多准则方法、根据加权总将其重新组合，以表示步行适宜性结果。空间分析的每个步骤均会生成适宜性（多准则）和敏感性（不确定性）的评价地图，证明被认为有吸引力和易受伤害的不同地区之间存在相似之处，旨在对空间结果进行修正完善，并选择与步行适宜性有关的主要变量。案例研究提供了在规划城市环境中生活质量时可能纳入考虑的最显著特征。

出行
地域偏好的探索性分析

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关键词:
多准则方法；适宜性评估的灵敏度分析；城市出行；城市景观；潘普利亚地区

1 INTRODUCTION

Urban daily life requires attention to citizen's demands and urban infrastructure available to them. Urban transportation plays an important role when analyzing how much time citizens spend on their everyday life routes. Time spent to go to and to come back from work or school and to do other activities often represents a significant part of the day, and this is an even bigger problem in countries with lack of organized and well distributed public transportation. These facts call attention to how the itinerary influences human health physically, mentally, and emotionally. Issues related to mobility must consider not only the difficulties in daily life as vulnerabilities, but also the quality of the place where people circulate on, because this may be seen as attractiveness and potentiality to urban planning, providing better places and routes to citizens' circulation.

Aiming to comprehend conscious and/or unconscious interactions between citizens and urban landscape and its consequences, the research organized data and produced information about existing infrastructure and visual landscape perception of a case study, using geoprocessing and computing tools. The main objectives were to identify characteristics and phenomena that may configure a landscape as attractive or not for citizens, in the sense of topophilia or topophobia, meaning how people feel about places (Tuan, 1974); and to parameterize its conditions in order to recognize areas which present similar aspects, but are not categorized as attractive and its probable reasons.

The study area chosen was the Pampulha Region (IMG.1), located in the northwest of Belo Horizonte (BH), capital of Minas Gerais state, Brazil. The region has an area of 47 square km, 34 districts and 10 slums, with a population of 187,315 inhabitants and a density of 40.13 inhab./km (IBGE, 2010), characterized by an expressive amount of remaining vegetation coverage that represents 26 km² of the area. Its choice was based on its natural, social and infrastructural characteristics, besides its data availability for the Laboratory of Geoprocessing's researchers due to an agreement with the City Hall.

It is the main destination for open air activities within BH; it is mostly flat and presents relatively low density and traffic jams – distinctively from most parts of the city and favorable for active transportation. Moreover, it is known for tourism activities and recognized by UNESCO as a World Heritage Centre, but still has a mixed land use with diversely residential, commercial, industrial, and institutional areas. In addition, transportation's phenomena occur in Pampulha, configuring interesting challenges to be studied: mobility islands caused by large landmarks as the Pampulha Lake, the Federal University of Minas Gerais (UFMG), the Governador Magalhães Pinto Stadium (Mineirão), the Pampulha Airport, and the BH Zoo; and underexplored walkability, despite its infrastructure and favorable conditions to walk compared to other regions of the city.

2 METHODOLOGY

Aiming to approach distinct methodologies of analyzing the area of study, the research has been developed applying two methodologies whose results will be compared on further studies. The first one, entitled Urban Resources (UR), is based on the main spatial characteristics of the Region and will be the focus of this paper. The second one, entitled Citizens' Perception (CP), considers citizens' opinions about their preferences on walking through the landscape in the Region and will be explained on a future paper.

Studies about the characterization of the area, according to Urban Resources, require the definition of a territorial reference to collect and analyze the data. The chosen method was the Territorial Analysis Units (UTA) that allows the comparison between distinct areas of the Pampulha Region. They were delimited in 5144 UTAs, approximately 1 per lane of road added with a buffer of 15 meters inside lots to capture vegetation or characteristics that are on the front part of the lot and are seen by the walker, composing the landscape. The territorial units were constructed using Voronoi polygons, calculating the area of influence of each track considering the road plus the frontal part of the lots, the first 15 meters.

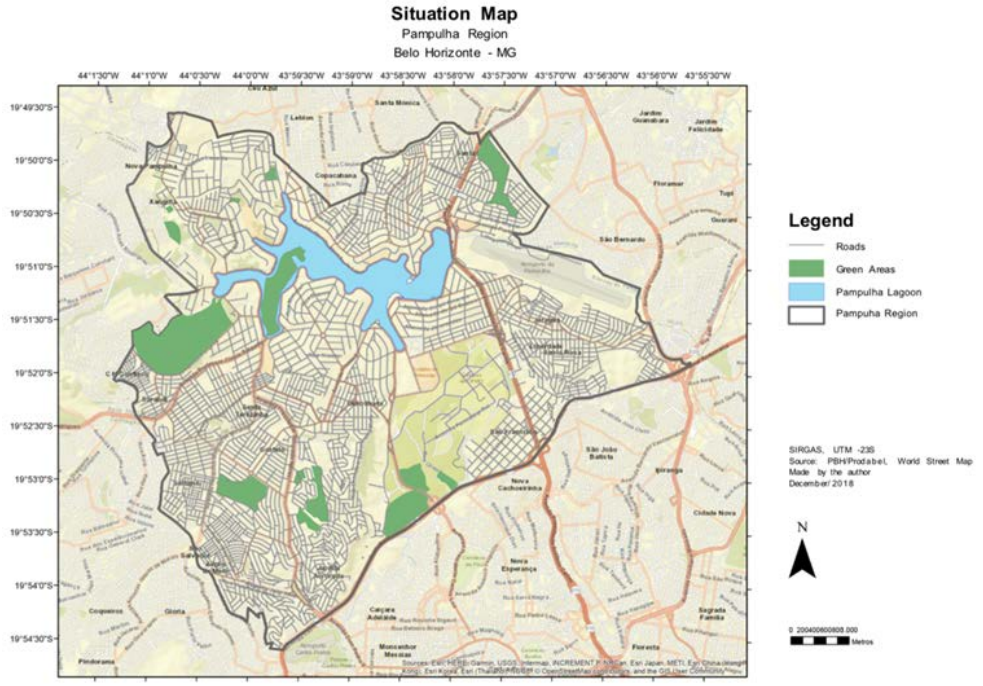

Fig. 1 Pampulha Region Situation Map

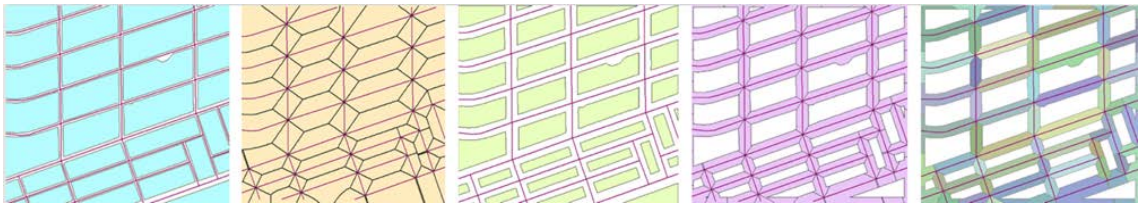

Fig. 2 UTAs construction: from roads and blocks to Voronoi polygons, resulting in one polygon per track

The second step was to define the main variables to be organized, using data provided by the City Hall or producing data by geoprocessing methods. The goal was to decompose reality according to its main characteristics, to compose the variables in principles of spatial analysis to represent the territorial distribution of occurrences or phenomena, and to recompose groups of variables to configure portraits of spatial reality. The method is based on suitability evaluation and studies about uncertainty in the results (Moura, 2007).

The process was oriented by the first part of Geodesign Framework developed by Steinitz (2012), and by studies of uncertainty developed by Ligmann-Zielinska and Jankowski (2012, 2014) according to the methods proposed by Moura and Jankowski (2016), consisting on data assessment based on:

- analyzing data and building Representation Models;
- manipulating information and building Process Models;
- applying knowledge and building Evaluation Models;
- analyzing results and calculating levels of uncertainty on the model.

Thus, the first step was to design Representation Models based on the urban data collected. This data was available due to an agreement, Urban Information Management Group (GGIU), between The Laboratory of Geoprocessing and The City Hall of Belo Horizonte (PBH/Prodabel). To design the Representation Models, a process of structuring and organization of urban infrastructure and environmental data was developed, as listed on the Results section, Tab. 1. Secondly, from these Representation Models and for the Process Models step, 30 (thirty) product files and 19 (nineteen) process-maps were generated, cited on Tab. 1.

Thirdly, to build Evaluation Models, two types of multi-criteria analysis were applied: the Multi-Criteria tool from the ArcGIS software and the Monte Carlo Weighted Sum evaluation tool (Jankowski & Ligmann-Zielinska, 2012, 2014; Moura & Jankowski, 2016). On the first method, all variables had the same weight equal to 5.26, calculated dividing 100 per 19 variables, producing a multi-criteria analysis map.

For the Monte Carlo analysis, the model increases the possibilities of weights to each variable, applying random values in a range defined by the user. Instead of just calculating one result, the model simulates many possible values of weights inside a minimum and a maximum value and compares the results in the many scenarios simulated. In those parts in which the results changed more according to changes in weights randomly selected in a defined range, it is possible to say that the level of uncertainty is higher. Using the tools developed by Jankowski and Ligmann-Zielinska (2014), two maps were produced: an evaluation map, as a suitability map for walkability in the territory, resulted from equal weight values for all variables, and an analysis of uncertainty of the results. Using the Multi-Criteria evaluation method, the Suitability Analysis Map was produced, and using the Monte Carlo method to calculate the uncertainty, the Sensitivity Evaluation Map was generated.

The process categorized each variable as high suitability and low sensitivity, or high suitability and high sensitivity, or low suitability and low sensitivity or low suitability and high sensitivity. The aim was to find results with high suitability and low sensitivity or, at least, high suitability and high sensitivity.

The application used enabled the identification of the most robust variables analysed and the variables that were more related to the level of uncertainty. In this sense, it was possible to identify and eliminate three variables, and to construct a new suitability map using the Multi-Criteria method. They were:

- residence's concentration: it is due to a peculiar characteristic of Pampulha Region that, for example, regions with low density could be great or terrible for walking. It increased the uncertainty levels of this variable;
- roads' Hierarchy: it is a technical nomenclature used by the City Hall that not necessarily represents a road's dimension but it is used to define authorization for land uses, and it was irrelevant for the proposed analysis;
- quantity of Bus Lines: Belo Horizonte's bus system (BRT/MOVE) works with few bus lines riding on main avenues that connect users to transfer stations. Therefore, it shows an inconsistent data comparing main avenues (with few lines but regular services) and ordinary roads (with more lines but not so regular services).

On second round, the Multi-Criteria evaluation tool was applied using only the 16 variables that had robust results. It also generated a Suitability Evaluation Map (based on multi-criteria analysis) and a Sensitivity Evaluation Map (based on Monte Carlo uncertainty analysis).

A third round of the research was also constructed to consider citizens' opinions on multi-criteria analysis. Instead of using same weights to all variables combined, a Delphi Method was applied to take into consideration people's opinion on the importance of each variable, so weights could represent the hierarchy of preferences on walkability. According to the method presented by Dalkey and Helmer (1963) and Moura (2006), 15 volunteers were interviewed, in anonymous schedule, in two rounds: first, they answered a value that express their opinion about the importance of each variable and the average of each one of them was calculated; then, the first average results were presented to them so they could review their votes, for a final average to be calculated and used as final weights on the multi-criteria combination of variables (Tab. 1).

3 RESULTS

To present the results, a comparison table was built (Tab. 1). On the first columns are listed all urban variables used and their correlated process-maps (the transformation of data into information to characterize occurrences and phenomena). The following columns show each methodology applied, variables weights (WT)

used, and, when applicable, its numeric results. The maps generated for each step of Multi-Criteria Analysis Methods are presented on Image 2.

The first step was composed by the calculation of MCA (Multi-Criteria Analysis) using ArcGis tools, considering all 19 variables and applying equal weights to them (5.263%). Since the following step used the same values of the first, but applied on a more qualified methodology - because variables' weights were calculated on a range instead of one unique value –, maps for the first step were not generated due to its lack of robustness.

On the second step, MCA was constructed using Monte Carlo Weighted Sum (Jankowski & Ligmann-Zielinska, 2012, 2014), considering to all 19 variables the same weight of 5,263%, but enlarging the possible weights that were automatically calculated by the tool within a range. As all the variables received the averaged weight, the tool based on the Monte Carlo simulation randomly selected weights within the range of 3,26 to 7,26%, because it represents the standard deviation calculated according to the function of probability density (Moura & Jankowski, 2016).

Along with MCA, the tool calculated the uncertainty based on the variance of the behavior of each variable. The result was that the variables "Bus Lines' Quantity", "Residence's Concentration", and "Roads' Hierarchy" presented the highest variance, which means that their spatial distribution changes a lot in areas that are classified as attractive or vulnerable in the combination of all variables, so they might not be used on further steps. As a result of the second step, those variables were eliminated from the list. The results are on Image 2's first line, maps *a* and *b*, about MCA (Suitability) and Uncertainly (Sensitivity).

The third step was to calculate MCA based on the Monte Carlo simulation again, after eliminating the 3 variables previously cited. The average of weight used was 6.25%, so the tool simulated random possible weights inside the range from 4.25 to 8.25 (according to standard deviation based on function of probability density). Along with the Monte Carlo simulation, the variance composition of variables was calculated, to check if there was still a variable that did not have a robust performance on the integration of all of them, meaning that they changed a lot in areas classified as attractive or vulnerable. As a result, we could observe that all variables were quite robust, and could be kept in the analysis. Only the variable "Concentration of Commerce" had a bigger value, but was still in the limits of robust behavior. The results can be seen on the second line of Image 2, maps *c* and *d*, about MCA (Suitability) and Uncertainly (Sensitivity).

The fourth step had the intention to know people's expectations, on a Delphi Method. Instead of applying the same weight to all variables, the goal was to use the weights according to the citizens' opinions, so that the most important characteristics of the place received higher values.

The interviews with volunteers resulted in values from 1 to 10 to define the importance of the variable (in absolute range), and these values were transformed in relative ones in order to compose a sum of 100%. Using these new values, another integration on MCA was composed, using the Monte Carlo simulation in a range of 2 points less and 2 more based on the value defined by the Delphi analysis. The decomposition of variance was also calculated to check if any variable did not have a robust behavior in the analysis, meaning that they changed a lot on those areas of attractiveness and vulnerabilities produced from the integration of all variables.

As a result, the variable "Permeability Percentage" presented a high variability, which indicated that it could, if reasonable, be further excluded from the list. The results can be seen in maps *e* and *f*, about MCA (Suitability) and Uncertainly (Sensitivity).

Comparing the steps and maps, it is possible to perceive that the analysis acquires refinement by selecting variables that are more related to the quality of urban spaces and walkability. But it is also important to recognize that all maps are very similar, without conflicts of results. It was important to follow all the steps, because the goal was to construct and control the results, improving the analysis, and presenting it as a learning process to researchers, avoiding the "black box" that are quite common in papers.

The quality of results was improved with the partial analysis on each step. In future studies, some of these steps can be eliminated, as we had already understood the partial and final results.

Urban Data	Process Maps	MCA - ArcGIS		MCA - Monte Carlo Weighted Sun + Uncertainty – SASE – 1st round			MCA - Monte Carlo Weighted Sun + Uncertainty – SASE – 2nd round			MCA - Delphi Method			MCA - Monte Carlo Weighted Sun + Uncertainty – SASE – 3rd round		
		Data	WT	Data	WT Range	Variance	Data	WT Range	Variance	Data	WT Absolute	WT Relative	Data	WT Range	Variance
Bus stops	Map of Bus Stops' Concentration	Bus Stops' Concentration	5,26	Bus Stops' Concentration	3,26 to 7,26	-0.065	Bus Stops' Concentration	4,25 to 8,25	0.196	Bus Stops' Concentration	7,8	6,0%	Bus Stops' Concentration	4 to 8	-0.001
Cycle grid	Map of Cycle Grid	Cycle Grid	5,26	Cycle Grid	3,26 to 7,26	-0.127	Cycle Grid	4,25 to 8,25	-0.03	Cycle Grid	8,0	6,1%	Cycle Grid	4,1 to 8,1	0.005
Green areas, urban parks and preservation areas	Map of Permeability Percentage	Permeability Percentage	5,26	Permeability Percentage	3,26 to 7,26	0.125	Permeability Percentage	4,25 to 8,25	-0.049	Permeability Percentage	9,1	6,9%	Permeability Percentage	4,9 to 8,9	0.421
Land densification and building's height	Map of Building's Height Predominance	Building's Height Predominance	5,26	Building's Height Predominance	3,26 to 7,26	0.072	Building's Height Predominance	4,25 to 8,25	-0.06	Building's Height Predominance	7,0	5,4%	Building's Height Predominance	3,4 to 7,4	0.003
	Map of Building's Height Variability	Building's Height Variability	5,26	Building's Height Variability	3,26 to 7,26	0.139	Building's Height Variability	4,25 to 8,25	0.106	Building's Height Variability	5,1	4,0%	Building's Height Variability	2 to 6	0.04
Lots' limits, block contours and land use	Map of Commerce Concentration	Commerce Concentration	5,26	Commerce Concentration	3,26 to 7,26	-0.073	Commerce Concentration	4,25 to 8,25	0.275	Commerce Concentration	7,0	5,4%	Commerce Concentration	3,4 to 7,4	0.002
	Map of Industry Concentration	Industry Concentration	5,26	Industry Concentration	3,26 to 7,26	-0.133	Industry Concentration	4,25 to 8,25	0.068	Industry Concentration	8,7	6,7%	Industry Concentration	4,7 to 8,7	0.001
Public and private equipment for leisure and tourism	Map of Cultural Attractions' Concentration	Cultural Attractions' Concentration	5,26	Cultural Attractions' Concentration	3,26 to 7,26	0.021	Cultural Attractions' Concentration	4,25 to 8,25	0.013	Cultural Attractions' Concentration	8,4	6,4%	Cultural Attractions' Concentration	4,4 to 8,14	0.005
Public and private urban equipment for health and education	Map of Urban Equipment Concentration	Urban Equipment Concentration	5,26	Urban Equipment Concentration	3,26 to 7,26	-0.00	Urban Equipment Concentration	4,25 to 8,25	0.05	Urban Equipment Concentration	7,5	5,8%	Urban Equipment Concentration	3,8 to 7,8	0.003
Roads' grid, hierarchy, type, width and pavement	Map of Roads' Width	Roads' Width	5,26	Roads' Width	3,26 to 7,26	0.172	Roads' Width	4,25 to 8,25	0.116	Roads' Width	9,3	7,1%	Roads' Width	5,1 to 9,1	0.011
	Map of Roads' Type	Roads' Type	5,26	Roads' Type	3,26 to 7,26	0.121	Roads' Type	4,25 to 8,25	0.008	Roads' Type	8,6	6,6%	Roads' Type	4,6 to 8,6	0.004
	Map of Roads' Paving Type	Roads' Paving Type	5,26	Roads' Paving Type	3,26 to 7,26	0.054	Roads' Paving Type	4,25 to 8,25	0.061	Roads' Paving Type	8,4	6,4%	Roads' Paving Type	4,4 to 8,4	0.093
Topography and roads' grid	Map of Roads' Slope	Roads' Slope	5,26	Roads' Slope	3,26 to 7,26	0.212	Roads' Slope	4,25 to 8,25	0.061	Roads' Slope	8,7	6,7%	Roads' Slope	4,7 to 8,7	0.054
Trees along the roads and in the frontal part of the lots (seen by walkers)	Map of Tree Concentration	Tree Concentration	5,26	Tree Concentration	3,26 to 7,26	-0.038	Tree Concentration	4,25 to 8,25	0.024	Tree Concentration	9,4	7,2%	Tree Concentration	5,2 to 9,2	0.295
Waterbodies	Map of Waterbodies' Visibility	Waterbodies' Visibility	5,26	Waterbodies' Visibility	3,26 to 7,26	-0.018	Waterbodies' Visibility	4,25 to 8,25	0.008	Waterbodies' Visibility	8,5	6,5%	Waterbodies' Visibility	4,5 to 8,5	0.005
Roads' connection and urban services or commerce	Map of Potential Interaction of Urban Nodes	Potential Interaction of Urban Nodes	5,26	Potential Interaction of Urban Nodes	3,26 to 7,26	0.132	Potential Interaction of Urban Nodes	4,25 to 8,25	0.131	Potential Interaction of Urban Nodes	8,8	6,8%	Potential Interaction of Urban Nodes		0.054
Bus lines	Map of Bus Lines' Quantity	Bus Lines' Quantity	5,26	Bus Lines' Quantity	3,26 to 7,26	0.366	x	x	x	x	x	x	x	x	x
Lots' limits, block contours and land use	Map of Residence Concentration	Residence Concentration	5,26	Residence Concentration	3,26 to 7,26	0.411	x	x	x	x	x	x	x	x	x
Roads' grid, hierarchy, type, width and pavement	Map of Roads' Hierarchy	Roads' Hierarchy	5,26	Roads' Hierarchy	3,26 to 7,26	-0.367	x	x	x	x	x	x	x	x	x

Tab. 1 Comparative use of urban data, products generated and results obtained

4 DISCUSSION

When we compare the maps produced, it is possible to understand that the models indicate the same regions as attractive areas and as vulnerable ones. This means that what is recognized as the best region for walkability in terms of technical approach (the first list of variables composed with equal weights) is also the best region in a MCA study with more robust results and going deeper on defining the best variables eliminating those that do not have a behavior that follow the others. The significant difference between the first and the last results is the quality of details and selection of main variables and conditions. Many researchers finish their tasks on the first step, presenting their opinions about the main variables and the final results. Others go further and try to simulate technical opinion but also citizens' way of thinking, constructing different methods of selecting variables and their weights, which can be done by visual driven, data driven or knowledge driven evaluations (Motta et. al, 2017; Moura, 2007; Moura et al., 2018). But the contribution of this paper is to include Sensitivity Analysis in order to recognize which variables really interfere on final results of an integration of values, and to eliminate those that the researcher believes have some importance, but on the case study, they behave in a robust distribution of conditions.

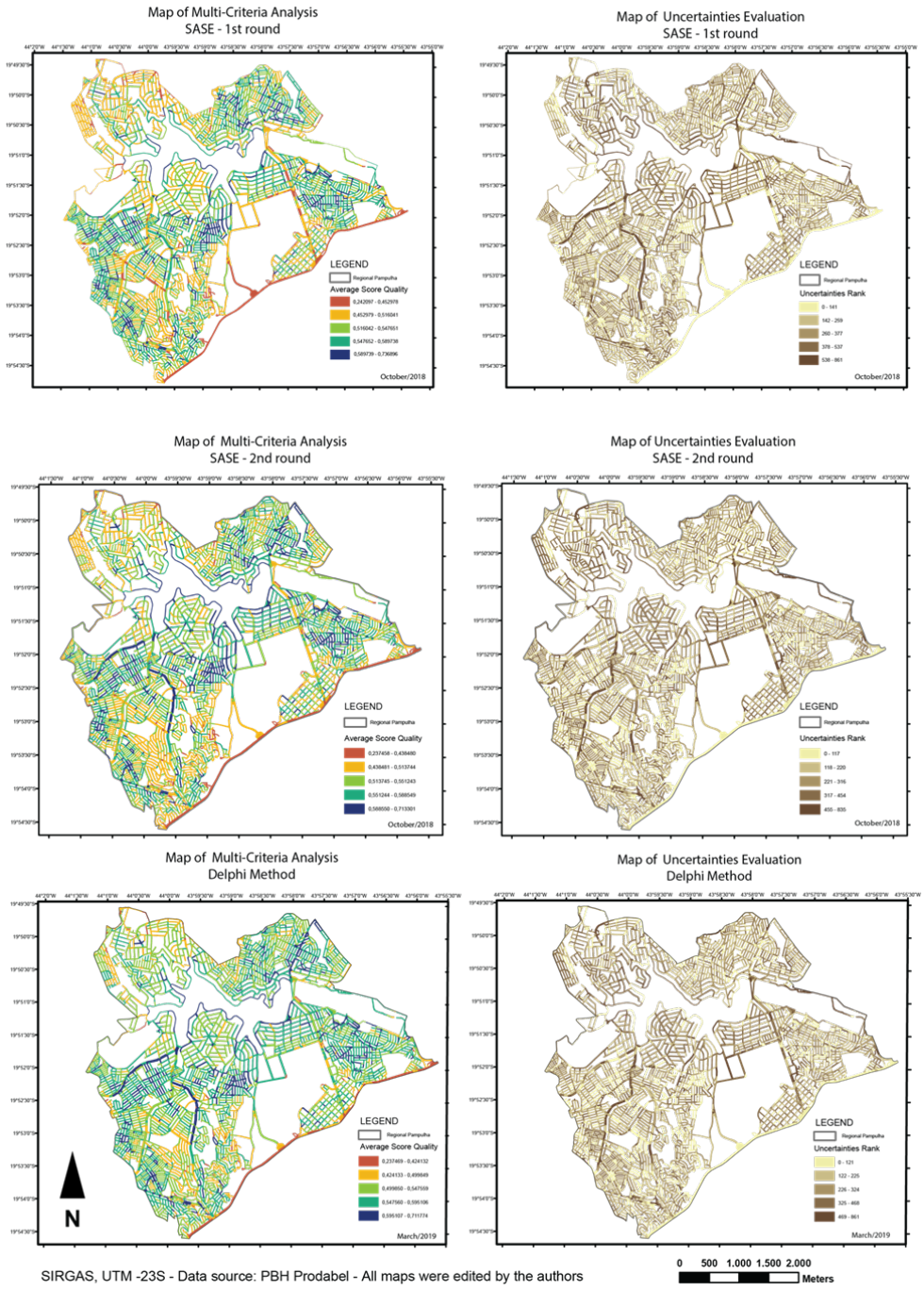

Fig. 3 Multi-Criteria (Suitability) and Uncertainty (Sensitivity) Evaluation Maps

The paper is a step further on multi-criteria analysis, utilizing the SASE methodology (Sensitivity Analysis to Suitability Evaluation) proposed by Ligmann-Zielinska and Jankowski (2012, 2014), with the goal to reduce the initial group of variables to a group of main variables, and also to spatialize uncertainty, to allow researchers to identify places where variables were not the way they expected it to be due to the variation of values. Using this model, it is possible to recognize areas in which there are the most certain attractiveness, areas with questionable attractiveness, and the researcher must go deeper on investigation; areas of certain vulnerabilities, or areas with questionable vulnerabilities that require further studies. The main product of the research so far is the method to go deeper on investigations and to produce steps of spatial analysis that represent knowledge driven (the way experts think) evaluation, to represent citizens' opinion and to compare them with the goal to achieve a first integration of analysis. It is a reproducible and defensible study that has as an output a more qualified spatial analysis. Once this portrait of reality is constructed, it will be time to

compare the results with the methods of CP, organized on web-based interview, with the goal to recognize the main characteristics people elected when they classify a place as presenting good quality of urban landscape and as suitable for walkability. This study is under development. Comparing the results of this step with previous ones, it will be possible to recognize the main variables that really relate to urban quality, and this can be considered on urban and landscape management and planning. Studies like these can be a support to the construction of opinion making, and also to decision making, as people can recognize the main characteristics that promote walkability in an area. The identification of conditions is a way to recognize the best places in the city, but mainly a method to select the main variables that can really interfere in quality of urban walkability and must be considered on plans to qualify places and services on urban areas. It has also a goal to encourage people to think about their common problems, values, and expectations.

ACKNOWLEDGEMENTS

Contribution to the project CNPq Universal Demand Call 1/2016, Process: 401066/2016-9, and FAPEMIG PPM-00368-18. We kindly thank the City Hall of Belo Horizonte for providing data (GGIU agreement), Prof. Clodoveu Davis Júnior for co-advising the research, the group of Prof. Ivan Blecic for contributing on the step of Citizens' Perception analysis that is under development, and also the students from Geoprocessing Laboratory for technical support on GIS (Débora Faria and Verônica Ramos).

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 2 (2019) 157-164
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6135

review paper received 28th May 2019, accepted 23th July 2019

www.tema.unina.it

How to cite item in APA format:
Ladu, M., Balletto, G. & Borruso G. (2019). Sport and the City, between urban regeneration and sustainable development. The Cagliari case study. *Tema. Journal of Land Use, Mobility and Environment, 12*(2), 157-164. doi: http://dx.doi.org/10.6092/1970-9870/6135

SPORT AND THE CITY, BETWEEN URBAN REGENERATION AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

Sport has always played a prominent role in civil society. Although it has been conceived as a strategic political means throughout history, nowadays sport is considered a positive force in achieving sustainable development. The international documents recognize the contributions it makes to health, education and social inclusion objectives. Anyway, the analysis concerning the relationship between sport and the city should consider both social and physical aspects because people are progressively understanding the city as an ideal palimpsest for sports activities. In this regard, the new phenomenon called "street sport" represents a real challenge for urban governance and planning.

The present study focuses on policies and urban design projects adopted by Cagliari City Council to make Cagliari a great Sports City. Cagliari has unique environmental, geographical and climatic features which allow to promote sport activities throughout the year. Moreover, in the recent years the City has realized significant interventions, both on a local and on a regional scale, as the operation - on going - of refurbishment and reconstruction of the new Stadium.

Within this favourable condition, the authors examine the community perception on benefits that sport provides for human well-being and for city development through the administration of a specific questionnaire. The outcome of this survey highlights to what extent citizens recognize Cagliari as a Sports City and gives interesting suggestions for the definition of shared policies and actions able to assume sport as a lever of sustainable development in the future.

KEYWORDS:
Sport in the city; Sustainable Development, Sport Governance

TeMA
有关土地使用、交通和环境的杂志

TeMA 2 (2019) 157-164
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介于城市再生和可持续发展之间的体育运动与城市

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摘要

古往今来，体育运动在文明社会中都发挥着突出的作用。虽然在人类历史上，体育运动一直被视作一项重要的政治手段，但现在更多地认为它是一种实现可持续发展的积极力量。国际上通过文件认定了体育运动在实现卫生保健、教育和社会包容性等方面所作出的积极贡献。
无论如何，针对体育运动与城市之间的关系开展的分析，应该考虑社会和物质两方面，因为人们逐渐将城市作为体育活动的一种理想载体。在这方面，“街头运动”这一新生事物是对城市管理和规划提出的真正挑战的典型代表。
本研究的重点是卡利亚里市议会为将卡利亚里打造成著名运动都市而开展的政策和城市设计项目。卡利亚里拥有独特的环境、地理和气候条件，适宜于全年开展体育运动。而且最近几年，这座城市已经在当地和地区一级采取了多项重大干预措施，`以促进在建新体育场的整修和重建工作。
鉴于这一有利条件，本文的作者们通过实施针对性的问卷调查，研究了人们对体育运动为人类福祉和城市发展所带来益处的普遍看法。该调查的结果强调了市民们对卡利亚里作为体育城市的认知程度，并针对共同政策的定义和将体育运动作为未来可持续发展杠杆的行动提出了几项颇吸引关注的建议。

关键词:
城市体育运动; 可持续发展; 体育运动管理

1 INTRODUCTION

Sport has always played a very important role in civil society, becoming progressively a clear expression of different cultures and communities' lifestyles throughout history. It has been conceived as a strategic means to achieve positive and negative political goals since ancient times. As a matter of fact, sport has been assumed as an educational and population control practice but also as a means of propaganda and amplification of the differences between ethnic groups (Balletto & Borruso, 2018b). Several dictatorships have often promoted and sustained sport and the related public events for their self-celebration (Strazzeri, 2018) reaching the maximum epilogue during the Fascist era, up until the Cold War (Balletto & Borruso, 2018a). More precisely, the realisation of sports facilities, as a significant component of the broader "public city", has become a direct expression of political ideologies and aspirations (Balletto & Borruso, 2018b). Nowadays, sport is considered an essential enabler in improving people's health and well-being and in pursuing sustainable development of our cities and regions. The 2030 Agenda for Sustainable Development (UNGA, 2015) states that:
«*37. Sport is also an important enabler of sustainable development. We recognize the growing contribution of sport to the realization of development and peace in its promotion of tolerance and respect and the contributions it makes to the empowerment of women and of young people, individuals and communities as well as to health, education and social inclusion objectives*».
This is a crucial principle which requires to integrate sport into social, economic and environmental urban policies, as well as into urban governance and planning (Lindsey & Darby, 2018).

2 TOWARDS A STRONGER RELATIONSHIP BETWEEN SPORT AND THE CITY

Most cultural principles assumed at the international level to strengthen the relationship between Sport and the City and to highlight the role of sport in pursuing sustainable development have been introduced in Italy to inform the political agenda (Clark et al., 2018). Over the past years, the Italian Government and the CONI (Italian National Olympic Committee) have promoted policies to sustain a comprehensive regeneration of existing sports facilities in peripheral areas, aimed at facing economic and social imbalances as well as urban security issues in deprived areas through specific material and immaterial actions aimed to increase sports activities and the related culture. Anyway, the quest for a closer relationship between sport and the city should be analysed taking into account both social and physical aspects. Nowadays more and more people prefer playing sport according to their personal needs and interests, in different places and at different times, understanding the city as an ideal palimpsest for sports activities (Balletto & Borruso, 2018b). This is a new challenge for urban governance and planning: sport has to be integrated into a broader urban regeneration and sustainable development strategy (CNAPPC, 2015). Urban transformation and regeneration programs, from Mega Events to local and neighbourhood scale, should guarantee a network of spaces and sport facilities able to embrace the new phenomenon called "street sport" (Clark et al., 2018), which stimulates virtuous behaviours and healthy lifestyles (Turner & Carnicelli, 2017). Therefore, the action of sport in urban areas should follow two main directions, not alternative but necessarily complementary. On the one hand, there is certainly space for the large-scale facilities required for the Mega Events which cyclically involve cities and capitals all over the world. Mega Events have often been the occasion to realize great projects (Smith et al., 2019), to allow certain sporting practices and to promote urban regeneration processes - even if not always effective. In this regard, as a matter of example, Italy has been involved in the important operations on stadiums for the World Cup Italia '90. At the same time, it is increasingly important to consider also the local and neighbourhood scale, where existing sport facilities and the still fragmented system of open spaces and green areas could prove to be strategic in defining a network of urban centralities and paths where sport, leisure and cultural activities will reinforce the relationship between sport and the city. According to the theoretical issues above discussed, the objective of the present study is to evaluate the sport attractiveness of Cagliari.

The research consists of two phases, an analytical and a more operational one. The first phase analyzes the peculiar geographical, environmental and climatic features of Cagliari and the framework of public interventions and initiatives carried out to promote sport throughout the City, focusing on two categories of actions:

- material actions - large-scale development projects and operations of redevelopment and enhancement of urban areas and routes;
- intangible actions - public events and bottom-up initiatives.

The operational phase, instead, examines to what extent citizens recognize Cagliari as Sports City and the community perception on benefits that sport provides for human well-being and for city development through the administration of a specific questionnaire.

The metropolitan city of Cagliari, with its system of nodes of various ranks and specializations, connected to the networks of urban parks, squares, boulevard and promenade, appears particularly attractive to the "street sport" (Balletto & Borruso, 2018a). This favourable condition has led Cagliari City Council to recognize the role of sport in the political agenda, promoting and supporting policies hopefully continuing in the future with a stronger participation of the local communities.

3 URBAN POLICIES FOR CAGLIARI-STREET SPORT, BETWEEN LAND AND WATER

Over the last years, Cagliari City Council have promoted a significant program of interventions and initiatives to establish sport as an essential enabler in pursuing sustainable development goals.

The political agenda has been defined according to the cultural principle that sport encourages healthy habits and spreads civic values, thus becoming an essential activity for the personal growth of people (Kiuppis, 2018). Moreover, the local government strategy is based on a deep awareness of the peculiar environmental, geographical and climatic features of the City, which make it an attractive place to play different types of sport and outdoor activities for more than 300 days a year (Comune di Cagliari, Dossier candidatura Città Europea dello Sport, 2017).

Thanks to these favourable conditions, Cagliari has been designated *European City of Sport 2017* by ACES Europe (European Capitals and Cities of Sport Federation), up to become the *Best European City of Sport 2017* (Comune di Cagliari, Report attività, 2017). In addition, Cagliari was a candidate for hosting the sailing regattas of the *2024 Olympic Games* in Rome - candidature resumed – (Comune di Cagliari, Dossier candidatura sede regate veliche). It must be acknowledged that Cagliari has been elected *European City of Sport* also by virtue of the several interventions carried out by the Local Administration, together with private investors, voluntary sports organisations and other associations and sports clubs. The City offers a rich and widespread system of outdoor and indoor sports facilities (over 150) where people can play a variety of activities, including team sports, gymnastics, popular sports such as football, volleyball, basketball, up to niche sports (Comune di Cagliari, Dossier candidatura Città Europea dello Sport, 2017) (Fig. 1). The Municipality represents still today the main public institution involved in the local sports governance and is constantly committed to integrating sport into important urban transformation and regeneration processes, both at a local and territorial scale.

Some strategic operations - completed, under construction or planned -, are worthy of attention (Fig. 1):

- the urban redevelopment of the beachfront (Lungomare Poetto), conceived as a linear promenade for walking, running, cycling, socializing, enjoying the view and for other similar activities;
- the - on going - refurbishment and reconstruction of the new Stadium of Cagliari, a smart sports arena close to the sea and well-connected with the existing urban centralities and networks (Balletto & Borruso, 2018a);
- the redevelopment scheme of the green spaces in the Sant'Elia district, recently become a new urban park (Parco degli Anelli) with areas for sports and leisure activities, fitted with green spaces, pedestrian and cycle paths;

- the Quayside redevelopment project, which consists of a wide pedestrian promenade along the historic port, linked to the promenade along the seafront (Passeggiata Su Siccu);
- the installation of the Luna Rossa' headquarter in the historic port (Molo Ichnusa), in preparation for the 36th edition of the America's Cup

Fig. 1 Cagliari street sport: land and water. The system of sports facilities in Cagliari and the main strategic projects - completed, under construction or planned -. Source: Elaboration of Ginevra Balletto and Giuseppe Borruso, 2018

In addition to these operations, in recent years the Municipality has organized or endorsed several sports events such as *AteneiKa*, *Cagliari respire* and *SoloWomenRun* which are progressively involved more and more people (Comune di Cagliari, Dossier candidatura Città Europea dello Sport, 2017). The significant program of material and immaterial actions carried out has been recently confirmed by the *Il Sole 24 Ore survey - Sportiness index 2018*, referred to the 107 Italian provinces, where Cagliari has reached the third place in the top 20 ranking.

According to the criteria established by the survey, Cagliari is:

- the 2nd in the Category "Sports index" (Indice di sportività);
- the 1st in the Category "Team Sport" (Sport di squadra);
- the 24th in the Category "Individual Sports" (Sport individuali), even if proves to be more attractive to play swimming, tennis, water sports and other indoor sports;
- the 5th in the Category "Sport and Society" (Sport e Società), reaching good performances in the sub-categories of sports and children, sports media and women's sports, while could do something more to improve its position as regard sport and nature and sport and tourism.

4 CAGLIARI AS A CITY OF SPORT? FIRST RESULTS OF A RESEARCH AND FUTURE PERSPECTIVES

A research has been carried on by means of a questionnaire, targeted towards people and organizations involved in sport activities. This has been done in order to better understand the role played by sport in the City of Cagliari, both referred to the lifestyles of the population and to the awareness that the population itself

developed about the importance of playing sport and having an active attitude to improve the quality of life and at the same time boost economic and social development of a territory. The choice of developing a questionnaire on a theme as 'city and sport' was done by two authors of the present paper, aimed at understanding the relationship between city and sport in the perception of big events - as well as ordinary ones - as possible means of urban transformation and regeneration.

The research has been developed following a parallel approach, preparing two questionnaires for the two cities of Cagliari and Trieste. The two questionnaires share a common, general section, and then have been developed with different sections adapted to better fit the peculiarities of two different urban contests: the sailing race 'Barcolana' in the case of Trieste, an event that characterize the city as a major event, and the possible other events to be implemented in the city; the city of Cagliari as 'The City of Wind', with its potential of becoming an attractor for sailing activities, following the fact it hosts the Luna Rossa Team. The questionnaire has been developed by means of a Google Form and distributed over a community of selected users, identified among people active in sport, both as amateur and professionals, and as managers of sporting activities. People were therefore motivated in filling in the questionnaires, and other 300 forms have been collected in the period of time between 9 May 2018 and 30 October 2018.

The majority of respondents are male (more than 60%), born in the City of Cagliari and its hinterland, of an age between 26 and 60 years. Around 80% stated practicing sport activities regularly, mainly individually (67.6%) and as amateurs (48.4%). Team sports and activities practiced by people registered in sport associations follow as preferred way of practicing. It is interesting to observe the preference of people for individual sport activities, demonstrating a growing trend in contemporary society of managing and organizing its own physical, sport activities in an autonomous way, according to particular needs and personal interests, and also, as a possible consequence of the good supply of urban spaces and natural areas - as humid areas and coast areas - suitable for practicing these activities. That seems to be confirmed by analysing the main sports practiced, as Sailing//Windsurf/Kitesurf, Running and similar, following by Bike (road and mountain), Swimming and Soccer. Low percentages have been registered for Body building, Tennis, other water sports, martial arts and Beach tennis. The questionnaire reveals also the weight that sport has in the life of people in terms of time and costs. The time dedicated to sport during the week is on average 2 to 3 hours (31.4%) and among 4 and 5 (34.2%), to reach a timeframe bigger than 6 hours (22.6%). Only 11.8 % of interviewees dedicate less than 1 hour per week to sport. About costs, 37.4% spends more than 500 euro per year, nonetheless a certain number of people seem spending less than 100 euros per year (21.3%). Again, another suggestion to confirm the capacity offered by the city to practice open air sports - namely street sports - and not necessarily in dedicated infrastructures. The parts of the city more directly interested by sport activities and by the related ones have been identified in the Poetto area, in the urban seaside promenade and in the parks (Molentargius, Monte Urpinu, etc.). The questionnaire highlighted also the widespread awareness of the benefits coming from sport events at different scales. The 96% of interviewees declares that sport events are particularly important for the well-being of people and for enhancing the image of the city. Furthermore, more than 80% agrees on the fact that sport plays a relevant role for the economic development of the city. Many respondents agree on the need to extend sport events in time, involving also other parts of the city, other than those favoured and already widely used (Fig. 2).

5 CONCLUSIONS

The present study has assessed the sporting attractiveness of the city of Cagliari.

The results of the questionnaire have confirmed Cagliari as a place that is highly suitable for welcoming the phenomenon of street sport, in line with the findings of the Il Sole 24 Ore survey. Anyway, the challenge is to make the City more sustainable and "fit for sport".

In this regard, some interviewees presented interesting proposals for the future. First of all, the general awareness of the main geographical, environmental and climatic characteristics of Cagliari suggests marketing activities at national and international level to enhance the sports offer in a highly favorable landscape, but also a major integration between sport governance and environmental policies. According to the sub-categories Sport and Nature and Sport and Tourism of the Il Sole 24 Ore survey, Cagliari are ranked 10th and 16th respectively.

This data suggests that new actions are necessary to overcome this gap, even starting from the indications coming from the local community.

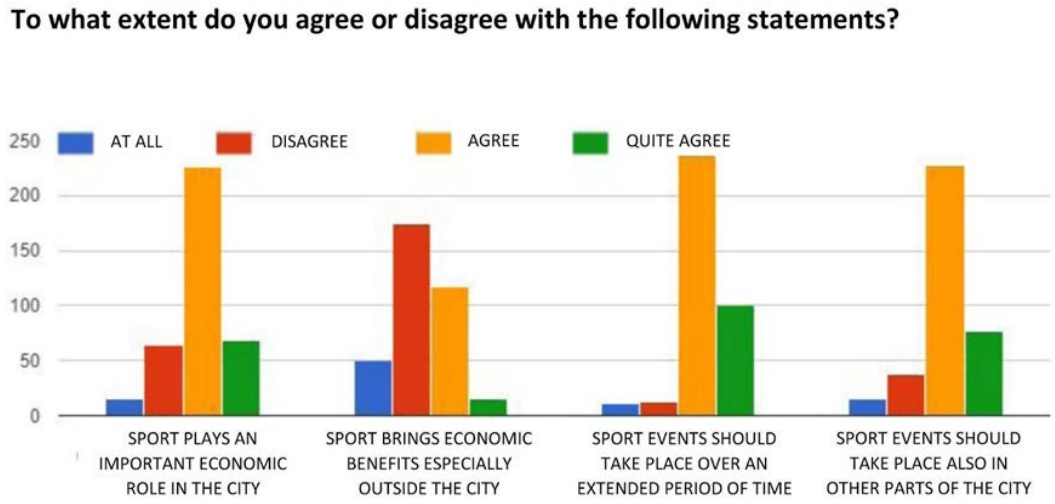

Fig. 2 Perception of interviewees about the economic importance of sport and sport events. Source: Questionnaire developed by Balletto and Borruso, 2018

Other respondents highlight actions to enhance the benefits deriving from the correlation between sport, wellness and social inclusion, such as:

- sports and suburbs;
- redevelop before building new sports facilities;
- make the local community aware of the importance of sport;
- internationalization of sporting events and events.

To conclude, the results of the questionnaire offered important suggestions for the implementation of the program of material and immaterial actions necessary to confirm Cagliari as a city of sport in the near future. In this sense the active involvement of the local community is fundamental to manage and strengthen the sport-city link and to define a shared model of sustainable social, economic and environmental development, as indicated by the Agenda 2030.

ACKNOWLEDGEMENTS

This study is endorsed by Sportium scrl (Milan), a specialized design consortium that has signed (10 September 2018) a memorandum of understanding with the University of Cagliari for all the design phases the new stadium of Cagliari.

This paper is the result of the joint work of the authors. In particular: paragraph 1, have been written by Ladu M.; paragraphs 2, have been jointly written by Ladu M. and Balletto G., paragraphs 3 and 4 have been jointly written by the authors Ladu M., Balletto G. and Borruso G.; Conclusion have been jointly written by Ladu M. and, Balletto G.

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TeMA Journal of Land Use, Mobility and Environment

TeMA 2 (2019) 165-178
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6118

review paper received 23th May 2019, accepted 24th July 2019

www.tema.unina.it

How to cite item in APA format:
Ustaoglu, E. & Aydınoglu, A.C. (2019). Land Suitability Assessment of Green Infrastructure Development: A Case Study of Pendik District (Turkey). *Tema. Journal of Land Use, Mobility and Environment*, *12*(2), 165-178. doi: http://dx.doi.org/10.6092/1970-9870/6118

LAND SUITABILITY ASSESSMENT OF GREEN INFRASTRUCTURE DEVELOPMENT

A CASE STUDY OF PENDIK DISTRICT (TURKEY)

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ABSTRACT

Urban green space, an integral part of urban ecosystems, provides important environmental and social services that mitigate environmental problems caused by rapid urbanisation and urban sprawl. Urban planning and policy aim at optimising the benefits obtained from urban green spaces. The analytic hierarch process (AHP) is a commonly used technique for suitability assessment of land uses. The traditional AHP method is criticised for its subjectivity and uncertainty. Considering this, Fuzzy-AHP has been introduced as an advanced methodology in dealing with the uncertainty in the decision making process. In this study, we compared the two methods of AHP and fuzzy-AHP integrated with Geographic Information Systems (GIS) for the suitability assessment of Pendik district, Istanbul regarding green space development. First, criteria and sub-criteria were determined and the corresponding weights were assigned based on literature and experts' knowledge. This is followed by preparation of spatial maps integrated with the corresponding weights and development of final suitability maps in both methods of AHP and fuzzy-AHP. Our results show that high suitability areas are mainly distributed in the southern part of Pendik district around the existing urban green infrastructure. In both maps obtained from AHP and fuzzy-AHP, more than 30 percent of the study area has the potential for green space development.

KEYWORDS:
Urban Green Space; Land Suitability Analysis; AHP; Fuzzy-AHP; GIS; Turkey

TeMA
有关土地使用、交通和环境的杂志

TeMA 1 (2019) 165-178
print ISSN 1970-9889, e- ISSN 1970-9870
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开发绿色基础设施的土地适宜性评估

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摘要

城市绿色空间作为城市生态系统的一个组成部分，为我们提供了能缓解快速城镇化和城市扩张所带来的环境问题的重要环境和社会服务。城市规划和政策的目标，是对城市绿色空间创造的效益进行优化。层次分析法（AHP）是一项常用的土地利用适宜性评估技术。传统的AHP法因其主观性和不确定性而备受批判。考虑到这一点，我们引入了模糊层次分析法，作为处理决策过程不确定性的一种更高级的方法。本研究对比了两种方法：AHP法和模糊AHP与地理信息系统（GIS）相结合的方法，将其分别用于评估伊斯坦布尔彭蒂克区的绿色空间开发适宜性。首先，基于文献和专门知识，确定一级和二级准则，并指定相应的权重。然后，根据相应权重绘制空间地图，`并用AHP和模糊AHP法分别绘制最终的适宜性地图。我们的研究结果显示，适宜性较高的区域主要分布在彭蒂克南部现有城市绿色基础设施的周边地区。在通过AHP法和模糊AHP法分别制成的两个地图上，具有绿色空间开发潜能的研究地区都超过30%。

关键词:
城市绿色空间；土地适宜性分析；层次分析法；模糊层次分析法; 地理信息系统; 土耳其

1 INTRODUCTION

Since cities face with rapid urbanisation that is associated with urban sprawl and the decrease of urban green space, there is increased pressure on urban ecological environment. Urban green spaces, an important part of urban ecosystems, provide significant benefits that contribute to preservation of biodiversity and quality of life in urban areas (Sreetheran, 2017; Uy & Nakagoshi, 2008). Urban green spaces generally improve urban environmental conditions by regulating temperature and microclimates, sequestering CO_2, reducing air pollution and noise, maintaining diversity, and providing recreational and social values (Armson, Stringer & Ennos, 2013; Hamada & Ohta, 2010). Development of urban green spaces has become an integral part of any urban policy and city planning. Determining suitable locations for urban green infrastructure (UGI) development is therefore an important task to support urban policy and planning aimed at improving urban ecological environment (Li et al., 2018; Zhou & Wang, 2011).

Land suitability analysis specifies the degree of land usefulness for potential land development by land requirement and qualities (Malczewski, 2004). Multi-criteria evaluation (MCE) method that is integrated with Geographical Information System (GIS) has been increasingly used for land suitability analysis. MCE focuses on different criteria such as bio-physical, socio-economic and policy related factors in decision making process to assess different land problems considering the alternatives (Pramanik, 2016). GIS is a technique to investigate the geo-spatial data with great flexibility and high precision in the land suitability assessments (Malczewski, 2006). Therefore, the integrated methodology where the MCE method is integrated with GIS involves utilisation of geographical data and assessment of various criteria based on decision makers preferences and specified decision rules (Malczewski, 2004).

Analytic hierarchy process (AHP), first developed by Saaty (1980), is a multi-criteria decision making model that composes complex decision making problems of land management (Malczewski, 2006). In the traditional AHP, the weight of importance of different land uses is determined based on pairwise comparisons of different parameters considered in the analysis. AHP is criticised due to its inability to deal with complexity and uncertainty of the evaluation parameters. Regarding real world problems, some of the decision data can be precisely assessed while some others cannot. In Leung and Chao's (2000) explanation, the uncertainty in preference judgements give rise to uncertainty in the ranking of alternatives and difficulty in assessing consistency of the preferences. Fuzzy-AHP has been introduced as an advanced methodology in dealing with the uncertainty and vagueness of the mathematical terms developed in the decision making process. The current study focuses on comparison of the two MCE methods (i.e. AHP and fuzzy-AHP approaches) integrated with GIS to assess the suitable sites for urban green infrastructure (UGI) development in Pendik district which is located in eastern part of Istanbul, Turkey. Considering adverse impacts of rapid urbanisation and high rates of population growth observed in Pendik, it is vital to assess and plan suitable sites for green space development in the area.

2 METHODOLOGY

2.1 SPECIFICATIONS AND ASSESSMENT OF CRITERIA

To acquire suitable land for amenity-led growth, local environmental and socio-economic conditions are essential factors. Opportunities for UGI development are related to environmental features like geophysical limitations, topographical and climatic features, proximity to lakes and rivers, and attractive landscapes due to their aesthetic value (Van Berkel & Verburg, 2012). Physical features can become amenities through the provision of protected areas, and the construction of urban green facilities that are linked to local demand for recreation and leisure activities (Van Berkel et al., 2014). Transportation infrastructure that increases accessibility to amenities is also of great significance. Therefore, recent land-use/cover and other

environmental and geophysical data are required for the identification of suitable amenity-led growth (Pramanik, 2016).

To identify the most suitable sites for green infrastructure development, the study focuses on 5 main criteria and 17 sub-criteria which were prepared as GIS-based layers. The selection of the criteria is based on a comprehensive literature review, expert opinions and specific conditions observed in the region (Tab. 1). The ranks of each criterion were determined based on the literature provided in the last column of Tab. 1 by using (1-7) scale. Weighting to sub-criteria was performed based on pair-wise comparison technique in AHP and using fuzzy-AHP values.

Weighting in analytic hierarchy process

As a decision analysis tool, AHP was first developed by Saaty (1980) for analysing complex decisions involving different criteria. In AHP, a matrix is generated as a result of pair-wise comparisons which help decision makers to assign different levels of importance of factors included in the analysis. The assigned ranks (1-7) indicate the strength and dominance of the criterion (Tab. 2). There are four steps for the calculation of weights in pair-wise comparison matrix (PCM) (Zolekar & Bhagat, 2015): (1) formation of judgements, (2) calculation of assigned ranks, (3) development of normalised pair-wise comparison matrix, and (4) calculation of weights. Accordingly, the cell values of PCM are divided by sum of each column and averaged across rows to calculate weights for each criterion. Consistency ratio (CR) is used for the determination of accuracy of the calculated weights (Saaty, 1980). In Saaty's (1980) explanation, the CR has the upper limit value of 0.10 implying that the values greater than 0.10 are inconsistent. In the present analysis, the CR is 0.07 therefore we concluded that there is no inconsistency of the judgements and the selected criteria are acceptable.

Weighting in fuzzy analytic hierarchy process

There is vast literature indicating that comparison ratios are imprecise judgements. According to Leung and Chao (2000), the fuzziness and vagueness in the preference judgements of decision makers in conventional AHP approaches leads to uncertainty in the ranking of alternatives, and causing difficulty in determining consistency of preferences. Fuzzy-AHP has been developed as an alternative to traditional AHP approach is considered as an advanced analytical method. According to fuzzy theory, any field X and theory Y can be fuzzified by replacing the concept of a crisp set in X and Y by that of a fuzzy set (Isabels & Uthra, 2012). A fuzzy set can be defined by assigning each individual in the universe of discourse a value representing its grade of membership in the fuzzy set. The fuzzy membership function is defined from X to $[0,1]$.

Fuzzy-AHP is based on a series of pair-wise comparisons indicating the relative preferences of between pairs of criteria in the same hierarchy. Using triangular fuzzy values for the linguistic variables, the fuzzy pairwise comparison matrix $X = (x_{ij})$ is constructed. The ratio for the pair-wise comparisons indexed i and j can be modelled through a fuzzy scale value.

Each element of X is a fuzzy number defined as:

$$X = (x_{ij}(l_{ij}, m_{ij}, u_{ij}))$$

Where:

- l is the lower limit value;
- m is the most possible value;
- u is the upper limit value.

MAIN CRITERIA	SUB-CRITERIA	SCORE	REFERENCES
Geo-physical			
Slope (degree)	2-5	7	Li et al., 2018; Dagistanlı et al., 2018
	5-10	6	
	10-15	5	
	15-20	4	
	>20	3	
Elevation (m)	0-100	7	Bunruamkaew & Murayama, 2011
	100-300	4	
	>300	1	
Aspect	135-225	7	Mahdavi & Niknejad, 2014; Pramanik, 2016
	45-135	5	
	225-315	3	
	315-45	1	
Erosion risk	Very low or low	7	Dagistanlı et al., 2018; Piran et al., 2013
	Moderate	5	
	High	3	
	Very high	1	
Land capability	Hard rocks	7	Peng et al., 2016; Piran et al., 2013
	Rocks	6	
	Soft rock, very dense soil	5	
	Stiff soil	4	
	Soft soil	3	
	Others	1	
Accessibility			
Distance from highways (m)	<2000	7	Bunruamkaew & Murayama, 2011
	2000-5000	4	
	>5000	1	
Distance from roads (m)	<200	7	Yousefi et al., 2016
	200-300	6	
	300-400	5	
	400-500	4	
	500-600	3	
	600-700	2	
	>700	1	
Distance from bus stops (m)	<300	7	Yigitcanlar et al., 2007
	300-400	6	
	400-800	5	
	800-1000	4	
	1000-1200	3	
	>1200	2	
Distance from metro stop (m)	<600	7	El-Geneidy et al., 2014
	600-800	6	
	800-1000	5	
	1000-1200	4	
	1200-1400	3	
	>1400	2	
Blue and green infrastructure			
Distance from reservoir (m)	<250	7	Dagistanlı et al., 2018; Kienast et al., 2012
	250-500	6	
	500-750	5	
	750-1000	4	
	1000-1500	3	
	1500-2000	2	
	>2000	1	
Distance from water courses (m)	<50	7	Kienast et al., 2012; Li et al., 2018
	50-100	6	
	100-300	5	
	300-500	4	
	500-700	3	
	700-1000	2	
	>1000	1	
Distance from coastline	<50	7	Li et al., 2018
	50-100	6	
	100-300	5	
	300-500	4	
	500-1000	3	
	1000-2000	2	
	>2000	1	

MAIN CRITERIA	SUB-CRITERIA	SCORE	REFERENCES
Distance from urban green (m)	<100	7	Li et al., 2018; Morckel, 2017
	100-300	6	
	300-500	5	
	500-1000	4	
	1000-1500	3	
	1500-2000	2	
	>2000	1	
Urban land			
Distance from commercial centers (m)	<250	7	Malmir et al., 2016; Zhang et al., 2013
	250-500	6	
	500-1000	5	
	1000-1500	4	
	1500-2000	3	
	2000-2500	2	
	>2500	1	
Distance from high density residential centers (m)	<100	7	Dagistanlı et al., 2018; Yousefi et al., 2016
	100-150	6	
	150-200	5	
	200-250	4	
	250-300	3	
	300-400	2	
	>400	1	
Vegetation			
Land use/land cover	Natural vegetation	7	Li et al., 2018, Mahdavi & Niknejad, 2014
	Water bodies	6	
	Forest	4	
	Agricultural land	3	
	Urban land use/ cover	2	
Agricultural land suitability	Very high	6	Steiner et al., 2000
	High	5	
	Moderate	4	
	Low	3	
	Very low	2	

Tab. 1 Weights of the criteria and sub-criteria in the study

RELATIVE IMPORTANCE	DEGREE OF PREFERENCES
1	Equal
3	Moderate
5	Strong
7	Very strong
9	Extreme
2, 4, 6, 8	Intermediate
Reciprocals	Less importance

Tab. 2 The rating scale for pairwise comparison matrix. Source: Saaty, 1980

Given the fuzzy theory, the membership function is defined as follows:

$$\mu(x) = \begin{cases} (x-l)/(m-l) & \text{if } l \le x \le m \\ (u-x)/(u-m) & \text{if } m \le x \le u \\ & \text{Otherwise} \end{cases} \quad (1)$$

The pair-wise comparisons are described by values that are converted into the following scale given in Tab. 3 including triangular fuzzy numbers (Fig. 1) developed by Chang (1996). More details on fuzzy theory can be seen in Chang (1996).

TRIANGULAR FUZZY SCALE	FUZZY NUMBERS	DEFINITION
(1,1,1)		Equal (E)
(1/2,1, 3/2)	1	Equally important (EI)
(1, 3/2, 2)	3	Weak (W)
(3/2, 2, 5/2)	5	Fairly strong (FS)
(2, 5/2, 3)	7	Very strong (VS)
(5/2, 3, 7/2)	9	Absolutely more important (AI)

Tab. 3 Triangular Fuzzy values used in the study. Source: Mahdavi & Niknejad, 2014

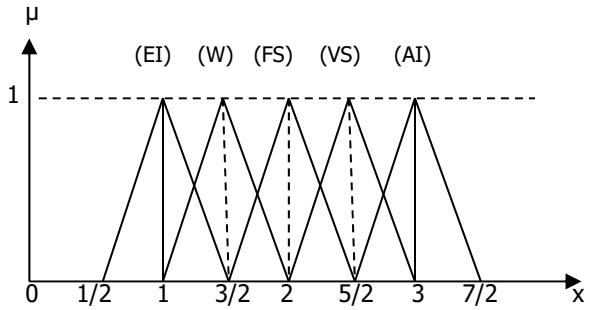

Fig. 1 Triangular fuzzy values representing the weight of each criterion. Source: Adopted from: Mahdavi & Niknejad, 2014

2.2 SUITABILITY EVALUATION

Following the development of final weights by AHP and fuzzy-AHP techniques, the suitability index was computed based on the sub-criteria considered in the analysis (Tab. 1). The suitability index was computed through weighted linear summation of different layers as shown in eq. (2).

$$S = \sum_{j=1}^{n} W_i R_{ji} \tag{2}$$

Where:

- S is the suitability score;
- n is the number of factors considered in the analysis;
- W_i is the weight of criterion i which was computed by using the AHP and fuzzy-AHP methods;
- R_{ji} is the value of pixel j in the map of sub-criterion i.

In our case, the value of the suitability score, S, ranges between 2 and 7 where a value close to 2 represents unsuitable land while 7 indicates extremely suitable. Arc GIS 10.4 model builder tool was used to develop a model of the green infrastructure suitability.

3 RESULTS

3.1 AHP AND FUZZY-AHP WEIGHTS

The weights of the sub-criteria obtained from the AHP and fuzzy-AHP methods are presented in Tab. 4. It can be noted that in AHP urban green infrastructure, current land use/cover and agricultural land suitability are the most effective criteria while physical attributes i.e. aspect, elevation and slope are the least effective ones. In fuzzy-AHP, urban green infrastructure, agricultural land suitability and land capability are associated with the highest weights; and similar to AHP, physical attributes are associated with the lowest weights. The ranks listed in Tab. 4 are relevant with the findings of the literature (Tab. 1).

CRITERIA	SUB-CRITERIA	AHP WEIGHTS	FUZZY AHP WEIGHTS
Geo-physical attributes	Aspect	0.021	0.016
	Elevation	0.02	0.011
	Slope	0.018	0.010
	Land capability	0.082	0.114
	Erosion risk	0.098	0.035
Accessibility	Distance from highways	0.03	0.029
	Distance from roads	0.028	0.023
	Distance from bus stops	0.044	0.056
	Distance from metro stops	0.039	0.052
Green and blue infrastructure	Distance from reservoirs	0.048	0.067
	Distance from coastline	0.047	0.064
	Distance from water bodies	0.048	0.067
	Distance from urban green areas	0.168	0.127
Urban land	Distance from industry/commerce	0.045	0.059
	Distance from high density residential areas	0.032	0.032
Vegetation	Current land use	0.12	0.113
	Agricultural land suitability	0.113	0.126

Tab. 4 Weights of sub-criteria for urban recreation land suitability evaluation

3.2 LAND SUITABILITY FOR GREEN INFRASTRUCTURE DEVELOPMENT

According to each criterion considered in the analysis, a map was prepared using the GIS software. Each GIS layer was classified following the classification of the related criterion provided in Tab. 1 and these are presented in Fig. 2. As described in Tab. 1, the highest suitability value is assigned for the most suitable class. For instance, in the case of slope, the slope lower than 5 is assigned with the highest suitability value. The maps in Fig. 2 were integrated using the corresponding weights with the application of weighted linear combination technique (eq. 2). Regarding final suitability, two different suitability maps were developed using the AHP and fuzzy-AHP methods. The suitability maps are provided in Fig. 3.

The results indicate that according to the AHP method, 2% of the area is highly suitable, around 15% is moderately suitable; 19% is marginally suitable and the rest has either low or very low suitability (Tab. 5; Fig. 3a). There is no high suitability class in the map produced from fuzzy-AHP method. Moderate suitability is 10% and marginal suitability is around 23% and the rest is lowly suitable for green infrastructure development (Tab. 5; Fig. 3b).

The results show that about 89% of pixels of the two maps were classified similarly. The results also indicate that more than half of the total area is classified as low suitability or very low suitability in both of the maps presented in Fig. 3. Around 35% of the total land is classified as suitable and these are mostly located in the southern part of the Pendik Region.

4 DISCUSSION AND CONCLUSION

In this study, land suitability for urban green infrastructure was assessed using AHP and fuzzy-AHP methods integrated with GIS. Seventeen factors including geo-physical characteristics, accessibility, blue and green infrastructure, urban land and vegetation were selected for the land suitability analysis. The weights of each sub-criterion were determined by using AHP and fuzzy-AHP methods separately. Two different land suitability indexes were calculated using the weighted additive combination model. Our findings from the suitability analysis are in line with the actual green infrastructure map in that main part of green infrastructure are located in highly and moderately suitable sites.

AHP is an example of multi-criteria decision making methodology that has been effectively used in multiple criteria problem solving and decision making. Decision making problems may contain socio-economic, physical and political factors requiring linguistic variables for multi-criteria decision assessment. In traditional AHP approach, numerical values of linguistic variables are used for the assessment of the subject criteria included in the analysis. The fuzziness and vagueness in the decision making process requires the use of fuzzy values.

Therefore, besides traditional AHP, we also used fuzzy-AHP approach for weighting the criteria that explain green infrastructure suitability in Pendik district. The study, in fact, evaluates and compares the results obtained from suitability analysis using AHP and fuzzy-AHP approaches. The AHP method had advantages and limitations: The method is flexible and can be integrated with different techniques such as linear programming, fuzzy logic etc. This makes it easier for the users to benefit from extensive options and achive the desired goals by more efficient means. However, there is a drawback of the methodology as it requires a questionnaire survey and expert opinions to conduct the measurement of the relative weights which makes the method more time consuming regarding the technical applications.

Further limitations of the method include insufficient knowledge for the area of interest, the reproducibility of the results and subjectivity of the weighting of the variables (Park et al., 2011). As described by Park et al. (2011) and Xu et al. (2011), there are alternative methods for the suitability assessment of land use development including frequency ratio (FR) model, logistic regression (LR), artificial neural network (ANN), and back-propagation neural network (BPNN) model. The FR model is simple as the calculation process and the inputs are easy to understand and the significance of factors explaining land use growth can be easily interpreted. The method is less time consuming in technical applications. The LR approach makes it possible to analyze the relationship between land use growth and its determinants quantitatively. To constract the underlying statistical relationship, the data in GIS environment needs to be converted to comply with the needs of the statistical program. The existence of big data may limit the performance of the statistical programme as it may not work well.

The ANN and BPNN models provide an improvement over the LR model as they make it possible to have more accurate analysis with a few training dataset. However, the models have some drawbacks such as difficulty in understanding the computation process, and the long calculation times and big volumes of calculation, which makes it less suitable for technical applications. Given this framework on the applications of alternative methodologies in UGI suitability assessment, we suggest the application of these methodologies using our structured data as a future research. This will allow us to compare the results of this work with those obtained from alternative approaches. From our findings we note that despite the differences in the methodology used for weighting the criteria, there is little difference in the weights obtained from AHP and fuzzy-AHP. Urban green infrastructure, agricultural suitability, current land use/cover and land capability were assigned with the highest weights whereas physical characteristics indicated the lowest weights. Overall, the weights of urban green infrastructure, agricultural land suitability, current land-use/cover and land capability accounted for almost half of the total weights assigned to sub-criteria. This has influenced the final suitability maps in that there is little difference in the suitability classifications obtained from AHP and fuzzy-AHP approaches. The results indicated that there is almost 90% coincidence regarding the suitability classes of the two maps of AHP and fuzzy-AHP. In the AHP, moderate and marginal suitability classes cover more than 40% of the area whereas using the fuzzy-AHP approach the study area results to be less suitable for green infrastructure development. According to the two maps produced, the southern part of the study area, along the existing urban green infrastructure corridor, is found suitable for future land development.

The site suitability maps obtained in this study are effective in assessing green infrastructure potential of the study area; and therefore can be utilised by local authorities and planners in their decision making and planning for the future site developments. Considering that there are small differences in the criteria weights obtained from AHP and fuzzy-AHP, for easiness of computation, we recommend using the AHP approach for the suitability assessment of green infrastructure development in Pendik district.

If the difference is higher concerning the AHP and fuzzy-AHP weights resulting in considerable differences in the suitability classifications in the maps, the use of fuzzy-AHP is recommended. Determination and assessment of the criteria for land suitability analysis can be affected from the differences observed between the evaluators e.g. experts, planners, policy makers and their characteristics. For instance, a pessimistic evaluator may not give any point more than five to assess a criterion; by contrast others may give more than

five even though it is irrelevant. This implies that there is fuzziness in the decision making process and fuzzy-AHP method can be effectively used to deal with the issue of fuzziness. Therefore, the proposed methodology of fuzzy-AHP is promising for land suitability assessment not only for green land development but also for other land uses. Apart from the weightings we applied in the AHP process, there are different approaches for the application of weightings and overlaying of GIS layers for developing the suitability map and we suggest to use them in the future research to compare the findings from current study. These include: Boolean overlay, Weighted Linear Combination (WLC) and Ordered Weighted Avaraging (OWA). According to the Boolean method, all the criteria are combined by logical operators such as intersection (and) or union (or) to produce discreate Boolean maps. WLC is an aggregation method where the factors are standardised to a common numeric range and then combined by weighted averaging.

The OWA method involves two different sets of weights: criterion imporatance weights and order weights. Through changing the order weights, it provides flexibility to develop a complete range of decision support maps (including cases of Boolean approach and WLC) and large variety of decision strategies (Romano et al., 2015). The details of these three approaches are provided in Romano et al. (2015).

The application and implementation of suitability analysis for the UGI development is important for the preservation of ecosystems and their functions as well as the structure of the landscape. It is therefore vital to construct such a conceptual framework and to have analysis of quantitative research to be performed for each individual green space in our case study area. As argued by Hobbs and Saunders (1990), preserving individual green space is a temporary solution and without continuity and connectivity of green spaces through the creation of corridors and urban greenways, isolation and loss of genetic diversity is inevitable.

This has not been considered in the current plans and applications in our case study area which resulted in green spaces be more fragmented and isolated. This would lead to reduction in green spaces and the quality of ecosystem services where urban environmental issues will become more serious.

The combination of different green spaces to construct a green space network is therefore highly significant in the UGI planning considering that it is difficult to use one or few of the green spaces to maintain all the benefits of greening in urban areas (Uy & Nakagoshi, 2008). Such comprehensive green space framework can constract a theoratical basis for the practices and applications of organising UGI at different scales aiming at supporting a number of key landscape ecology requirements in our study area.

		SUITABLE AREAS (USING AHP)			SUITABLE AREAS (USING FUZZY-AHP)		
SUITABILITY	SUITABILITY SCORE	TOTAL PIXELS	AREA (sq. KM)	AREA (%)	TOTAL PIXELS	AREA (sq. KM)	AREA (%)
Very low	2	44309	39.88	22.41	38798	34.92	19.62
↓	3	87475	78.73	44.24	94532	85.08	47.81
↓	4	37066	33.36	18.75	44608	40.15	22.56
↓	5	28843	25.96	14.59	19775	17.80	10.00
High	6	20	0.02	0.01	0	0	0

Tab. 5 The area and percentage of different suitability classes developed from AHP and fuzzy-AHP methods

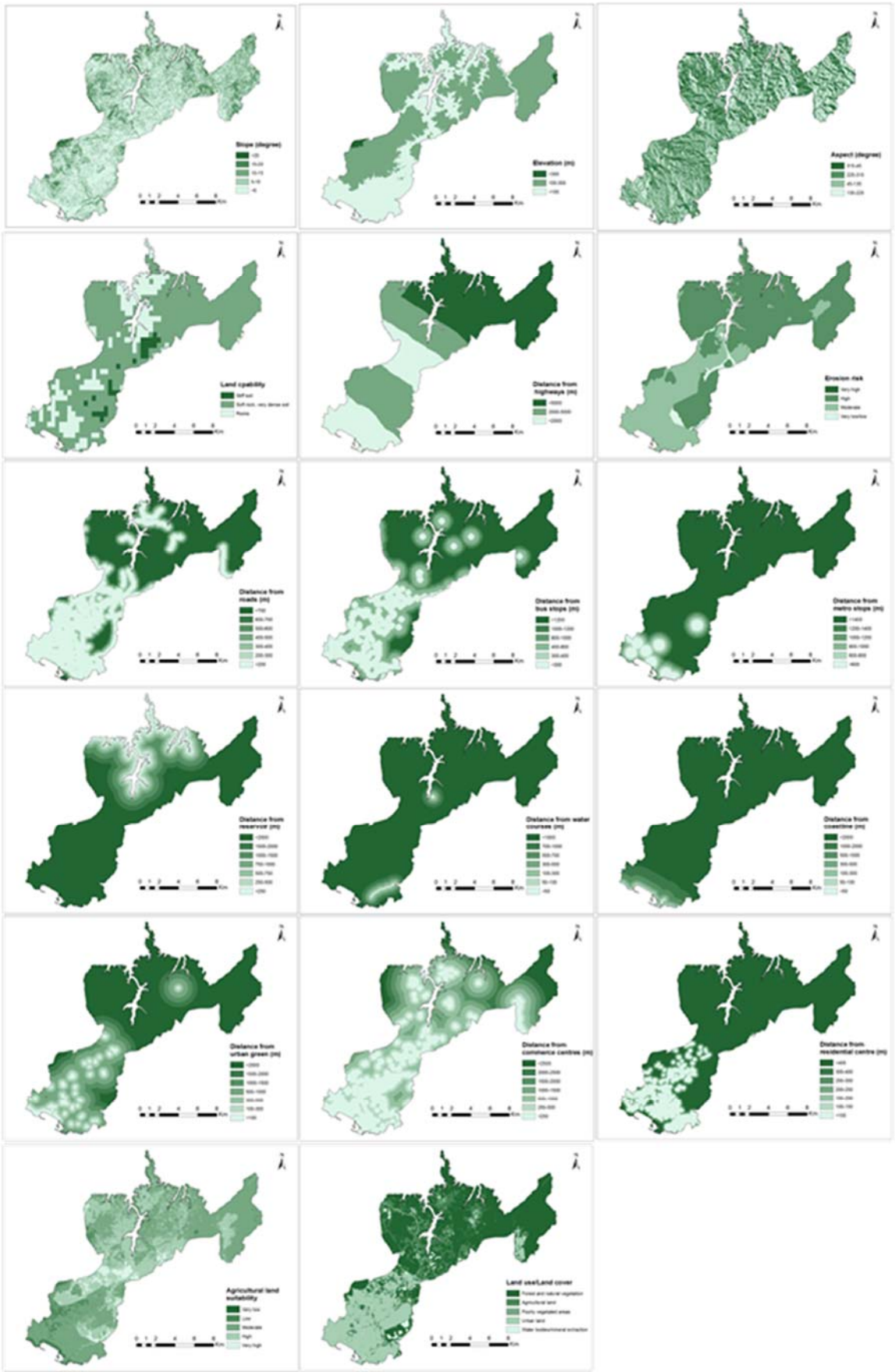

Fig. 2 Suitability value maps for each criterion

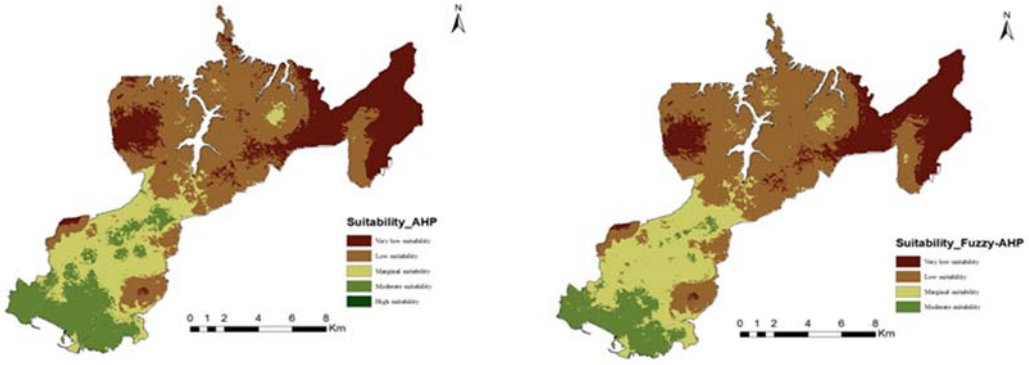

Fig. 3 Suitability maps AHP (a) left; Suitability maps Fuzzy-AHP (b) right

ACKNOWLEDGEMENTS

The study presented here was funded by The Scientific and Technological Research Council of Turkey (TUBİTAK) linked to BIDEB-2232 Programme, Project No. 118C002. We thank to anonymous reviewers for their helpful comments and suggestions on the earlier versions of this paper.

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 2 (2019) 179-188
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 110.6092/1970-9870/6127

review paper received 3rd June 2019, accepted 25th July 2019

www.tema.unina.it

How to cite item in APA format:
Ghida, N., Boussora, K. & Atzeni, C. (2019). The prominent values of the Mustapha Pacha Hospital of Algiers at different scales. *Tema. Journal of Land Use, Mobility and Environment, 12*(2), 179-188. doi: http://dx.doi.org/10.6092/1970-9870/6127

THE PROMINENT VALUES OF THE MUSTAPHA PACHA HOSPITAL OF ALGIERS AT DIFFERENT SCALES

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ABSTRACT

Mustapha Pacha healthcare facility is one of the most important structure of the sanitary history in Africa. Its stratification goes back to the 19th century. Both of its location in the urban heart of the capital of Algeria and its architectural composition are strategic characteristics of its longevity. But in 2015, some political will pointed out the necessity to demolished the entire hospital. A Utopia due to the complexity of the structure and to economic issues. The study aims to reveal the different heritage scale values of the hospital which characterize it as a preserved and as a functional hospital. Those values are part of the urbanity of the city, its architectural criteria and the medical history. Multi-scalar values are the urban value, the architectural value, the collective value, the scientific value, and the value of belonging. The results aim first to point out the importance of Mustapha Pacha healthcare facility as a building heritage due to its contribution to architectural, human, medical, surgical and technical development. Secondly, it exposes healthcare facilities possibility to be valorized and protected as a built heritage. It also has direct practical implications such as to be an academic base for future researches aiming to understand 20th century healthcare facilities organization and values in general and the Mustapha Pacha hospital as a specific architectural object. The regrouped information is also a deep data collection never done before in order to understand the hospital and can promote heritage' file submission proposition

KEYWORDS:
Healthcare facility; Urbanity; Values; Sustainability

TeMA
有关土地使用、交通和环境的杂志

TeMA 2 (2019) 179-188
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阿尔及尔穆斯塔法•帕查医院在不同尺度下的重要价值

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摘要

穆斯塔法•帕查医疗保健机构是非洲卫生历史上最重要的组织之一。它的起源可以追溯到19世纪。该机构位于阿尔及利亚首都市中心的地理位置和建筑布局，都反映了其悠久的历史和重要的地位。但在2015年，一些政见提出有必要拆除整座医院。但由于结构方面的复杂性和经济问题，这一提议只成为了一个乌托邦。本研究的目的是揭示该院作为一家受保护机构和功能性机构，在这两方面所具有的不同文化遗产规模价值。这些价值是医院所在城市都市化、其建筑准则和医学历史的一部分。多标量的价值包括城市价值、建筑价值、集体价值、科学价值，以及归属感。研究结果的首要目的，是指出穆斯塔法•帕查医院作为一项建筑遗产，因其在建筑、人力、医疗、外科和技术发展方面所作出的贡献而具有的重要意义。　其次，研究结果揭示了医疗卫生机构定位为建筑遗产而进行保护的可能性。研究还具有一些直接的实际影响。例如，为今后旨在了解20世纪的卫生医疗组织机构及价值一般情况、以及以穆斯塔法•帕查医院为具体建筑对象的研究提供了学术基础。此外，通过研究中对信息的重新整理，还提供了深入的数据，便于促进对该院的了解、并有利于遗产文件申请工作的开展。

关键词:
卫生机构；都市化；价值；可持续发展

1 INTRODUCTION

Mustapha Pacha healthcare facility is one of the first built healthcare structure in Africa (Saouillet, 1955). It constitutes a rich sanitary history from the Ottoman period to the actual contemporary world, but till today, it has rarely been studied through architectural researches. Its architectural data is divided between the archives of Algeria and France and its building structure is fragmented between oral and written history. Its first available plan is dated on 1854 but testimonies of its creation dates of 1851 (Bodichon, 1851). It exposes the organization of the wards to receive the French injured military corps during the different wars (Saouillet, 1955). Its strategic implementation near the coast and in the Algiers' heart city center made it one of the most important sanitary structure till nowadays. But due to hospitals' life cycle in general and regarding the continuous development of influent factors (such as medical' technologies, industrial revolution, demographic growth and human' comfort assessment and appraisals) it requires more internal spaces and different spatial organizations (« Grandeur et décadence de l'hôpital Mustapha », s. d.; liberte-algerie.com, s. d.). Since the 70th the Algerian government worked on a national strategy for both qualitative and quantitative healthcare system that involves the planning of hospitals and the rehabilitation of the structures currently in existence. But due to both the huge surface of the country and to a lack of the inclusion of architectural perspective, in 2015, the ministry of health of Algeria has exposed the aim to build a new healthcare structure projection for the Mustapha Pacha hospital instead of its rehabilitation (« Le nouveau centre hospitalier universitaire d'Alger », s. d.; « University Hospital Center Alger », s. d.).

No information has been presented about the Mustapha Pacha ancient structure reuse or demolition but the main objective of the project was to offer users more humanized and adaptable spaces and till today, the project never began due to economic issues and to the dependent economic budget of hospitals (Kaddar, 1988; Mezouaghi, 2015). The controversial projection offered this research the opportunity to look forward to expose the Mustapha Pacha original values and potential as an ancient structure. Healthcare facilities are a specific architectural concern in practice and research (Ulrich, 2006). From the modern period to nowadays, architects' goal is to make them functional, humanized and concerned about future developments, regarding all their complex missions (Lankford et al., 2003). The role of the "*machine à guérir*" (Foucault et al., 1979) is to make children as comfortable as in their house and to make elder people as confident, relaxed and in contact with nature in order to keep them connected to the world and to feel part of it development and continuity (Inouye et al., 2000). Through multidisciplinary studies, it has been proved that the impact of a built healthcare structure on users is important (Rajendran, Gambatese, & Behm, 2009). Environmental components and evidence based design have to improve users' outcomes. The evaluation of space is fundamental to understand both users' need and how architects can improve it. Even the green building need to be evaluated in order to create continuous healing design. It is important to evaluate healthcare facilities from different periods and to evaluate users' satisfaction to see how much architecture contribute to the well-being of hospitalized persons, even if it is an ancient structure (Paul & Taylor, 2008).

It is commonly known that heritage is the common material or immaterial wealth of a group. In architecture, it regroups monuments, natural and urban sites. Palaces, theatre or houses are part of heritage but it is not really common to find healthcare facilities. The Art Deco San Pau hospital of Barcelona (Marsili, 2014) and the Otto Wagner Hospital of Vienna (« Heritage Alert: Otto-Wagner-Hospital, Steinhof, Vienna - International Council on Monuments and Sites », s. d.) are part of the UNESCO heritage list (Centre, s. d.) but both are facing difficult phases due to management issues. The Children's University Hospital of Niño Jesús 1879 which is part of the national monument list (de Rojas et al., 2004). Being part of the international or the national heritage list offer the possibility to valorize and optimize the interest regarding healthcare structures. Among the main elements of selection to protect a monument, the UNESCO exposes clear and organized criteria. Among those criteria, values play a major role. Francoise Choay (1992) expresses values through different scales. They can differ from a structure to another. She also expose the negative impact of "*patrimonialisation*"

that can damage the architecture through excessive exploitation as tourism (Choay, 1992). Protecting a structure can also limit its use under the heritage law (Zeroual, 1998) and that is why this study do not aim to make the Mustapha Pacha as an architectural inventory but to highlight its values in order to expose its importance and impact both the architectural and healthcare field.

2 METHODOLOGY

The overall method consists to analyze the historical, urban and architectural data collection of the hospital to understand its historical stratigraphy, its actual spatial organization and use under values which can be a basic research to promote the importance of the building (Choay, 1992) and its contribution to sanitary heritage at a local or an international scale.

The observation was also an important tool to understand some architectural facts. The values are exposed through argumentative findings under 5 main values: the urban value, the architectural value, the collective value, the cognitive value, the value of the place names and the belonging value. Those values are part of the contribution to the comprehension of the building and its protection under a sensorial rehabilitation and sustainability. For a long term impact, those values are contributors of the sustainability, the "*patrimonialisation*" (Di Méo, 2007) and the sensory rehabilitation of ancient healthcare facilities.

3 RESULTS

The data collection findings reveal a rich architectural stratification of the hospital. The available data exposes the development of the construction of Mustapha Pacha through more than 168 years. The first plan is from 1854 and shows how the hospital was partly a civic and a military structure at the same time (« Alger, ville & architecture 1830-1940 », s. d.). The regrouped historical data expose how architects, urbanists and scientists has contributed to the Mustapha Pacha healthcare development in Algeria.

The urban interaction between the hospital and the city of Algiers is fundamental and constitute one of the "*urbanity"* of Algiers (Picard, 1997). In fact, the surface of 14 hectares of the hospital is in the heart of the capital and forms an urban park for the neighborhood and a urban shortcut for daily urban use (Fig. 1) The double (internal and external) urbanity and the centrality of the structure offers the possibility to live the space freely but in a controlled way.

The findings expose 5 main important values for the hospital structured from the urban scale to the architectural scale and from the immaterial value to the material value. Each value exposes the impact of the construction to develop healthcare and healthcare design.

3.1 THE URBAN VALUE

Mustapha Pacha implantation is located in the heart of the first extension of the urbanism of Algiers. It is part of the main central districts of the city and is integrated to the daily urban life. As far as the hospital exists its urbanity is part of the urbanity city of Algiers. The complex is in the heart of three main districts of Algiers: The Champs de Manoeuvre of Algiers, The Hassiba Benbouali main district and the Messonier district. The different accessibility points offer the fluidity of the city through the hospital. In fact, connections are direct through the hospital' internal road structures and offers the inhabitant of Algiers to use the internal roads of the hospital as shortcuts to have direct access to the lower or the higher point of the city. The connectivity of the hospital to the city urban word offers the possibility to create direct relations and to promote the central garden of the hospital as an opportunity for the neighborhood' citizens to interact inside the hospital and for the users of the hospital to interact with external people. Offering social possibility exchange inside a healthcare facility is a positive strategy for positive outcomes (Douglas & Douglas, 2004).

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Fig. 1 The internal and the external urbanity of the Mustapha Pacha hospital

3.2 THE ARCHITECTURAL VALUE

The history of the hospital construction is a testimony of the stratification of important architect of the two different centuries as GuiAuchain Jules Voinot or Xavier Salvador (Aiche, 2003) through different periods (Fig. 2). Besides the different period of the hospital building we can observe an open book exposing architecture from the 19th till the 21th century (Fig. 2).

Fig. 2 The evolution of the Mustapha Pacha hospital through centuries

Architecture values can be evaluated at different levels from macro to micro. From the plan organization to the unit interaction with the external spaces. From a macro observation, each building has a specific composition of wards. The external spaces of transition composed of roads and greenery spaces form indirectly spaces of meetings and relaxation. The ward' composition and its complexity offers the services an adaptable space to receive inpatients even if the increasing number of population makes space use satisfaction sometimes impossible. Beside the matter of management, the structures are aging rapidly than expected. The architecture of wards is planned to answer user's needs of the 21th century but with a less number and more strategic management. The architectural details and technical elements composing the space are one of the most performing during the 1950 (Chantiers, 1950).

The Medical Infantile Unit build in 1883 than in 1948 (considered as the first children hospitals in Africa) is a major testimonial of space organization and internal interaction through its central elevator for daily management and function use. The spaces are all connected vertically and horizontally by physical connections: the elevator is the main important first vertical connection as stairs and a central hoist load which insure and coordinate the eaten service in the hospital. The Children chirurgical service during the 1950 has one of the most developed technologies to insure child security and well-being inside the service. It also offers pathways' distinction of users in a hospital which is an important layout management preoccupation in healthcare facilities (Hanne, Melo, & Nickel, 2009).

Fig. 3 The medical infantile unit in 1955 and in 2018

3.3 THE COLLECTIVE VALUE

The Algerian communities cannot divide the city of Algiers from the hospital Mustapha Pacha regarding its national scale impact, its influence and its importance. It is part of the society references of the medical field in Algeria. Medical students come from all the cities in order to try to be formed in this prestigious university hospital center (Boufenara & Labii, 2009). Besides, inpatients come from all over the country to look for a bed inside the hospital as a reference in medical treatment and fellowship.

3.4 THE SCIENTIFIC VALUE

The hospital has formed since 1854 the first Algerian modern doctors, surgeons and scientists of different fields such as pharmaceutical or biological researchers. It is considered to be one of the most renowned hospitals for medical, surgical and paramedical training in Algeria centuries after. The hospital has also a national users' impact. The Mustapha Pasha hospital is the only medical school during the French colonial period that opened in 1854. The greatest researchers of the 20th century have been formed inside its walls and inside the main amphitheater.

The botanist Jules Aimé Battandier who documents the Algerian flora by his research publications. Jean Baptiste Paulin Trolard major figure in the history of anatomy and medicine has been formed in the heart of the hospital Mustapha in 1856 and later he found the first institute of pharmaceutical research Pasteur. Jean Marie Trolard, offer to the science after his graduation from the hospital contribute by his research on anatomy: "*la veine cérébrale anastomotique supérieure ou veine de Trolard*" (Stam, 2005), "*le ligament costo-lamellaire de Trolard*" , The « *loi de Trolard* » (Bussière, 1895) and « *les chevrons de Trolard* ». He contributed also by his botanical knowledge by publishing on Algeria' forest.

Even during the Algerian resistance (from 1954-1962) the hospital formed doctors who believed in the independence of Algeria and contributed for its freedom such as Pierre CHAULET (Pablos-Méndez et al., 1998).

3.5 THE VALUE OF BELONGING (LA VALEUR D'APPARTENANCE)

The Name of the hospital is part of the history of the urban site and of the history of Algeria. Mustapha Pacha was an ottoman leader who marked the history of the country. The location of the hospital is one of the Mustapha Pacha' gardens. Located in a green area it was not the best place to implant a hospital after the donation of these 14 hectares of lands.

The greenery aspect of the hospital is an evidence but offering the lower part of the garden is a strategic choice rather than a sanitary one: The purpose was to be the closest to the sea to transport soldiers quickly. The hygienic aspect of the hospital was not an evidence till the development of the construction materials and the hygienic medical movement (Bodichon, 1851). The variety and the green space is an opportunity to explore and connect the indoor spaces with the outdoor protected spaces of the hospital.

4 DISCUSSION

The results have a direct impact in practice. The values of the hospitals offer an urban and an architectural lecture of space at macro scales only but with deeper exploration more values will be exposed. Exploring the different tangible and intangible values characterizing the hospital and its singularity in order to expose its strategic role in the city and for architecture is an innovative approach to express how valuable the modern hospital architecture principles are in Algeria.

It is also an opportunity to point out a field that is not explored in Algeria by architects. Healthcare structures is a hard design that need multiple reflections and projections. The Rehabilitation Center "Groot Klimmendaal" in the Netherlands for example, took more than 9 years of projections before its construction but offers multiple evidence based design concepts and a humanized architecture. The method of this study is composed of two

major steps: historical data collection about the building to understand its composition and evolution and to understand its history never studied before. Those values offer some design' tracks of the Mustapha Pacha:

- the urbanity of the hospital is a matter of social interaction;
- the layout and planning organization is a hygienic and a safety matter;
- the greenery implantation offers psychological healing and a regeneration opportunity for the users of the hospital;
- almost two centuries of healthcare material and immaterial values needs to be valorized and promoted to maintain motivational medical development and to think about architectural reuse of space and rehabilitation in a sustainable way;
- healthcare architecture is a complex field that needs to assure multidisciplinary functions in the same bubble: housing, working, discovering, teaching, treating, operating, training, forming, discussing, maintaining, interacting and healing. A small city with multi-criteria of functional and emotional human' state;
- architects have to think about ancient structure reuse in order to insure a sufficient development and environmental protection.

5 CONCLUSION

The objective of this paper is the promotion of the healthcare structure as a discipline of specialized architecture in Algeria. It aims also to point out the necessity to think about the rehabilitation of the ancient structures following sensorial and evidence based design strategies. The planet cannot handle more consumption of natural spaces and energies. Architects need to think about the reuse of ancient structures of the 19th century and to regenerate the space through humanized design. The study offers practical use for NGOs defending the heritage field in Algeria a basic of academic knowledge regarding Mustapha Pacha values. This study can promote a submission folder for a "*patrimonialisation*" or building protection demands. It also offers the academic field original historical document and architectural data. The values exposed are not the definitive values for the Mustapha Pacha or another healthcare facility. The context of the building, its history and its use are the main elements which can offer perspective of defining ancient building values. Those are only the results of an investigation of 4 years of data collection and maybe more data could be found in France (Regarding the archive problematic of Algeria divided between the countries).

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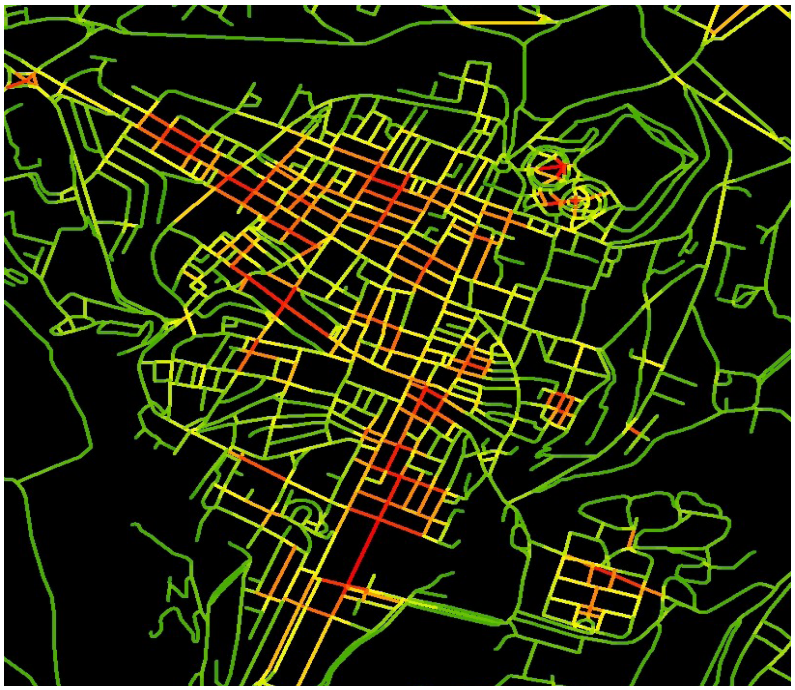
TeMA Journal of Land Use, Mobility and Environment

TeMA 2 (2019) 189-196
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6126

review paper received 2nd June 2019, accepted 23th July 2019

www.tema.unina.it

How to cite item in APA format:
Di Ludovico, D. & Rizzi, P. (2019) Walkability and urban design in a post-earthquake city. *Tema. Journal of Land Use, Mobility and Environment, 12*(2), 189-196. doi: http://dx.doi.org/10.6092/1970-9870/6126



WALKABILITY AND URBAN DESIGN IN A POST-EARTHQUAKE CITY

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ABSTRACT

The research described in this article concerns the issue of accessibility with a focus on the walkability in a city that is under reconstruction, such as the city of L'Aquila struck by a destructive earthquake in 2009. The reconstruction is determining a new urban layout in which there is a chaotic overlap of flows of the movements of vehicles and people, quite exceptional with respect to the configuration of an ordinary city. For example, the flows of heavy vehicles and work machines, linked to building reconstruction, and which also generate strong noise pollution and therefore a new soundscape, increase considerably. It is a city in which the return to the residences mixes with large building sites, in which urban transformations are very fast and must be governed through appropriate urban design instruments.
The main aim of this research is to define a strategy to realize a method able to calculate at the same time an overlapping indexes in order to classify streets according to how friendly they are for the pedestrian and bike. This theme is approached to a methodological level and is related to the interacting theme of urban design and new centralities. The tool used for this integration is the Strategic Urban Project, which the research experience has found to be more effective and with greater performance than the more traditional Land Use Planning. The design approach and methodology is to integrate urban design techniques with spatial planning techniques, in order to obtain a higher performance of pedestrian networks.

KEYWORDS:
Walkability; Urban Design; Spatial Planning; Transport

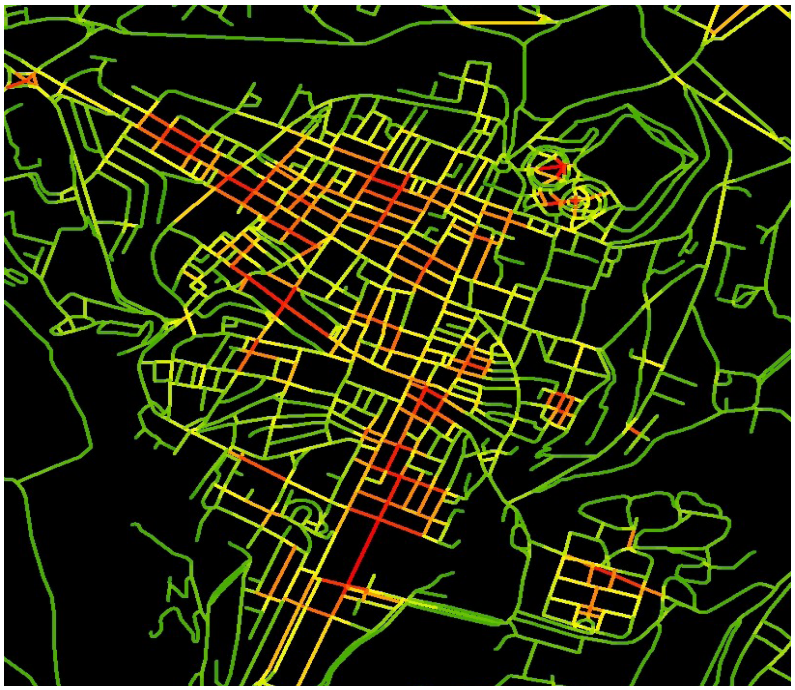
TeMA
有关土地使用、交通和环境的杂志

TeMA 2 (2019) 189-196
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6126

review paper received 2nd June 2019, accepted 25th July 2019

www.tema.unina.it

How to cite item in APA format:
Di Ludovico, D. & Rizzi, P. (2019) Walkability and urban design in a post-earthquake city. *Tema. Journal of Land Use, Mobility and Environment, 12*(2), 189-196. doi: http://dx.doi.org/10.6092/1970-9870/6126



地震灾后城市的步行适宜性和市区设计

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摘要

本文所述的研究主要是关于通达性的问题，其重点在于城市在重建过程中的步行适合程度，例如2009年遭受地震严重破坏的拉奎拉市。重建工作决定了城市的新布局——其中存在人流与车流重叠存在的混乱状况，这与正常城市的情形截然不同。例如，由于房屋重建的需要，重型车辆和工程机械的车流会大幅度增加，并且也会产生巨大的噪音污染和不同以往的声音环境。在居住区域重建与大型建筑工地相互混杂的城市中，其城市化带来的转变非常迅速，必须通过适当的城市设计措施进行管控。
本研究的主要目的是制定一种策略，以确立某种方式来计算某个期间内的重叠索引，根据街道对于行人和自行车的便捷程度对其分类。我们从方法学的角度来处理这一主题，并将其与城市设计和重建后集中度的相互作用关联起来。这项整合工作所使用的工具为战略性城市项目法。研究经验证明，该方法比传统的土地使用规划法具有更高的效率和成效。采用的设计方式和方法，是将城市设计技术与空间规划技术相结合，以实现效果更佳的步行网络。

关键词:
步行适宜度；城市设计；空间规划；交通

1 INTRODUCTION

This article describes the basics of a research in its preliminary stages, It concerns the project and the performance of the walkable and cycling-walkable networks of a city characterized by an exacerbated polycentrism (Espon, 2005), like the city of L'Aquila which is going through a strong urban, social and economic transformation due to the 2009 post-earthquake reconstruction process which is still in progress. This accelerated process is taking place without a real government of transformations, without the idea of the city in the future, without a vision, all also without an assessment of the sustainability and performance of the reconstruction. The research is grafted onto this situation, in which L'Aquila is a paradigmatic case, But this condition also concerns other Italian cities where the level of physical and social fragmentation is very high.
In this specific field the scientific literature focuses more on the themes of physical and economic reconstruction than social reconstruction and the issues of accessibility (Bono & Gutiérrez, 2011), sustainable mobility and in particular on walkability. Our study, which draws its origins from a more extensive research on the transformations of infrastructure and mobility in cities hit by natural and anthropic disasters (D'Ascanio, Di Ludovico & Di Lodovico, 2016; D'Ovidio, Di Ludovico & La Rocca, 2016; Di Ludovico & D'Ovidio, 2017), focuses on this last topic, walkability, tracing a model of city development that considers urban fragments as new urban centralities, innervated by a railway axis that operates as a subway serving these new centrality. In every centrality corresponds in the general vision of development. A Strategic Urban Project (Albrechts, 2006) is a large scale urban project (Di Ludovico & Properzi, 2012; Di Ludovico, 2017;) which is characterized by a high level of urban innovation, also in application of the principles of Smart city (Di Ludovico, Properzi & Graziosi, 2014; Di Ludovico & Properzi, 2018). It's a Plan design according with a concept of mobility model that favors sustainable public transport and discourages private (today predominant) and which prefers, within these new centralities, walkable and cycling-walkable movement. Section 2 describes the initial conditions of the post-earthquake city, an extremely fragmented city and its fragments develop along a linear infrastructural bundle about 14 km long. Section 3 briefly describes the general idea of sustainable development of the city in terms of spatial planning. Finally, the third section deals with the methodology for designing and assessment the performance of the walkable and cycling/walkable network. The conclusions essentially trace the future developments of the research.

2 L'AQUILA FRAGMENTED CITY

The 2009 earthquake has hit an economic system largely in crisis. Overall, the economy of the L'Aquila area before the earthquake was already declining substantially, with a fall in per capita and industrial value, a decrease in employee productivity and a weak performance of services before the earthquake (Cresa, 2011). After the 2009 earthquake, this crisis was accompanied by a first population decline followed by a fluctuation and in recent years by a stabilization of about 69,000 inhabitants. Because of this we must add a decrease in the number of university students, around 25,000 just after the earthquake, and today around 19,000, are based in L'Aquila. Around 12,000 of them are from off-site. The result of the first step in the emergency phase of recovery from the disaster is a large area which include the city where 19 new settlements have been built. They are the CASE projects (CASE is acronym for Sustainable and Environmentally Friendly Anti-seismic Complexes), erroneously called New Town, of 4,500 dwellings and 15,000 inhabitants. CASE was realized without a spatial planning strategy, without taking into account urban planning and territorial rebalancing, resulting in a substantial increase in settlement dispersion and unplanned land consumption (+ 6.7%). This situation is worsen by a sprawl in the agricultural pattern where more than 1,500 prefab houses in wood were built. The post-earthquake dispersion has also affected the commercial system, which has moved to the periphery of the city and has a changed shape. In fact, the small commercial network had characterized the city before the earthquake, after it was concentrated in some abandoned factories in the industrial areas, on the periphery of the city, thus composing a sprawl pattern of small "shopping malls" that did not exist before

the earthquake. All this has exacerbated the polycentrism of the city, results in a very high number of secondary poles composed of hamlets, of which one with 5,000 inhabitants, of 19 CASE projects, of industrial agglomerations that today are mainly commercial and directional (Fig. 1). This phenomenon is now accompanied by a strong propensity for urban innovation, with the tendency to apply the principles of smart city and smart growth to reconstruction (Duany, Speck & Lydon, 2010) and a model of sustainable mobility and urban transformation oriented to the needs deriving from contemporary social models (Touraine, 2010).

Fig. 1 L'Aquila, Urban centralities before and after the 2009 earthquake

3 RECONNECT THE URBAN FRAGMENTS

The redevelopment of a particular urban system, such as that of L'Aquila struck by the earthquake, has as its main strategy the "reconnection" of urban fragments derived from post-earthquake disintegration. The goal is to connect the fragments together through the development of sustainable urban networks, maintaining the polycentric post-earthquake urban structure, thus avoiding the environmental costs that would be necessary to recompose a city that already had clear signs of dispersion before the earthquake as well as obvious problems on the topic of urban mobility. The "reconnection" urban project is based on the following elements: the presence of urban fragments, that is urban parts without a coherent structure, isolated, which no longer have an efficient system of services and facilities and which are not effectively connected to the infrastructural network; the presence of an inefficient mobility system, with high transport costs, and an almost unused valley railway; the possibility of structuring efficient and integrated urban networks, both of an environmental nature and of an infrastructural material nature (mobility) and intangible nature (digital).

3.1 THE PROPOSED URBAN DEVELOPMENT MODEL

As can be seen in Fig. 2, the idea is to connect the fragments (urban parts, including the historic center) through the railroad that must be transformed into a metro with high-frequency trains. From the stations of this metro, feeder lines are connected that distribute the residents to the fragments that are generally residential settlements of about 1,000-2,000 inhabitants. Thus, many urban parts that are now isolated and incomplete with services and facilities are connected to the metro. The goal is to structure a Strategic Urban Project (Albrechts, 2006) for each of them that transforms these parts into self-sufficient urban nuclei pursuing the principles of sustainable development and smart growth. Looking for an analogy in the scientific literature, this development model can be related to Transit Oriented Development (TOD), developed in the 1990s in relation to sustainable mobility policy (Barton, 1998; Calthorpe, 1993), which is applied to parts of the city, centered on "transit stops" (such as metro stations), which are re-planned as mixed-use places, with specific urban densities and a high quality and easily accessible cycling-walkable network (Vale, 2015). However, the goal is not only the physical and spatial re-planning of the part but also the construction of a new system of social relations that makes the same urban part more livable, in which the local community also plays a major role (Dittmar & Poticha, 2004). In our model all these factors are fundamental, but there are some innovations.

First of all, the development area is not a district of the city but are settlement systems belonging to a polycentric structure, thus, they are fragments. Moreover, the transit stop, that is the connective node, is not only the station but also the distribution feeder line. Finally, sustainability is not achieved only by facilitating Walkability or Cyclability as much as possible but also by facilitating the use of zero-emission public transport.
In the Strategic Urban Projects, which re-design the fragments to develop new small polycentric urban centralities, we pursue the following objectives: complete or implement the system of basic public services and facilities to make the centrality self-sufficient; improve accessibility and bring it back to a limit distance of 300 m, also applying innovative principles of urban densification (Jenks, Burton & Williams, 2005); improve the urban safety of centrality, both in physical terms and in social terms; innovate urban systems through the application of new Smart technologies also aimed at contrasting and mitigating the effects of climate change; supporting network development, that is centering the development on the network paradigm, integrating urban environmental networks (green infrastructure (EC, 2013)), sustainable infrastructural networks (also digital), networks of urban (and social) spaces.
These objectives must also be pursued through the construction of a system for assessing the social, economic and environmental performance of Strategic Urban Projects, an assessment that is considered essential to achieve an optimal design solution but above all to verify the performance of the projects ex-post. The next section describes, in the context of new centralities, the methodology for the evaluation of existing road infrastructure systems to be the site of safe cycling and walkable networks.

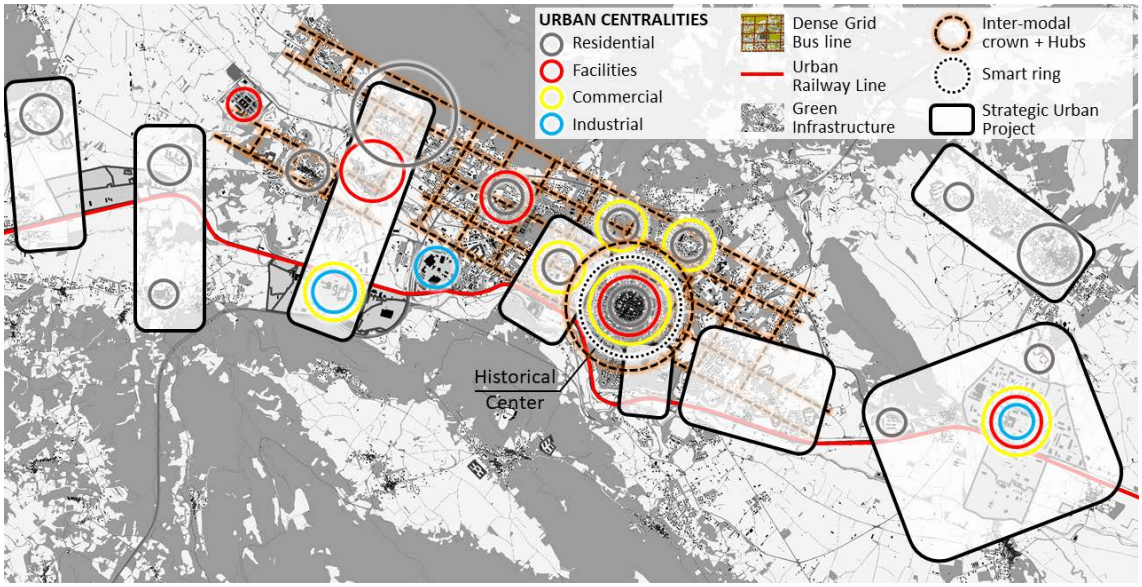

Fig. 2 L'Aquila, the Strategic Urban Projects

4 SECURE AND SAFE WALKABLE NETWORKS: THE ASSESSMENT METHODOLOGY

In our research, the road network (De Vico, Di Ludovico & Colagrande, 2014) is integrated with the other networks that refer to the concept of smart growth and resilience (Fekete & Fiedrich, 2018) such as green infrastructure (EC, 2013) and the system of public spaces together with the theme of urban security (Brand & Nicholson, 2016). These three networks (Transport, Green and Public Spaces) are integrated by a fourth the digital network, which is now rapidly developing in L'Aquila as application of the principles of the Smart city.
A particular class of network, inside the mobility system, is the walkable or cycling-walkable network. In relation to urban physical characteristics and national legislation, for safety this network should have the minimum of intersections with roads and meet the following criteria oriented to accessibility and safety:
sufficient road width to create a bicycle lane with a minimum width of 1.50 m in one direction or 2.50 m in two directions. This criterion concerns only Cyclability; sidewalk width sufficient to create a walkable lane with

a minimum width of 1.00 m in one direction or 2.00 m in two directions. This criterion concerns the Walkability. Also integrating Cyclability. These widths are increased by the quantities in the previous point; maximum index of alignment of the facades of buildings facing the road (absence of indentations); longitudinal slope less than 5%; horizontal curvature radii greater than 3.00 m; distance from the primary public services (collective services, public spaces, etc.), public facilities, from the feeder line and from the metro station less than 300m. Our research is based on the development of a GIS application able to automatically evaluate the aforementioned criteria, divided by Walkability (W), Ciclability (C) and Walkability + Ciclability (W + C), based on an urban analysis founded on geographical coverages that describes the settlement with vector primitives derived from the Regional Map on a scale of 1: 5.000. The expected result are maps in which the road axes are associated with summary indicators of suitability and performance, such as: I_W, I_C and $I_{W\&C}$. These indicators will make it possible to define the design lines for the Walkability of parts of the city, and to determine which parts of the infrastructural network can be dedicated exclusively to walkable traffic, eliminating private vehicular traffic. The aims are focused to define the abovementioned mathematical indexes to be used for evaluating new urban designs and strategies on turning cities into more walkable friendly places, considering also soft modes of transportation that are regarded as beneficial both in environmental and social in terms. This methodology seems to be promising but there are still several issues to be solved in order to achieve overarching and superimposable I_W, I_C e $I_{W\&C}$ indexes. The calibration process need to be elaborated by taking into account the overlapping of the three indexes at sametime.

5 CONCLUSION

The work presented in this research concerns a more focused and deeper aspect of a wider research on the transformations of cities hit by disasters of natural and anthropic origin. The general theme is the physical and social "reconnection" of fragmented cities due to a strong shock through Urban Design tools, within which the work group is developing the specific theme of Walkability, whose research is presented in this paper in the form of methodological assumptions. The scientific studies on the reconstruction of L'Aquila are demonstrating the need to intervene on the city with effective and rapid Strategic Urban Projects of large urban parts in the context of a long-term Vision. The Projects are presented in these studies as actions to build new communities and new urban centralities in this, to apply the principles of Smart City and Smart Growth as well as Sustainable Development. In this sense a sub-theme selected was that of mobility within which we are developing Walkability also in terms of performance. The expected result is that of progressively reducing private vehicular mobility in favor of zero-emission public mobility and in favor of pedestrianization, within large urban parts in a certain sense disintegrated and today undergoing strong uncontrolled transformation, without government. The design and assessment model of the proposed Walkability, in the future can be further characterized to support performance even in critical conditions (not in safety), such as those that occur after an earthquake or another catastrophe. In this case the criteria (4) must be further investigated and can also be linked to real-time assessment supported by measurements made with a sensor network or with drones.

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 2 (2019) 197-219
print ISSN 1970-9889, e- ISSN 1970-9870
doi: http://dx.doi.org/10.6092/1970-9870/6224

REVIEWS PAGES

THE TIMES THEY ARE A-CHANGIN' 2(2019)

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.

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

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

author: Federica Gaglione
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04_UBAN 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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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 2 (2019) 197-219
print ISSN 1970-9889, e- ISSN 1970-9870
doi: http://dx.doi.org/10.6092/1970-9870/6224

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评述页：

提高城市系统对自然及人为变化顺应能力的方法、工具和最佳实践

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

01_WEB RESOURCES
网站报告为读者提供与主题直接相关的网页。

author: Rosa Morosini
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02_BOOKS
书评推荐与期刊该期主题相关的最新出版著作。

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03_LAWS
法律部分提供主题相关标准方面的大量综述。

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

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

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01

THE TIMES THEY ARE A – CHANGIN' 2(2019)

REVIEW PAGES: WEB RESOURCES

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In this number

THE ROLE OF SOIL IN ECOSYSTEM SERVICES

Local decision makers have invested substantial economic and human resources to adapt cities to climate change by increasing their urban resilience. In this perspective, the eco-system services have been integrating more and more within both spatial planning and urban governace (McPhearson et al., 2015). In fact, ecosystem services are essential for human well-being and, at the same time, they support economies at different scales, from local to regional and national. In general, traditional economic evaluations do not consider the indispensability and the unrepeatability of these resources, contradicting the concept of sustainable development introduced for the first time in the Brundtland Report in 1987.

For this reason, it is clear why the integration of functions and ecosystem services has become essential in urban and territorial transformation decision processes. Local administrators can monitor the threatening pressures on ecosystem and their functionalities, improving their effectiveness and "building" a governance model based on tools that consider the right management of environments and of ecosystem services.

With that in mind, the evaluation and the mapping of Ecosystem Services can be a significant support in decision-making processes related to the land-use matter, in order to get services even more sustainable (Pelorosso et al., 2016).

Soil represents a fundamental contribution to ecosystem services, due to its multiple functions such as: the production of biomass and food; the supply of raw materials; site of human activity and, above all, for its waterproofing and carbon storage functions, which are essential to mitigate the climate change effects (Zucaro & Morosini, 2018). The soil contributes to ecosystem services through its functions in terms of "benefits that people can gain from ecosystems" (Calzonari et al., 2015), and it is one of the four classes defined by the Millennium Ecosystem Assessment in 2005 (MEA, 2005), which are used to classify ecosystem services.

In fact, this classification provides for the articulation in ecosystem services in four functional classes: for providing, in terms of products obtained by ecosystems such as food, pure water, fibre, fuel, medicines; for regulation, since ecosystem services' benefits have impacts on climate, water regime, pathogens' actions; for cultural aim, because ecosystem services can produce non material benefits in a spiritual, ethic, recreational, aesthetic and social sense; for support, considering all the supportive services to ecosystems such as soil formation, nutrient cycling and primary production of biomass (MEA, 2015).

LSECities
https://lsecities.net/

LSE Cities is an international centre at the London School of Economics and Political Science that carries out research, graduate and executive education and outreach activities in London and abroad. The centre studies how people and cities interact in a rapidly urbanising world, focusing on how the physical form and design of cities impacts on society, culture and the environment.

In the website homepage, at the top right there are the eight sections (about; research; publications; events, urban age; education; urban at LSE and join us) into which the site is articulated, as well as the links to social pages such as Twitter, Facebook, Linkedin, and YouTube. An interesting section is the one dedicated to the research; in this section it is possible to access to multiple contents that are organized in three subsections, in relation to the particular theme of interest:

- cities, space, and society;
- cities, environment, and climate change;
- urban governance.

Sliding down, the page allows to visualize contemporarly all the pages of the three subsections through an image, a title and a caption describing the contents. The browsing is quite simple, considering that with a click on the image it is possible to connect to the page on interest. For what concerns the natural resources and ecosystem services theme, in the "cities, environment and climate change" subsection there is a whole page dedicated to the "resource urbanisms" project, co-funded by LSE Kuwait Programme (,) and it aims at examining multiple aspects of how natural resources, urban form and infrastructure affect each other and potentially lead to the establishment of divergent forms of urbanism.

The starting point of the project is the common idea that cities and urban development are directly interested by availability and costs of natural resources, and that, on their behalf, different forms of urban development can lead to substantial differences for the use of resources. The project, in particular, is related to the use of two specific resources, soil and energy, and it explores their relationships with the urban shape, mobility and built environment.

Through the project page of the site, it is possible to find out general information related to the project and, on the left, all the events, news and publications, while on the right (in the same page) there are all the information related to the project partners, as well as to the stakeholders, project experts, project coordinator, researchers, project partner, project collaboration, project funders; finally, there are the project schedule and its keywords.

Moreover, the Publications section is rich of contents and easy to consult, since there are further four subsections: books; journal articles & papers; reports and urban age and other writing. With a click, users can get access to a wide range of useful links to deepen knowledge on a theme. If interested in events, users can consult the events' section, where future and past research conferences are reported, as well as an archive of events taken in the last ten years.

Urban at LSE is a portal for masters and doctoral teaching and for research activities on cities and urban issues across LSE and its aim is to be a rich resource for teachers, researchers and university students. Moreover, LSE Cities invest in multidisciplinary research through seed funding and hosting visitors and academics. At the end of the page, as well as at the end of each page, there are many links to get a quick access to the website sections, and on the top right there is a box for a keyword search.

100 RESILIENT CITIES
http://www.100resilientcities.org

100 resilient cities was created by the Rockefeller Fundation for its 100th anniversary, in 2013. In that year, only 32 cities all over the world were collaborating with the group until november 2015, when they got 100. The team members of the 100 resilient cities are expert judges who examined over 1.000 requests of potential cities to take part in the project. From the homepage it is possible to access to the seven sections of the site, as well as to the keywords research box.
The most interesting sections are: resources and urban resilience. The first section includes tools that can help to increase and improve resilience levels of urban systems; publications and media documents refered to that theme. The urban resilience section has contents related to the definition of resilience and all the characteristics that systems need to have in order to be defined as resilient. The information related to events, past and incoming, deidicated to this issue are in the news section. In the partners section, there are all the member cities, there is also the resilience strategy, promoted as one of the mai tools promoting 100 resilient cities. The stretegy is the product of a process that lasts from six to nine months and it joins people, projects and priorities, promoting innovative solutions which are crucial for cities that are facing resilience challenges. From each page, on the bottom right, it is possible to access, through quick links, to different sections and to social network pages such as Facebook, Twitter, Linkedin and YouTube.

BISE
https://biodiversity.europa.eu

The Biodiversity Information System for Europe (BISE) is a portal where data on biodiversity can be consulted, to support the realization of the European Union strategy. BISE is a partnership between the European Commission, DG Environment - Directorate B, and the European Environment Agency, supporting the knowledge base for the implementation of the EU 2020 Biodiversity Strategy. It also serves as the Clearing House Mechanism for the EU within the context of the United Nations Convention on Biological Diversity (CBD) and as such it is supported by the collaboration of the European CHM network and the CBD Secretariat.
The web site is easily consultable, in fact the home page can be divided into five parts:

- topics;
- policy;
- data;
- knowledge;
- countries;
- networks.

All the sections are organized in subsections to whom it is possible to access through quick links; moreover, they have rich and interesting contents.

One of the most interesting links, in the topic section, is refered to the Flagship Projects, where the user can deepen its projects' knowledge, and consequentely of their results, developed in the European context. One of the project is SOER 2015 – The European environment – state and outlook in 2015.
For what concerns the role of soil in the ecosystem services, the subsection threats in the topic section is very interesting: users' can access to these contents by clicking on the land use change link. In that way, it is possible to access to a page completely dedicated to this issue, where relations between land use change and impact on biodiversity are analyzed, highlithing their importance for the territorial transformation governance, promoting interventions aimed at reducing the effects of climate change and/or fragmentation, through sustainable intervention such as green infrastructures.
At the bottom of the page, there are further links that allow users to acess to other connected web sites, referred to the same issue. The section policy and data give information and data on global and European projects policies, such as: the Strategic Plan for Biodiversity, 2011-2020; EU 2050 vision; CBD and other conventions infrMEA. As for the policy section as for the data section, there are numerous links that allow users to immediately access to connected pages. In the knowledge section, there are some useful directions to the main European funding sources for research aimed at biodiversity and ecosystem services such as: Horizon 2020, LIFE programme, European Research Counsil and, more globally, Future Earth.
Back to the homepage, on the bottom there are three links: about BISE, where information concerning the portal is given; Contact us, through which users can find contacts; and street addresses and SiteMap, where users can find an overview of available contents.

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IMAGE SOURCES

The images are from: https://biodiversity.europa.eu; http://www.100resilientcities.org; https://lsecities.net/

02

THE TIMES THEY ARE A – CHANGIN' 2(2019)

REVIEW PAGES: BOOKS AND JOURNALS

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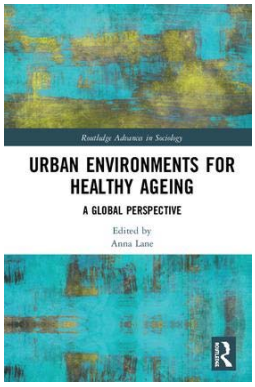
In this number

AGEING IN AGEING CITIES

"Ageing in ageing cities" is not just a wordplay: it represents one of the hardest economic and social challenges that have never been faced in human history, with significant impacts on employment, education and health (ARUP, 2015). In European Union, at beginning of 2016, the share of people aged more than 65 years old was about 19%, with an increase of 2.4% compared to 2006; according to some projections, this trend is going to increase during next years, up to 30% in 2080. Considering a strong increase of the infertility rate and a significant birth decrease, this ageing phenomenon would lead to a deep demographic change. Cities would suffer the consequences of this unexperienced phenomenon, because of their complex structure and of the high human presence in their physical and digital environments (Angelidou, 2017). It may seem a paradox, because, since the birth of cities, accessibility to activities, people and ideas for a wide and heterogeneous group of people has been one of the essential and inalienable traits of urban life. "The Times They are A-Changig" and then, the paradox is only apparent, considering the complexity of urban systems, due to last century technology innovations, the growing of well-being levels, the changing of family lifestyles (Massa & Campagna, 2014), and therefore the multiplication of space-temporal fractures, the lack of transparency and consistency. With that in mind, it is easy to understand that elderly people dwelling in urban areas will suffer for a more and more limited participation in the decision of territorial processes and for a deeper social exclusion, due to the lack of accessibility to local public transport, for the presence of barriers and obstacles accessing to public spaces, for bad health conditions due to pollution and sedentary lifestyle.

Thanks to a deeper awareness on the issue, plans, strategies, initiatives and solutions of all sorts and sizes are being developed to design new shapes and functional structures for cities (Papa et al., 2015), in order to be age friendly. This planning view requires a holistic approach to the urban environment, taking into account the land-use and the transport systems, whose interaction is critical to satisfy the community needs, guaranteeing certain level of service.

According to these themes, this section proposes three works (two books and a scientific journal) that help to better understand the topics of this number: Urban Environments for healthy ageing. A global perspective; Geographies of Transport and Ageing; Aging in Social Policy.



Title: **Urban Environments for healthy ageing. A global perspective.**
Author/Editor: Anna P. Lane
Publisher: Routledge
Publication year: 2019
ISBN code: 978-0-367-19755-1 (hbk), 978-0-429-24309-7 (ebk)

Urban Environments for healthy ageing. A global perspective. It is an interesting volume based on a selection of papers, as well as activities and discussions arisen from, presented at the inaugural International Ageing Urbanism Colloquium, 26-27 October 2017, at the University of Technology and Design of Singapore. The contributions were developed on the following themes: (a) affordable and accessible housing options to support ageing in place; (b) urban environments to promote health-enhancing mobility and activity pattern; and (c) innovative planning and design strategies for inclusive and age-friendly neighborhoods. The themes map directly onto select key priority areas in Singapore's Action Plan for Successful Ageing (Ministry of Health [MOH], 2016) and they were developed by established and emerging researchers from multiple disciplines, including gerontology, psychology, engineering, urban planning, and design, who are working in multiple contexts, including Asia-Pacific, Europe, and North America. The book is organized in three major parts: Housing (I), Mobility and Transportation (II), and Urban planning and Design (III). The first part reviews the literature and focuses on the intersections between the individuals, their housing and care services, highlighting that most people prefer living in their own homes for as long as reasonably possible. Ageing in place therefore emphasizes choice in housing decisions and, by extension, has implications for social- and health-care provision. The contributions of this first part argue integration and coordination of policies between the ministries responsible for health and construction are critical if ageing in place is to be realized. In the second part, given the association between physical and health and well-being, there are calls from public health and urban planning experts to promote physical activity through built, as well as social environmental approaches. The focus turns to transportation infrastructure and mobility, since older people rely on various modes of transport such as walking, cycling, buses, trains, and cars to move between home, work, supermarkets, healthcare facilities, recreational facilities, and so on. Transportation options influence people's perceived and actual capacity to access finance, food, care, leisure-time activities, from which they derive good health and well-being. The third part concerns more properly the urban planning process and design. This thematic part includes contributions from urban planners, architects, and designers who are working to advance innovation on urban environments and technologies for healthy and active ageing. The residential neighborhood is considered a particularly salient urban scale for older people as they tend to spend a greater proportion of their daily lives in and around their homes. This is due in part to mobility limitations that arise from declines in physical functioning and reduced driving ability. Moreover, retirement from paid work and the take-up of new roles as family caregivers or community volunteers represent other reasons why older people may spend more hours in their day at or near their home. As older adults spend relatively more time in their immediate residential area than younger adults do, they are more likely to be impacted by their experiences and exposures to social and physical aspects in that setting. Through some case studies, each contribution demonstrates how design strategies related to technology acceptance, technology adoption, and multi-stakeholder collaboration can contribute to greater transportation accessibility and ultimately greater outdoor mobility among older adults, with obvious implications for healthy and active ageing.

Title: **Geographies of Transport and Ageing**
Author/Editor: Angela Curl and Charles Musselwhite
Publisher: Palgrave Macmillan
Publication year: 2018
ISBN code: 978-3-319-76359-0, 978-3-319-76360-6 (e-book)

Geographies of Transport and Ageing presents a unique geographical perspective on issues of transport and mobility for ageing populations. Society is ageing across the globe. As well as living longer, older people are fitter, healthier and more active than previous generations were. There is both a desire and a need to be mobile in later life and mobility is clearly linked to older people's health and wellbeing. Yet mobility can be hard for older people and our neighborhoods, towns, cities and villages are not designed in an age friendly way. Moreover, when thinking about transport, travel and mobilities of an ageing population, it is impossible to do so without taking a multi-disciplinary approach. Naturally mobility involves geography, the movement of people over space and time, and it takes into account cultural, social and psychological elements. Transport is essentially a means to overcome the geography; the distance between people and place. Yet mobility is not just literal but also virtual, social and cultural. The volume brings together contributions from a broad range of human geographers with different disciplinary perspectives of transport and ageing and it outlines some of the key contemporary issues for an ageing society in terms of transport and mobility, highlighting the importance of considering transport and mobility for ageing populations. The contributions also demonstrate that a geographical approach can offer great performance to study the phenomena of transport and ageing. In fact, with case studies from across the globe, authors take a geographical lens to the important topic of transport and mobility in later life. Chapters examine how the relationships between mobility, modes of transport, place and technologies affect an aging population. This collection is of interest to scholars and students in human geography, in particular to those with interests in transport geography, mobilities, geographies of health and wellbeing, urban geographies and geographical gerontology. It will also appeal to practitioners and policy makers in urban design and planning, transport planning and engineering and public health who have interests in age-friendly cities and policy.

Journal of
Aging &
Social Policy

Title: **Aging in Social Policy**
Editor-in-chief: Edward Alan Miller, University of Massachusetts Boston
Print ISSN: 0895-9420 Online ISSN: 1545-0821

Policymakers, practitioners, and researchers need a balanced, thoughtful, and analytical resource to meet the challenge of global aging at a rate that's historically unprecedented. The *Journal of Aging & Social Policy* examines the important policy issues that affect the elderly in societies throughout the world. It is an open access journal, based in the United States of America.

The Journal of Aging & Social Policy presents insightful contributions from an international and interdisciplinary panel of policy analysts and scholars. Critical phenomena that affect aging and development and implementation of programs for elders from a global perspective are examined and analysed, highlighting not only the United States but also Europe, the Middle East, Australia, Latin America, Asia, and the Asia-Pacific rim.

Issues regularly addressed in the journal include: long-term services and supports; home- and community-based care; nursing-home care; assisted living; long-term care financing; financial security; employment and training; public and private pension coverage; housing; transportation; health care access, financing, and quality; family dynamics; and retirement.

The Journal of Aging & Social Policy closely examines the processes for adopting policies and programs at the local, state, and federal levels, examining the interplay of political and economic forces and legal and regulatory constraints on addressing the major challenges posed by the "greying" of society. The Journal is an essential source for critical and historical analysis, cutting-edge thought and discussion on age-based policy, and is potentially useful for educators, practitioners, researchers, administrators, and other readers who work with or are concerned about older adults.

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03

THE TIMES THEY ARE A – CHANGIN' 2 (2019)

REVIEW PAGES: LAWS

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In this number

"TOWARDS SUSTAINABLE MOBILITY: THE MAIN GUIDELINES"

In recent years the European Commission has promoted actions aimed at urban development in a sustainable and efficient way (Niglio & Comitale, 2015). The idea of favoring the city model is also given by the high value of negative externalities that are generated by the transport system.

The focus on identifying these externalities has grown over time, in a historical period in which the scarce presence of public resources makes it necessary to analyze the costs and direct and indirect benefits they generate in urban areas.

The scientific community identifies four main external factors associated with mobility:

- production of nitrogen oxide (NOx), sulfur oxide (SO2), ozone (O3) and other volatile organic compounds (VOC);
- noise pollution, deriving from the exposure of part of the population to the noise generated by road, rail and air traffic, especially near infrastructural nodes of considerable importance;
- accident rates, particularly road accidents;
- congestion of the infrastructural network and loss of production capacity is the time required for travel with respect to optimal time (an unloaded network).

Further externalities need to be considered, such as the exponential growth of shifts, both, and impacts on the environment and in urban areas. The European Union estimates that the transport sector has energy consumption of 35%, producing 21% of greenhouse gas emissions, with a tendency that compromises the achievement of global sustainability objectives established by international agreements (Lattarulo & Plechero, 2005)

Dir 2014/94 / EU has defined a common framework of measures for the construction of an alternative fuels infrastructure with the aim of minimizing oil dependency and mitigating the environmental impact in the transport sector (Art. 1).

The management of the minimum requirements for the construction of the infrastructure for alternative fuels, with regard to power supply systems and natural gas (LNG and CNG), in addition to the technical specifications for recharging and saving points and concerning information to users. The types of "alternative" fuels or energy sources that serve, at least in part, from sources of oil.

The directive establishes minimum requirements for the construction of infrastructure for alternative fuels, including recharging points for electric vehicles and natural gas (LNG and CNG) and hydrogen refuelling points, to be implemented through the Member States' national strategic frameworks, as well as common technical specifications for such recharging and refuelling points, and information requirements for users. Article 2 defines the types of "alternative" fuels or energy sources that serve, at least in part, as substitutes for fossil oil sources in the supply for transport and which can contribute to its decarbonisation and to improve the environmental performance of the transport. Each Member State, as regulated in Article 3, adopts a national strategic framework for the development of the market with regard to alternative fuels in the transport sector and the construction of the related infrastructure. Member States must ensure that national strategic frameworks consider the needs of the different modes of transport existing on their territory, including those for which limited alternatives to fossil fuels are available. These national strategic frameworks, where appropriate, must take into account the interests of regional and local authorities with the aim of ensuring the necessary measures, applied in compliance with the state aid rules contained in the TFEU (Treaty on the Functioning of the European Union) in order to achieve the objectives of this Directive are consistent and coordinated. National strategic frameworks must be in line with current EU legislation on environmental and climate protection.

Articles 4 to 6 govern the supply of electricity, natural gas and hydrogen for transport in line with the objectives of the national strategic frameworks defined by the member states, while for Article 7 Member States ensure that clear information is made available, consistent and relevant with regard to motor vehicles that can regularly use certain fuels placed on the market or be recharged via recharging points. Finally, articles 8 to 13 define the implementation of the national strategic framework every three years.

To support the achievement of the objectives of the National Strategic Framework, in its various forms, Legislative Decree 257/2016, regulates the implementation of Directive 2014/94 / EU on the construction of an infrastructure for alternative fuels, moreover, the article 3 paragraph 7 letter c , explicit not only the adoption of measures aimed at creating the infrastructure for alternative fuels in public transport services, but also the adoption of guidelines for the preparation of urban plans for sustainable mobility (PUMS) to be implemented by decree of the Ministry of Infrastructure and Transport, subject to the opinion of the Unified Conference.

Guidelines for drawing up PUMS

The decree of the Ministry of Infrastructure and Transport of 4 August 2017 has the task of define the guidelines for the preparation of urban sustainable mobility plans. They refer to the document "guidelines. developing and implementing a sustainable urban mobility plan", approved in 2014 by the European Commission's Directorate-General for Mobility and Transport. The guidelines provide for developing a vision of urban mobility system that tends to environmental, social and economic sustainability objectives through the definition of actions aimed at improving the effectiveness and efficiency of the mobility system and its integration with urban planning and territorial developments in order to guarantee accessibility levels.

The guidelines outline a uniform procedure for the drafting and approval of the PUMS, with the identification of the reference strategies, the macro and specific objectives and the actions that contribute to the concrete

implementation of the strategies, as well as the indicators to be used for the verification of the achievement of the goals of the PUMS (Article 2). The ministerial decree prescribes that metropolitan cities, large area bodies, municipalities and associations of municipalities with more than 100,000 inhabitants are called to draft and adopt the PUMS in order to access state funding for mass transport infrastructures, such as metropolitan railway systems, tram and metro.Institutions have two years to draft the PUMS, which have a time horizon of at least ten years and need to be revised each 5 years. Furthermore, the municipalities that have adopted a PUMS have two years to update the objectives of the plan in accordance with the guidelines (Article 3).
During the elaboration phase of the PUMS the importance of the listening phase and the participation of all stakeholders is underlined. Within the guidelines the procedure for adopting a PUMS is divided into the following phases:

- definition of the interdisciplinary/inter-institutional working group. The PUMS is drawn by a group with knowledge in the various disciplines of territory government, such as offices and sectors of urban planning, mobility, the environment, tourism, economic activities and others which will be joined by the various actors institutional of the territory and external technicians of proven experience in the field. The area mobility manager must also be part of the group;
- preparation of the cognitive framework. It represents a photo of the actual state of the area covered by the plan. It is articulated in different points: urban logistics, transport networks and services, legislation, mobility policies, cycle and pedestrian traffic flows, environmental impacts;
- start of the participated path. Each administration can choose the techniques and the approach of participation that it considers most appropriate to its territorial reality and economic availability;
- definition of objectives. Within the plan, there are (i) four minimum macro objectives (effectiveness and efficiency of the mobility system, energy and environmental sustainability, reduction of road accidents, socio-economic sustainability) to be achieved over a period of 10 years and (ii) specific objectives of lower hierarchical level, functional to the achievement of macro-objectives. All objectives must be monitored every two years to assess their achievement and actuality;
- participatory construction of the plan scenario. Once the cognitive framework is set and the objectives set, strategies and actions must be identified with the participatory process;
- strategic environmental assessment (SEA). The SEA procedure is contained in the legislative decree 152/2006 and is applied to the PUMS according to the SEA screening procedure;
- adoption of the plan and subsequent approval. The decree recommends (three) as passages (i) adoption of the PUMS in the municipal or metropolitan council; (ii) publication of the PUMS and collection of observations; (iii) counter-arguments to the observations or acceptance of the same and subsequent approval of the plan in the municipal or metropolitan council;
- monitoring every two years. During the preparation of the PUMS, mandatory monitoring activities to be started following the approval of the PUMS must also be envisaged. The monitoring is divided into the following phases: (i) collection of the data necessary for the estimation of the ex post indicators, to be evaluated every two years; (ii) comparison of the ex-ante and ex-post indicators for the evaluation of the effectiveness and efficiency of the interventions envisaged by the plan; (iii) reconsideration of the interventions if the expected results are not achieved, with indications of the integrations / changes to be made to the plan; (iv) any revision of the targets to be achieved.

Transport policy is therefore one of the main foundations on which the European strategy on urban sustainability is based. The impacts on the environment, on human health and on the economy, generated by the current configuration of the transport system, negatively affect the quality of life in urban areas. It follows the need to promote, in the various physiognomies that it can assume, urban transport the diffusion of new mobility models in a sustainable perspective that aims to improve people's quality of life.

Linee guida PUMS

In Italy, Puglia region is an example of drafting and approving regional guidelines with DGR n. 193/2018, which in the national context, intended to prepare them in continuity with the national document and introduces further details, cognitive data and assessments related to the specificities of the Apulian context.
The guidelines of the Puglia region on one hand identifies a programmatic and regulatory reference framework for the Apulian regional territory and on the other they define the aims that a PUMS must draw from and, finally, they define the objectives that a transport system pursues, which are: (i) the modal balance of mobility; (ii) reduction of road congestion; (iii) improvement of air quality; (iv) reduction of noise pollution; (v) reduction of motorization rate and finally increase in accessibility. As far as the results defined in the PUMS are concerned, useful information on the management of expected facts has been placed in a different point of view in different time periods. Finally, they define the process of drafting a PUMS, identifying the main phases and the procedural procedure for the purpose of approving the plan in line with the regional legislation of reference. The DGR n. 193/2018 provides examples of strategies and good practices and tools and outline a general framework of the main European and national funding programs on sustainable mobility, in order to support Administrations and professional experts in the development and implementation of a PUMS. The Regional Guidelines are intended in the first instance to Apulian Local Administrations that intend to engage in the development of an Urban Sustainable Mobility Plan (PUMS), but also to professionals who are experts in planning and mobility management and provide their support to local administrations.

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04

THE TIMES THEY ARE A – CHANGIN' 2(2019)

REVIEW PAGES: URBAN PRACTICES

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In this number

PLANNING FOR URBAN RESILIENCE IN SOUTHEAST ASIA: TWO CASE STUDIES

With a greater concentration of people and assets in urban areas, cities need to address an increasingly complex range of shocks and stresses to safeguard development gains and well-being. Managing disaster risk and the impacts of climate change have long been an important focus of urban resilience (Galderisi, Mazzeo & Pinto, 2016), but recent examples have shown how economic crises, health epidemics, and uncontrolled urbanization can also affect the ability of a city to sustain growth and provide services for its citizens, underscoring the need for a new approach to resilient urban development. In response of these concerns, in the last few decades, researchers from different disciplines have started investigating the meaning, aspects and elements of urban resilience, suggesting that resilience is a complex and multifaced concept with wide implications for planning practices (Salat & Bourdic, 2012), also arguing that achieving resilience in urban areas requires a strong partnership between local governments, research centers, the non-profit sector, businesses, and communities (Stumpp, 2013). Within this context, several initiatives involving both public and private stakeholders have been created in the last few years, aimed at fostering resilience in urban areas. A notable example in this direction is the 100 Resilient Cities initiative, pioneered by the Rockefeller Foundation. The initiative represents one of the most remarkable effort to helping cities around the world become more resilient to the physical, social and economic challenges that are a growing part of the 21st century. The 100 Resilient Cities programme defines urban resilience as "the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience". Based on this definition, a "City Resilience Framework" (CRF) has been established. The framework provides an innovative model for the local authorities to develop a holistic city strategy in collaboration with adjacent municipalities, local academic institutions, private stakeholders, and communities of the city and represents the foundation for the developments of a city resilient strategy. The programme has been established in 2013, in honor of Rockefeller's 100th anniversary and had initial funding of $100 million (although the level of funding support has grown since the programme was launched). Since then, 102 cities worldwide have joined the programme, and 68 Resilience Strategies (with nearly 3,000 concrete actions and initiatives) have been developed.

This contribution presents two relevant Resilient Strategies, developed in two cities of the Southeast Asia, within the 100 Resilient Cities framework: i) the Melaka (Malaysia) Resilient Strategy and ii) the Can Tho

(Vietnam) Resilient Strategy. Beside pertaining to the same geographic area, the two cities have been selected because they share a great portion of physical, social and economic challenges, including; a) a fragile city economy; b) aging and poorly maintained infrastructures; c) environmental degradation and d) persistent social inequalities.

RESILIENT MELAKA

Creating a thriving, liveable and smart Melaka

MELAKA is the oldest city of Malaysia and has an urban population of 484,885 inhabitants. The city not only boasts a rich history and cultural patrimony, represented by its word-famous historic center (that received recognition as UNESCO World Heritage Site in 2008), but it is also an international exhibition center, hosting every year numerous national and international conferences, congresses and trade fairs. While tourism represents one of the main economic activity, it is also causing serious problems by increasingly placing pressure on the city infrastructures. Furthermore, the city is experiencing high levels of traffic congestion that stem from a very weak and unattractive public transport network. Finally, an aging drainage system is creating significant flood risk in several locations, while a chronical water supply shortage, combined with poorly maintained hygiene and environmental sanitation infrastructures have caused in past years serious disease outbreaks, making public health an issue of mayor concern for citizens and policy makers.

In order to face these and other relevant urban challenges, on May 2019, the city of Melaka released its Resilience Strategy with the support of the 100 Resilient Cities initiative. The strategy sets a vision for "a vibrant city, where smart governance, collective leadership, sustainable mobility and protective infrastructure supports a thriving, healthy community that is proud of Melaka's outstanding universal values as a world heritage city." The strategy is organized into three pillars which reflect the city's vision and needs for Melaka's future:

- PILLAR I: THRIVING AND ENGAGED COMMUNITIES. This pillar emphasizes the fundamental role of the Melaka's community in building resilience. It brings together actions to equip Melaka's residents, households and business owners with the knowledge and skills to address the city's water, waste and health challenges effectively. It also encourages all citizens to celebrate and preserve Melaka's unique heritage and take part in the conversation about the city's future. Relevant initiatives related to this pillar include: i) the promotion of authentic heritage businesses and products; ii) the development of cultural heritage skills education programs aimed at creating employment and entrepreneurship opportunities, iii) the implementation of community rapid emergency response trainings. Beside these action, important efforts are also devoted toward enhancing citizens awareness by developing awareness campaign in the field of sustainable waste management, public health and sustainable water management.
- PILLAR II: A LIVABLE, VIBRANT AND EFFICIENTLY CONNECTED CITY. Pillar II brings together actions to improve the city's mobility network, public transport services, urban spaces and infrastructure so that they can create healthier environments for residents and visitors. These actions seek to improve resident's quality of life, but also aim to enhance the attractiveness of Melaka to visitors and investors. Actions within this pillar are targeted toward reaching the following three goals: i) developing sustainable transport options; ii) creating vibrant public spaces and iii) cleaning-up and protecting the environment.
- PILLAR III: COLLECTIVE LEADERSHIP AND SMART GOVERNANCE. Pillar III seeks to broaden Melaka's capacity to act upon key issues for Melaka's future by building a network of private and public

stakeholders; developing a data-driven and evidence-based approach to key decisions; and promoting integrated long-term planning across different departments and agencies. To this aim the strategy envisions, among other initiatives, the creation of Data Observatory, an IT infrastructure that integrates data from various agencies in Melaka, to share expertise and technology and facilitate a transparent, responsive, and well-informed society.

RESILIENT CAN THO
Can Tho Resilience Strategy until 2030

CAN THO is the fourth largest city in Vietnam and has an urban population of approximately 1,2 million inhabitants. It is noted for its floating market, rice paper-making village, and picturesque rural canals. Living conditions and livelihoods in the city were historically well adapted to the regular pattern of seasonal flooding, which residents and local governments describe as a "living-with-floods" strategy. However, during the past few years, flooding has become less predictable and more damaging due to a multitude of factors such as climate change, land subsidence and urban development. This created many challenges for the living-with-floods strategy. In addition, the city has been facing many other challenges such as extreme heat waves, infectious disease epidemics, environmental pollution, water resource depletion, and economic recessions.
These challenges also have grown in severity and unpredictability, and are often characterized by inter-disciplinary, inter-regional and even global linkages.
In response, the city of Can Tho released its Resilience Strategy on June 2019, within the context of the 100 Resilient Cities programme. The Strategy is framed by four interconnected pillars:

- PILLAR I: SYSTEMATIC, INTEGRATED AND PARTICIPATORY CITY PLANNING. This pillar is aimed at developing policies and plans in a systematic, integrated manner, with active participation of all relevant stakeholders. It will be implemented in three consecutive and interrelated steps. In the first place, the city will review and analyse key plans and policies of the in order to make recommendations to ensure that they are consistent, systemic and integrated. After this analysis, the city will put in place several initiatives aimed at improving the effectiveness of monitoring and evaluation of the implementation of city plans. Key decision will be thus taken by involving all relevant stakeholders. Particular attention will be paid to engage the Can Tho communities, with a special focus on young people and student.
- PILLAR II: A GREEN AND SUSTAINABLE RIVER CITY. This pillar addresses the environmental component of urban resilience. Its main aim is to protect natural green and blue areas while providing the city with an infrastructure system that is well-connected, modern, flexible, diverse and resilient to extreme natural hazards. Several actions will concur to the achievement of this objectives. These includes, among others: i) the development of a master green infrastructure plan for core urban areas, aimed at creating new green public spaces for community activities; ii) expanding and renewing the hydraulic infrastructures of the cities, making them more resilient to the changing climate, while improving the capacity of public services providers to organize and operate effectively and iii) the development of a well-connected and consistent GIS database on key urban infrastructure, and information management and user interface system to support the planning and management of urban infrastructure.
- PILLAR III: A KNOWLEDGE ECONOMY THAT IS PROACTIVE, DIVERSE, AND DEEPLY INTEGRATED. Pillar III brings together actions to improve city competitiveness in key economic domains such as tourism and agriculture. To meet this target, the strategy envisions several activities aimed at improving the

effectiveness and scale up the platform for regular dialogues between enterprises, investors, and scientists with city leadership and related department leaders. Beside these activities, the strategy also defines supporting mechanisms and policies to incentivize enterprises focusing on clean agriculture products, tourism and rural development that also supports livelihoods of the poor.

- PILLAR IV: GREEN AND CLEAN ENVIRONMENT. The main aim of the fourth pillar is to ensure that communities have secure and stable income, and live in a green and clean environment, buffered from the impacts of economic, social and environmental shocks and stresses. To meet this goal, the strategies proposes a series of coordinated actions, including: i) integrating the resilience approach into policies and programs for environmental safeguard ii) adjusting housing support policies and programs to strengthen the resilience of poor and vulnerable households and iii) conducting research to assess the conditions, characteristics and resilience of migrant groups in the core urban area of the city and propose support measures.

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IMAGE SOURCES

The images are from: https://www.100resilienentcities.org and https://www.tripadvisor.com/.

05

THE TIMES THEY ARE A – CHANGIN' 2(2019)

REVIEW PAGES: NEWS AND EVENTS

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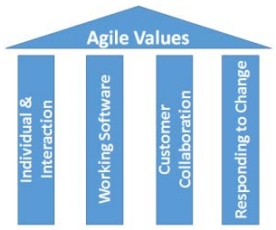

In this number

AGILE DEVELOPMENT METHODOLOGY FOR URBAN POLICY IMPLEMENTATION

In recent years a lot of scientific literature has been produced on the topic of smart city, trying to understand how much the new tools proposed by the emergence of ICT could affect the configuration of cities (Papa et al., 2015; Aldegheishem, 2019). The focus has often been on product innovation, analysing the digital revolution as a powerful tool for optimizing existing processes; nonetheless, as has often happened in history, the great technological innovations have brought with them Copernican revolutions, grafting into society process innovations not imaginable at the beginning but able to modify the systems of relations that govern the socio-political structures of organisms such as cities.

One such case could be the adoption of "agile" methodologies as a governance tool capable of transforming the interaction between public administration and citizens in the definition and creation of services for the community.

In software engineering, the term agile methodology refers to a set of software development methods that have emerged since the early 2000s and are based on a set of common principles, directly or indirectly derived from the principles of the "Manifesto for Agile Software Development" (Beck et al., 2001). The agile methods contrast with the waterfall model and other traditional development models, proposing a less structured approach focused on the objective of delivering to the customer, in a short and frequent time, functioning and quality software. Among the practices promoted by agile methods are the formation of small, multi-functional and self-organized development teams, iterative and incremental development, adaptive planning, and the direct and continuous involvement of the client in the development process.

In addition to some scientific papers that analyse the relationship between agile methodology and urban planning and its positive and negative consequences on the cities development (Stevens & Dovey, 2019), a practical application is represented by the project urbanAPI – Interactive analysis, simulation and visualization tools for the implementation of Urban Agile policies – financed by the EU through the European Commission's Seventh Framework Programme. The project is led by Fraunhofer IGD and supported by UWE development partners, Bristol, AIT, GeoVille and partner cities Vienna, Bologna, Ruse and Vitoria-Gasteiz.

UrbanAPI aims to provide ICT-enabled solutions that adapt governance models to support stakeholder involvement and citizen participation, in order to improve the development and delivery of sustainable urban

policies. UrbanAPI applications can be used for decision support, conflict management, analysis and visualization and are based on innovative interaction platforms. They support policy makers, planners and stakeholders at different levels of governance and spatial: urban neighbourhood level, municipal level and urban region level. UrbanAPI adopts an agile development methodology with cyclical and multiple activities in parallel, developing a set of tools that creates advanced ICT-based intelligence in three urban planning contexts:

- the 3D Scenario Creator application directly addresses the issue of stakeholder engagement in the planning process through the development and delivery of advanced 3D visualizations of the virtual reality of neighborhood development proposals;
- mobility Explorer offers ICT solutions based on mobile phones that allow the analysis and visual representation of socio-economic activity across cities and in relation to the various elements of city land use;
- the Urban Development Simulator prototype provides ICT simulation tools for simulating the development of interactive urban areas that address urban growth and densification as a result of planning interventions.

The following 5 questions led to the selection of the conferences described below:

- Can the city be reimagined as a commons?
- Which urban processes have been affected by the smart revolution?
- How disruptive trends are already changing and transforming urban living around the world today?
- Can new ICT technologies affect social inclusion, sustainability and empowerment processes?
- Can the networking capabilities of new ICT technologies affect national policies?

THE CITY AS A COMMONS

The City as a Commons

Where: Pavia, Italy

When: 2-4 September, 2019

http://cityascommons.unipv.it/researchsymposium2019/

Can the city be reimagined as a commons?

It has become fashionable to talk about the "urban commons", and it's clear why. What we traditionally conceive of as "the public" is in retreat: public services are at the mercy of austerity policies, public housing is being sold off and public space is increasingly no such thing. In a relentlessly neoliberal climate, the commons seem to offer an alternative to the battle between public and private; nonetheless, we cannot have a common resource without a common strategy for managing it. And so, rather than a resource, the commons is a process, a set of social relations by which a group of people share responsibility for, yes, a garden or even the governance of their neighbourhood.

The 2019 edition of the Research Symposium is jointly organised by the University of Pavia and the University of Huddersfield and it will bring together scholars and experts on this topic to share theoretical and practical agendas, including best practices and outcomes from live case studies.; it aims at investigating the notion of Urban Commons and their spatial unfolding in relationship to the City. Taking into consideration the wider debate on Commons and its relevance to several disciplines (economics, geography, law, architecture, planning, etc.), the event aims at focusing on urban commons and broader spatial implications, both in terms of spatial practices and design agencies.

THE FOURTH INTERNATIONAL CONFERENCE ON SMART CITY APPLICATIONS (SCA 2019)
Where: Casablanca, Morocco
When: 2-4 October, 2019
http://www.medi-ast.org/sca19/

Which urban processes have been affected by the smart revolution?

SCA conference aims to bring together research scientists and industrial engineers to discuss and exchange both experimental and theoretical results, novel designs, case studies, and trend-setting ideas in the area of smart cities. The conference covers any topic with an intersection with smart cities, including education, healthcare, economy, digital business, building and home automation, environment and agriculture, information technologies and computer science. The Conference encourages submission of original works presenting novel research results and new products or concepts.

4TH ANNUAL INTELLIGENT CITIES SUMMIT
Where: Toronto, Canada
When: 7-8 October, 2019
https://iotevents.ca/event/intelligent-cities-19/

How disruptive trends are already changing and transforming urban living around the world today?

The 4th Annual Intelligent Cities Summit brings together leading global municipal professionals and tech experts to discuss, share ideas and case studies on how to utilize new technology to enhance our cities – making them more efficient, offering better city services and improving quality of life.

SMART CITY EXPO WORLD CONGRESS
Where: Barcelona, Spain
When: 19-21 November, 2019
http://www.smartcityexpo.com/en/home

Can new ICT technologies affect of social inclusion, sustainability and empowerment processes?

The conference proposes a format focused around 5 main tracks, allowing for in-depth discussion in a wide range of formats. Each track is made up of a range of themes, with dedicated sessions honing in on the most critical issues facing cities today.
The main tracks of the conference are the following:

- Digital transformation;
- Urban Environment;
- Mobility;
- Governance & Finance;
- Inclusive & Sharing Cities.

In particular, the last track has the following themes:

- Future of Work & Education;
- Bridging the Gap;
- Circular Economy;
- Sharing Economy;
- Right to the City.

EUROCITIES 2019 Prague

Where: Prague, Czech Republic

When: 20-22 November, 2019

http://www.eurocities.eu/eurocities/allcontent/EUROCITIES-2019-Prague-conference-programme-WSPO-BDABVP

Can the networking capabilities of new ICT technologies affect national policies?

EUROCITIES was founded in 1986 by the mayors of six large cities: Barcelona, Birmingham, Frankfurt, Lyon, Milan and Rotterdam. Through six thematic forums, a wide range of working groups, projects, activities and events, the group offers to the members a platform for sharing knowledge and exchanging ideas with the aim to influence the EU institutions to respond to common issues that affect the day-to-day lives of Europeans. Its objective is to reinforce the important role that local governments should play in a multilevel governance structure. The Eurocities 2019 conference - Cities at a crossroads – is one of the initiatives organized by the group to share with the participants the most recent issues of the debate on the enforcement of the rights of European local communities.

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IMAGE SOURCES

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AUTHORS' PROFILES

Gennaro Angiello

Engineer, Ph.D. in Civil Systems Engineering at the Federico II University of Naples. His research interests are in the field of accessibility analysis and modeling, land-use and transport interactions and sustainable mobility. He was involved in the research project Smart Energy Master and in the COST Action TU1002 accessibility Instruments for Planning Practice in Europe.

Federica Gaglione

Engineer, Ph.D. student in Civil Systems Engineering at University of Naples Federico II. Her research topic concerns the urban accessibility. The aim is to develop a decision support tool that, on an urban scale, allows to choose the most effective actions to improve urban accessibility for vulnerable users, by contributing to improve their quality of life.

Carmen Guida

Engineer, Ph.D. student in Civil Systems Engineering at University of Naples Federico II. She received a master degree in Hydraulic and Transport Systems Engineering at University of Naples Federico II with a thesis on the safety performance of urban intersections, developed at University of Central Florida, Orlando (U.S.). Currently, her PhD research concerns accessibility to urban services for elderly people with the aim of minimizing social exclusion and inequalities within urban areas.

Rosa Morosini

Engineer, Ph.D. student in Civil Systems Engineering at University of Naples Federico II. Her research topic concerns the urban planning transformations and soil consumption. The purpose is to identify supporting tools for the local authorities with the aim of minimizing the use of this resource and make it a sustainable use.

Andrea Tulisi

Architect graduated in Architecture from the University Federico II in Naples in 2006. In January 2014 holds a PhD in Environmental Technology with a research focused on rehabilitation strategies for semi-enclosed spaces in the "Compact City". He was involved in the project Smart Energy Master at the DICEA department of the University of Naples Federico II. His research activity is focused on the link between urban open spaces and energy consumption.

EDITORIAL PREFACE: TEMA JOURNAL OF LAND USE MOBILITY AND ENVIRONMENT 3 (2019)

THE TIMES THEY ARE A-CHANGIN'

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In these last ten years, TeMA Journal has published several international studies and researches supporting the scientific debate on the urban complexity and the future challenges of urban areas. Thus, the three issues of the 12th volume will think again the debate on the definition and implementation of methods, tools and best practices connected to the evolution of the main scientific topics examined in depth in previous TeMA Journal volumes.

For this issue, the section "Focus" contains two articles.

The first article, titled "Defining urban green infrastructure role in analysis of climate resiliency in cities based on landscape ecology theories" by Elmira Shirgir, Reza Kheyroddin, Mostafa Behzadfar (University of Teheran, Iran). The paper addresses the landscape ecology principles and relationship between them and green infrastructure in cities. An application in a neighborhood of Tehran (Yousef Abad) was developed using the aerial images, field surveys and preparation of basic and analytical GIS maps. Finally, the effective qualities in assessing the climate resilience in cities using the urban green infrastructures based on landscape ecology were obtained.

The second article "Guidelines for Mega-event organization considering safety, security and resilience: Insights from London Olympic Games 2012 and Milan EXPO 2015" by Funda Atun and Ozlem Edizel Tasci (University of Twente, Netherland). The paper addresses the issue of mega-event organization, analyzing the Milan World Expo 2015 and London Olympic and Paralympic Games 2012. The paper, in particular, considers the two event under the light of security, safety and resilience of the events. The results are based on the experience of the real actors involved in these two events. The findings suggest several courses of action for decision-makers and emergency planners to safety and security design strategies that can facilitate resilience as a legacy of a mega-event.

The paper addresses the section "Land Use, Mobility and Environment" are five articles.

The first article, titled "High speed rail and airport. Future scenarios in Marco Polo Airport in Venice", by Paola Pucci and Giovanni Lanza (Politecnico di Milano, Italy). This paper introduces an analysis of the possible extension of the catchment area of the Venice Marco Polo Airport, due to the implementation of a direct rail connection and the completion of the high speed/high capacity railway between Milan and Trieste. The study estimates the effects generated by the new railway connections in terms of extension of the Marco Polo airport's catchment area and the related impacts on air traffic, in terms of potential new passengers.

The second article, titled "Walking and talking. The effect of smartphone use and group conversation on pedestrian speed", by Lexie Reynolds Walsh, Tingsen (Tim) Xian, David Matthew Levinson, Hema Sharanya Rayaprolu (University of Sydney, Australia). Distracted walking due to smartphone use is on the rise resulting in growing concern over pedestrian safety and well-being. The study measured the walking speeds of pedestrian groups differentiated by their smartphone use in two different environments - a wide pedestrian bridge at a university, and a narrow footpath on a busy commercial street.

The third article "Elders' quality of life and urban accessibility. A method proposal for spatial planning", by Federica Gaglione, Carmela Gargiulo and Floriana Zucaro (University of Naples Federico II, Italy) deals the issue of the progressive ageing of population is a challenge each city has to tackle by now in order to satisfy the related new commitments. Responding to the needs of the elderly implies rethinking the ri-organization and the planning of the urban space to guarantee the best accessibility and usability to urban services of interest for the elderly segment of the population. In this perspective, the paper provides a methodology for classifying the areas of a city according to the levels of mobility and urban services for over 65.

The fourth article "Land-Use and Transport integration polices and real estate values. The development of a GIS methodology and the application to Naples (Italy)", by Gerardo Carpentieri, Carmen Guida (University of Naples Federico II, Italy) and Paul Chours (Province of North Holland, Netherlands). The aim of this study is to develop an ex-post spatial analysis procedure, GIS-based, able to quantify, in terms of real estate values, the impacts in station areas, at micro and macro level, that have been recorded as results of redevelopment and opening of new urban railway lines and stations, as well as of the development of urban requalification and transformation actions. Moreover, a second objective is to apply the methodology to the Naples case study, in order to assess its effectiveness.

The fifth article "Transport Implications in Tourist Destinations. The Trapani Airport in Western Sicily", by Enrique Calderon (Universidad Politécnica de Madrid, Spain), Paolo Ventura, Alessandro Massaro (University of Parma, Italy),. The paper discusses the impact upon the regional development of the tourist traffic of the Trapani Airport sited in the westernmost part of Sicily. Furthermore, it analyzes the important role of connectivity and accessibility in the development of the area and tourism, seeking a maximum involvement of stakeholders.

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. In particular, the Web section by Rosa Morosini describes three web resources of: (i) The Environmental pollution centers; (ii) European soil data centre and (iii) ECOREMED. The Books section by Carmen Guida briefly reviews three relevant books related to the Issues' theme: (i) Urban Climates; (ii) The Urban Fix: Resilient Cities in the War Against Climate Change, Heat Islands and Overpopulation and (iii) Domus Ecoworld. The Law section by Federica Gaglione keeps readers up to Improve the sustainability of cities through soft mobility. The Urban Practices section by Gennaro Angiello presents two case studies for urban resilience in north America (i) Chicago (Unite States) and (ii) Toronto (Canada). The News and Event section by Andrea Tulisi, select conferences deliberately deal with different issues not necessarily related to the theme of resilience, but which basically question on the future of cities.

Just few hours before the publication of this third issue of TeMA for 2019, the news of the failure of the International UN Climate Change Conference of Madrid 2019 (COP 25) came. This is not good news for those who take to heart the future of our planet. As partial solage, we report the speech of the President of the European Commission, Ursula von der Leyen, at the opening session of COP25 in Madrid.

"In ten days from now, the European Commission will present the European Green Deal. Our goal is to be the first climate neutral continent by 2050. If we want to achieve that goal, we have to act now, we have to implement our policies now. Because we know that this transition needs a generational change. Three thoughts. The European Green Deal is Europe's new growth strategy. It will cut emissions while also creating jobs and improving our quality of life. For that we need investment! Investment in research, innovation, green technologies. To pull this off, we will deliver a Sustainable Europe Investment Plan – which will support one trillion euros of investment over the next decade. Second thought. Only what gets measured gets done. Therefore, in March next year, we will propose the first-ever European Climate Law to make the transition to climate neutrality irreversible. This will include extending emission trading to all relevant sectors, clean,

affordable and secure energy, the boosting of the circular economy, a farm to fork strategy as well as a biodiversity strategy. The European Green Deal will open new opportunities in all sectors – from transport to taxation, from food to farming, from industry to infrastructure. Third thought. This transition must work for all or it will not work at all. And with a Just Transition Fund we will make sure that we help those who will have to take a bigger step and leave no one behind. The Fund will leverage public and private money, including with the help of the European Investment Bank that has committed itself to become Europe's Climate Bank. We Europeans are ready. If we move together, we will also move faster, in everyone's interest. We will be as ambitious as we can throughout these COP negotiations. We are ready to contribute with our European Deal to a Global Green Deal. Thank you."

TeMA Journal of
Land Use, Mobility and Environment

Call for Paper

TeMA vol. 13 (2020) The city challenges and external agents. Methods, Tools and Best Practices

The Times They Are a-Changin' and cities have to face challenges which may not be further postponed. In particular, six of these challenges to modify and/or adapt cities physical shape, facilities distribution and their organization as complex systems: climate changes effects, population aging, reduction of fossil-fuel energy consumptions, immigration flows from disadvantaged regions, technological innovation and optimization of land use.

The three issues of the 13th volume will collect articles concerning the challenges that cities are going to face in the immediate future, providing readings and interpretations of these phenomena and, mostly, methods, tools, technics and innovative practices (defined as Climate proof cities, Zero consumption cities, Car Free cities, ..) oriented to gain and keep a new equilibrium between cities and new external agents.

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

• First issue: 10th January 2020;

• Second issue: 10th April 2020;

• Third issue: 10th September 2020.

TeMA Journal of Land Use, Mobility and Environment

TeMA 3 (2019) 227-247
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6250

paper received 26th August 2019, accepted 14th November 2019

www.tema.unina.it

How to cite item in APA format:
Shirgir, E., Kheyroddin, R. & Behzadfar, M. (2019). Defining urban green infrastructure role in analysis of climate resilience in cities based on landscape ecology principles. *Tema. Journal of Land Use, Mobility and Environment*, *12* (3), 227-247. doi: http://dx.doi.org/10.6092/1970-9870/6250

DEFINING URBAN GREEN INFRASTRUCTURE ROLE IN ANALYSIS OF CLIMATE RESILIENCE IN CITIES BASED ON LANDSCAPE ECOLOGY PRINCIPLES

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ABSTRACT

Climate change is a globally widespread phenomenon. Urban development and climate change are closely interrelated; cities are exposed to the risk of climate change and as a result, are very vulnerable. In recent years, to face the challenges caused by the climate change, the concepts of, urban ecological resilience, specifically, climate resilience have been introduced. Climate resilience, is a type of urban ecological resilience, which is defined as the urban resilience to climate change.

Urban green infrastructure has an established role as one of the strategies for adapting to climate change and for developing and promoting climate resilience in cities. Given the theoretical gap existing in this field, this question arises: "How and based on which features of the green infrastructure can we assess and analyze climate resilience in a city?" To answer this question, the landscape ecology principles and relationship between them and green infrastructure in cities were studied. The relationship was developed in the Yousef Abad neighborhood of Tehran and was qualitatively tested using the aerial images, field surveys and preparation of basic and analytical GIS maps. Finally, the 'effective qualities in assessing the climate resilience in cities using the urban green infrastructures based on landscape ecology' were obtained.

KEYWORDS:
Climate change; Urban climate resilience; Urban Green Infrastructures; Landscape Ecology; Yousef Abad Neighborhood in Tehran

TeMA
有关土地使用、交通和环境的杂志

TeMA 3 (2019) 227-247
print ISSN 1970-9889, e- ISSN 1970-9870
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基于景观生态学原理来定义城市绿色基础设施在城市气候弹性度分析中的作用

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摘要

气候变化是一个全球性的现象。城市发展与气候变化密切相关；城市面临着气候变化的风险，因此非常脆弱。近年来，为了应对气候变化挑战，引入了城市生态弹性度的概念，特别是气候弹性度。气候弹性度是城市生态弹性度的一种，被定义为城市在气候变化面前所表现出的弹性。
作为适应气候变化以及发展和促进城市气候弹性度的战略之一，城市绿色基础设施已经确立了其作用。鉴于该领域存在的理论差距，进而引发了这一问题：“我们应该如何以及基于绿色基础设施的哪些功能来评估和分析城市的气候弹性度？”为了回答这一问题，我们对景观生态学原理及其与城市绿色基础设施之间的关系进行了研究。这种关系是在德黑兰的优素福阿巴德街区发展起来的，并通过航拍图像、实地调查以及编制基本和分析 GIS 地图进行了定性测试。最后，得出了“基于景观生态学使用城市绿色基础设施来对城市气候弹性度进行评价的有效质量”。

关键词：
气候变化；城市气候弹性度；城市绿色基础设施；景观生态，德黑兰的优素福阿巴德街区

1 INTRODUCTION

Cities all over the world face a wide range of hazards that are affected by the factors such as increased urban population and climate change (IPCC, 2008). Urban development and climate change are closely related. Cities are exposed to the risk of climate change and are very vulnerable (Mishra, 2017).
In this respect, in recent years, urban resilience concept has been developed to reduce these negative effects. Resilience is the ability of a system to absorb the disturbances while maintaining the basic structure in the same way and the functional methods, the capacity for self-organization and the capacity to adapt to stress and change (IPCC, 2008). Adaption to climate change focuses on reducing vulnerability to these changes (Leichenko, 2011). Resilience has different dimensions, among which 'climate resilience' as a type of urban ecological resilience is considered in this study (Childers & Cadenasso, 2015), which includes adaptation to and mitigation of the risks and adverse effects of climate change (Asian Development Bank, 2014).
Urban green infrastructure has various vital functions, including the environmental, social, etc., according to research, it is effective in reducing the impacts of climate change in cities and enhancing climate resilience (Byrne et al., 2015).
Reviewing the literature on urban green infrastructure related to its role in creating urban (climate) resilience, characteristics of green infrastructure and the amount of effectiveness based on the development, analysis and evaluation of urban resilience to climate change have not been properly addressed so far. In general, no exact factors have been provided to assess this kind of resilience. It seems that these characteristics can be used as important factors for assessing the quality of climate resilience.
To achieve this goal, the relationship between landscape ecology and its principles is useful for analyzing the resilience potential of green urban infrastructure. Consequently, this relationship will be scrutinized in this paper in a theoretical manner. Then, the principles and results obtained from this study, will be implemented in Yousef Abad neighborhood in Tehran, Iran. Tehran is a city with many problems due to climate change, such as air pollution, drought, increased temperature and lack of water resources. By conducting field surveys, use of aerial images of area of study and preparation of basic maps and analysis using GIS software, this research provides a proposed model and framework based on its question for using the existing green infrastructure in a city to assess quality of climate resilience based on principles of landscape ecology. In the following, the theoretical framework required for this research is introduced.

2 TERMINOLOGY

2.1 CLIMATE CHANGE AND URBAN CLIMATE RESILIENCE

Today, direct and indirect effects of climate change on the low-income and middle-income residents can be seen in the countries that have had the least impact on global warming and climate change. Certainly, the low-income class will be mostly effected from climate change (Asian Development Bank, 2014). Urbanization and climate change have a negative impact on quality of life, economic situation and social stability. The areas with the concentration of population, industries and infrastructure (green–grey), are mostly influenced by climate change. Some urban areas are also more vulnerable to greater impacts of climate change including high temperatures, rising sea levels, precipitation fluctuations due to their geographical situation. Urban dynamic intensifies the effects of climate, the rapid growth of cities will replace the vegetation with hard building surfaces (IPCC, 2008), as a result, the precipitation is reduced and temperature rises. This is what will be discussed more in the case study section of this research. Reducing the impacts of climate changes is related to these five key factors: 1) City form, 2) Construction, 3) Artificial environment, 4) Urban

infrastructure, and 5) Transportation and production of carbon (Connell et al., 2017). This research is focused on urban infrastructures, specifically 'green urban infrastructures'.

Concept of urban resilience has been proposed in recent years to reduce and adapt to these changes. In this study, 'climate resilience', a type of urban ecological resilience, will be discussed. To accurately define the concept of climate resilience, it is necessary to first provide an exact definition of the concept of resilience: resilience refers to 'return to the past' and even 'the ability to easily and immediately return to the previous state', meaning the "elasticity" or flexibility (Adhya, 2010). According to the large scientific literature on the resilience concept and namely on its importance for coping with uncertainty, resilience can be a useful concept for driving strategies addressed to urban adaptation in face of climate change, mainly due to these aspects: resilience is conceived as a conceptual approach to deal with uncertainty and future change with respect to traditional approaches mainly focused on system's control; resilience represents a premise for a proactive response to disasters as it embodies the concept of adaptive and learning capacity, which is typical of living systems; resilience gives room to the emergence of new configurations of the system (even more desirable than the previous ones) after a disturbance, as a result of the self-organization capacity that is typical of complex systems, (Galderisi & Ferrara,2012).

Folke (2006) claims that,' Resilience deals with complex adaptive system dynamics and true uncertainty and how to learn to live with change and make use of it. In popular terms, resilience is having the capacity to persist in the face of change, to continue to develop with ever changing environments. Resilience thinking is about how periods of gradual changes interact with abrupt changes, and the capacity of people, communities, societies, cultures to adapt or even transform into new development pathways in the face of dynamic change. It is about how to navigate the journey in relation to diverse pathways, and thresholds and tipping points between them.

Types of resilience include: 1) urban ecological resilience, 2) urban-regional-economic resilience; 3) resilience to reduce urban hazards and accidents; and 4) resilience enhancement through urban governance (Childers & Cadenasso, 2015).

Urban ecological resilience refers to the capacity of ecological systems to absorb the disturbances and also to maintain the feedbacks, processes, and structures necessary and inherent to the system. In other words, it is the severity of the disturbance the system can absorb before the structure of the systems is transformed into a different structure by changing the variables and processes that control its behavior. Climate resilience, is a type of urban ecological resilience (Schipper, 2007). According to the definition of ecological resilience and taking the concept of climate change into account, climate resilience includes: the capacity of an independent unit or a group or organization to respond to climate change in a dynamic and effective manner, while still continuing to daily activities in an acceptable level. This feature includes the resistance to change, recovery after the shock, and reorganization to prevent the destruction of the system that is the city, here and for continued life (Dayland & Brown, 2012). A definition of urban climate resilience is also provided by the Environmental Protection Agency (United States Environmental Protection Agency, EPA, 2017): it is 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,(Errigo,2018). In general, climate resilience, is urban resilience to climate change (Fig. 1).

The factors contributing to climate change include infrastructures, institutions, ecosystems, and capabilities of organizations and authorities (Miller et al., 2009) (Fig. 2).

To sum up, infrastructure is among the factors affecting the development and promotion of climate resilience in cities, urban green infrastructure (UGI) are in focus here which will be further discussed.

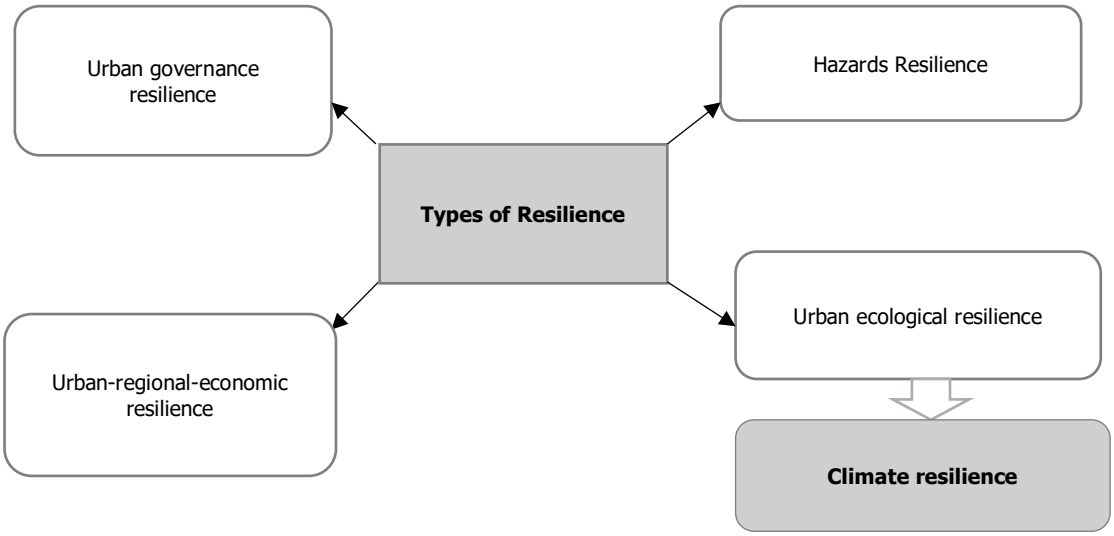

Fig.1 Relationship between climate resilience and other types of resilience

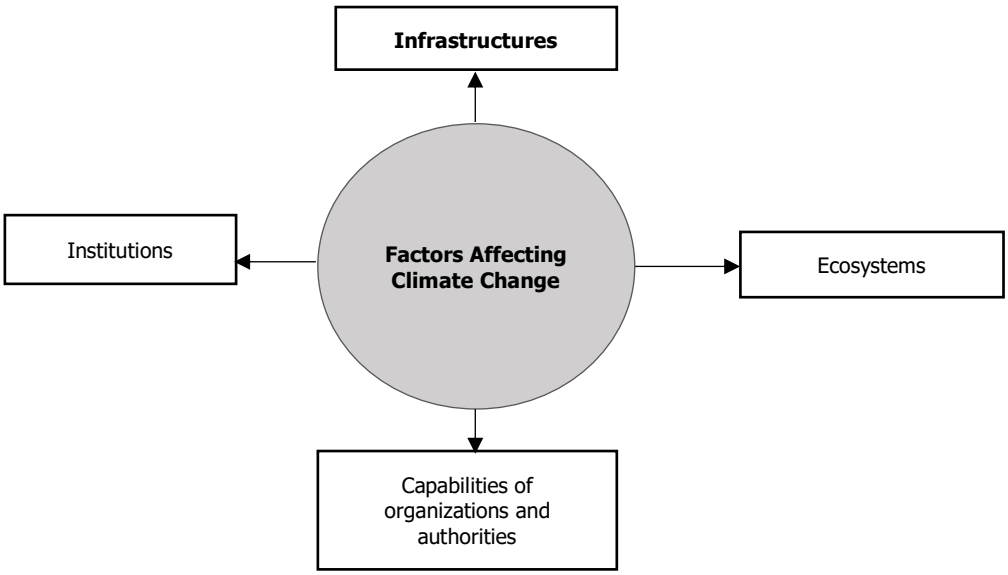

Fig.2 Factors affecting climate change

2.2 URBAN GREEN INFRASTRUCTURES AND THEIR ROLE ON INTEGRATING URBAN CLIMATE RESILIENCE

The influential factors in developing and enhancing climate resilience include various types of infrastructures such as green infrastructures. They are considered as one of the most important urban elements. The term infrastructure as a park and green space was first used in 1996 to define public parks as a subcategory of urban infrastructure. Green Infrastructure (GI) is defined as an ecosystem or a network of ecosystems with specific parts, needs, functions and services, an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations (Bianoci et al., 2018). Green infrastructures include a related network of green spaces that are strategically managed, have many functions, and are useful in ecological, social and economic terms (Pataki et al., 2011). Urban green infrastructure is a kind of ecological social system which results from the interactions of various elements, especially human beings. On the other hand, the components of green urban infrastructure can be considered as a combination of open and closed spaces and a mixture of natural plant habitats, which are of great ecologic, social and economic significance. As a result, the proper design in these spaces can have a profound effect on

everyday life, also resilient design is considered one of the most appropriate principles for the design of such spaces (Oliver, 2014). In general, GI includes green roofs, permeable green surfaces, green paths and streets, urban forests, public parks, neighborhood gardens, and urban wetlands, (Demuzere et al., 2014).

Urban green infrastructure (UGI), is one of the most important 'strategies for adaptation to climate change'. Adaptability has been defined as "the capacity of actors in a system to influence resilience" (Derzken, 2017) and is about adapting within critical social-ecological thresholds. Adaptability is central to persistence. It helps turn changes and surprises into opportunities and, hence, is an important part of social-ecological resilience (Berkes et al., 2016).

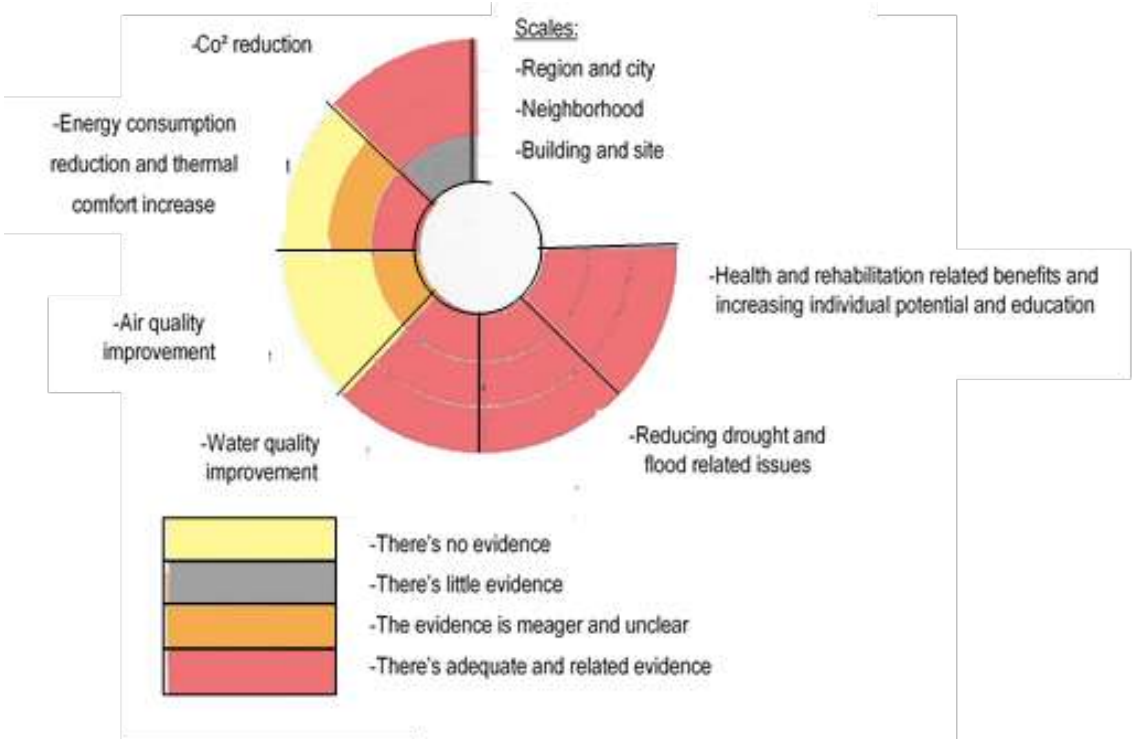

Fig.3 The link between the effects of urban green infrastructure and their impacton climate change reduction and adaptation in three scales and evidence-based

Green infrastructure plays a significant action to mitigate the effects of climate change in the urban environment, promoting adaptation strategies of cities (Salata & Yiannakou, 2016).GI can enhance the cities' climate and reduce the impacts of climate change in future (Foster et al., 2011). It can play an important role for the reduction of emissions, prevention of hydro-geological collapse, soil protection, improvement of air quality and conservation of genetic resources potentially better suited to cope with extreme weather and socio-economic conditions (Bianoci et al., 2018). It also reduces the effects of heat islands and floods in cities as well (Byrne et al., 2015). The effects of green structures on reducing the climate change impacts and increasing the resilience in cities can be divided into several categories: 1) Physical effects; 2) Increased thermal comfort and reduced energy consumption; 3) Reduced negative effects of floods, increased water quality and reduced drought; 4) Impact on air quality; 5) Positive psychological and social effects; 6) Impact on health, social and individual activities, education (Demuzere et al., 2014). In Fig. 3, the impact of urban green infrastructure on climate resilience and adaptation to climate change are displayed. The effects of UGI as an important strategy for adaptation to climate change on: reducing drought, extreme heat, precipitation reduction and air pollution are the main focus of this research, therefore they will be discussed more in the next section.

2.3 CLIMATE CHANGE ADAPTATION STRATEGIC PRINCIPLES

Using UGI as an adaptive strategy is mostly applicable in areas dealing with extreme heat, drought, precipitation reduction, air pollution and water shortage. These conditions can be generalizable to the current state of climate change in many countries around the globe with the same problems due to climate change. Different countries face different types of climate change challenges according to their location and climate conditions, population and natural resources.

As Gill (2007) states, adaptation strategies to climate change, regarding urban green infrastructure, are categorized in three general strategic principles, (Fig. 4): A) *Preservation and Enhancement of Existing Vegetation:* One of the important strategies for reducing the temperature in the warm seasons is preservation and maintenance of existing vegetation whether in private gardens, public green spaces or in green spaces on the streets. There's a fact that in many urban areas, hard and built infrastructure already exist, and it is impossible to change their land use and replace them with large green spaces. In these circumstances, green infrastructure must be added to the environment creatively, using special methods.

Among these methods, the use of green roofs, green facades, planting of rows of trees along the streets and railroads and turning the streets into green corridors can be referred to. Priority should be given to areas where people's vulnerability to climate change is high. Areas with higher poverty, extreme heat, high population and etc., are the most vulnerable.

B) *Using Climate-tolerant Plants:* Another strategy is the use of drought tolerant plants. It goes without saying that one of the negative effects of climate change is causing droughts. Under such conditions, the use of plants with less water requirements and less susceptibility to climatic conditions is effective. Some types of plants are very resistant to specific climatic conditions, including drought. The use of trees is very suitable in such conditions. These plants continue to shade and evaporate under severe climatic conditions. To plant such trees on the streets, it should be noted that the roots of them have good space and conditions. In addition, their placement must be selected correctly. Conditions of irrigation are also very effective and it must be ensured that enough water will reach these trees. Water for irrigation of plants under drought conditions can be provided by reuse of gray or underground waters in the suburbs or by storing water obtained from flood and precipitation (Gill et al., 2007).

C) *Use of Science of Landscape Ecology in finding Proper Locations for Green infrastructures in New Urban Projects and also in quantitative analysis of the UGI resilience to climate change:* To deal with climate change, the location of the green infrastructures is very important. The last strategy presented here, is the main focus of this research which will be discussed in the following section. To complete the strategic principles mentioned above. Based on the theoretical framework presented previously, some key facts can be discussed in the following section.

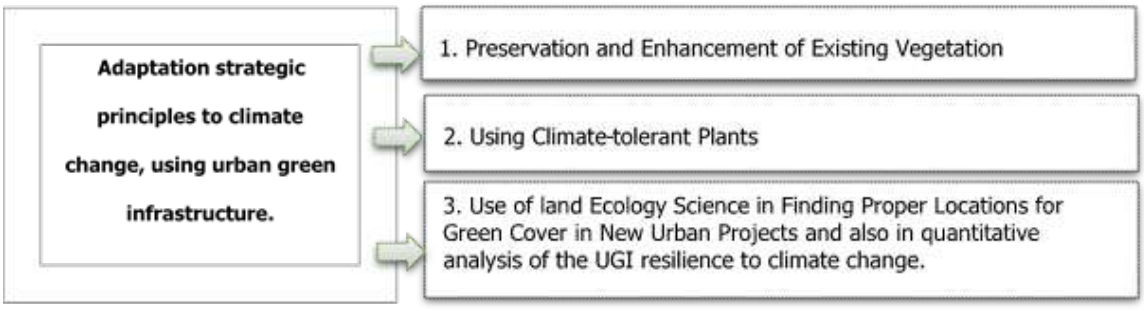

Fig.4 A Framework for Climate Adaption Strategic Principles Using Urban Green Infrastructure to Improve Climate Resilience in cities facing drought, extreme heat, precipitation reduction and water shortage

2.4 RELATIONSHIP BETWEEN LANDSCAPE ECOLOGY AND URBAN GREEN INFRASTRUCTURE AND RESILIENCE TO CLIMATE CHANGE

During the 1980s, advances in the accessibility of computing, remotely sensed satellite and aerial imagery, development of geographic information systems (GIS, ARC/INFO was first released in 1982), and spatial statistical methods (Fortin & Dale 2005), enabled ecologists to observe and analyze spatial heterogeneity ranging from local habitats to entire continents. Landscape ecology, then, involves the study of these landscape patterns, the interactions among the elements of this pattern, and how these patterns and interactions change over time (DucUy & Nakagoshi, 2008).It is best distinguished by its focus on: 1) spatial heterogeneity, 2) broader spatial extents than those traditionally studied in ecology, and 3) the role of humans in creating and affecting landscape patterns and process (Forman, 1995) and by spatial heterogeneity and pattern: how to characterize it, where it comes from, how it changes through time, why it matters, and how humans manage it (Forman & Godron, 1986).

According to Forman and Godron (1986), components of green infrastructure can be classified into three elements: *patch, corridor and matrix***.** A patch is an area of habitat differing from its surroundings, often the smallest ecologically distinct landscape feature in a landscape mapping and classification system .The characteristics of patches are important in landscape ecology, (e.g., the size, shape, or perimeter to area ratio of individual patches). The matrix is the majority of the surrounding landscape (i.e., not the patches); the large proportion of the landscape classified as matrix may have profound influences on the ecological processes in the landscape. Corridors are narrow patches that may act as links or barriers in a landscape. Beyond the image of narrow patches, corridors are functionally important landscape structures influencing dispersal of plants and animals in the landscape (Haddad et al. 2003). Ecologists have been particularly interested in how the spatial distribution of elements affects ecological processes, (McGarigal, 2001).

The development and dynamics of spatial heterogeneity in landscapes is a central theme of ecological studies, especially the effects of conversion of natural ecosystems into human dominated systems such as UGI or urban land use. As natural habitat (UGI) is altered in a landscape, (or city) both the composition and the configuration (spatial pattern of patches) change. This conversion is called fragmentation (in cities, green patches are fragmented during time because of city growth). Evidence is mounting that change in composition has a dominant effect on composition of the biota, whereas variation in configuration has a lesser effect, except at very low proportion of patch composition in the landscape (Fahrig, 1997). This interest has led to the emergence of a dynamic mosaic paradigm (Haddad et al., 2003), which complements the patch-corridor-matrix paradigm. Landscape concepts regarding loss and fragmentation of vegetation cover around the world have become fundamental to understanding the carbon cycle, and predicting the consequences of global climate change (Houghton, 1995).

The patch-corridor-matrix paradigm is what will be used later, to analyze the existing UGI, as a climate change mitigation strategy in the area of study, in this research. To deal with climate change, spatial analysis of components of landscape ecology is necessary, the location, of green cover is very important, whether monitored during a length of time or at the exact time of the analysis.

Each of these elements has the following benefits on climate change effects: Corridors are effective in storing the water from flooding and controlling flood flow, patches are mostly effective in restoring the rainwater and preventing it from flooding. The cooling of space through evaporation is further done by patches than matrixes, and the appropriate micro-climates are also created in the patches, Matrixes are more effective in treating the rainwater than the patches (Gill et al., 2007).

When the green spaces are greater than one hectare, they create a good microclimate. Shading occurs in the patches and matrixes, which leads to cooling of residential areas (Forman, 1995).Therefore green patches and their status are important in this study. Generally, green space is effective in reducing the rate and amount

of surface runoff in sandy soils. The creation of protected areas on such soils can be a good strategy for the areas with such soil types (Gill et al., 2007).

	CORRIDOR	PATCH	MATRIX
Retention of water from flood	⋆⋆⋆	⋆⋆	⋆
Water Treatment property	⋆	⋆⋆	⋆⋆⋆
Cooling through evaporation	⋆	⋆⋆⋆	⋆⋆
Shading	⋆	⋆⋆	⋆⋆⋆

⋆ Mark shows the effect of corridor, patch and matrix on various kinds of climate changes.

Tab.1 Typology and influence of urban green infrastructure on adaptation to climate change from landscape ecology point of view (Gill et al., 2007)

Imaging and mapping technology naturally promoted a patch-corridor-matrix approach to landscape ecology. Examining the map or aerial image of an area helps to define important vocabulary, (Clark, 2010). In this article the main purpose is to use the 'patch-corridor-Matrix heterogeneity model', to analyze and read, the quality of existing urban green infrastructure in a city based on its climate resilience potentials. By using this approach, and analyzing the heterogeneity of the components of landscape ecology, the greatest function and relationship of landscape ecology with urban green infrastructure will appear and that is to locate, suggested green cover in new urban projects by reaching solutions to guide green patches and corridors to the their utter heterogeneity and to lesser the fragmentations caused by urbanity during the years. The above cases can be used both for new urban areas and projects and also, to preserve and enhance the vegetation available in an area. As Galderisi (2014) states, for using UGI to face climate change impacts: existing green spaces in cities must be preserved and looked after, authorities and decision makers must provide the city with more green and blue spaces, and green continuous networks (corridors) must be created in cities.

In Tab. 1, types (typology) of green infrastructure based on landscape ecology's classification, displays how elements of landscape ecology, can be effective in integrating resilience to climate change (Gill et al., 2007; Shirgir et al., 2019).

In addition to the type of green infrastructure, the landscape ecology states that the position and location of the patches, corridors and matrixes are effective in promoting the resilience (Gill et al., 2007). Also, the size of these factors can affect climate resilience. This way, the wider the green patches, the more resilient they are, and the more extended and connected the natural and artificial corridors, the more ensured the resilience. These measures and measurable data can play an important role in assessing the climate resilience. By spatially analyzing a city and measuring the number of green patches, corridors and matrixes of the city, their existence or absence, how they are placed beside each other, their connection and fragmentation, their size, health and suitability of existing vegetation in the city, an accurate spatial-qualitative (if more studied into details even a proper quantitate method) assessment of resilience in cities can be provided.

By conducting such analysis, some suggestions and principles can be presented in the next step for improving the current situation and strengthening green spaces of any type in cities. In this respect, the principles and method of assessing and analyzing the situation of urban green infrastructure are depicted based on the landscape ecology (Fig. 5).

According to this figure and using the principles derived from the relationship between the landscape ecology and urban green infrastructure and climate resilience, correct location for a new, strengthened green infrastructure can be found using the patch, corridor and matrix theories (correct location of proposed green infrastructure).

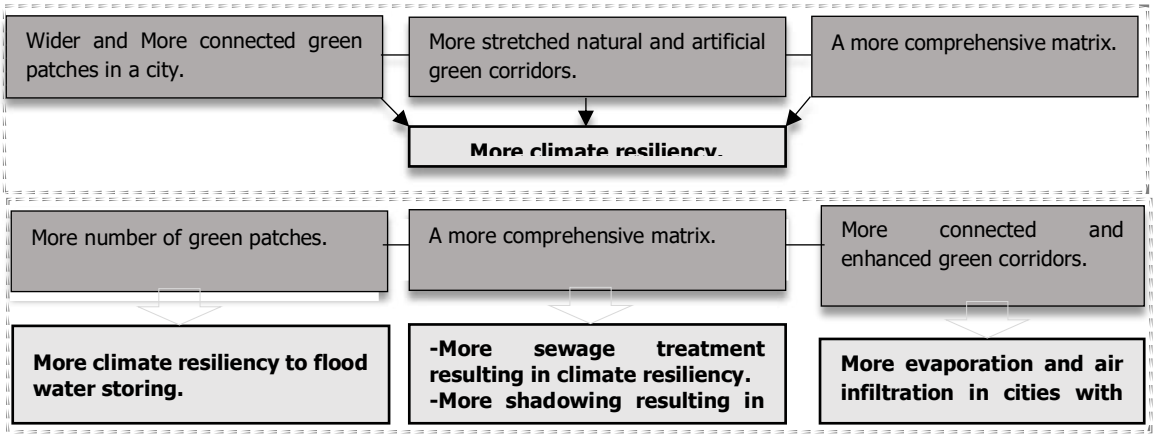

Fig. 5 Principles for analyzing UGI conditions based on their climate resilience role in a city through the language of landscape ecology (Patches, corridors and matrixes)

3 RESEARCH METHOD

In order to study the existing green infrastructure in a city scale, a valid method needed to be used. Norton (2015), has suggested a method to study and analyze the existing UGI, based on their potential to mitigate climate effects, in a city especially in the neighborhood scale. This is a 6 step framework to prioritize green infrastructure to mitigate mostly the high temperatures in urban landscapes.

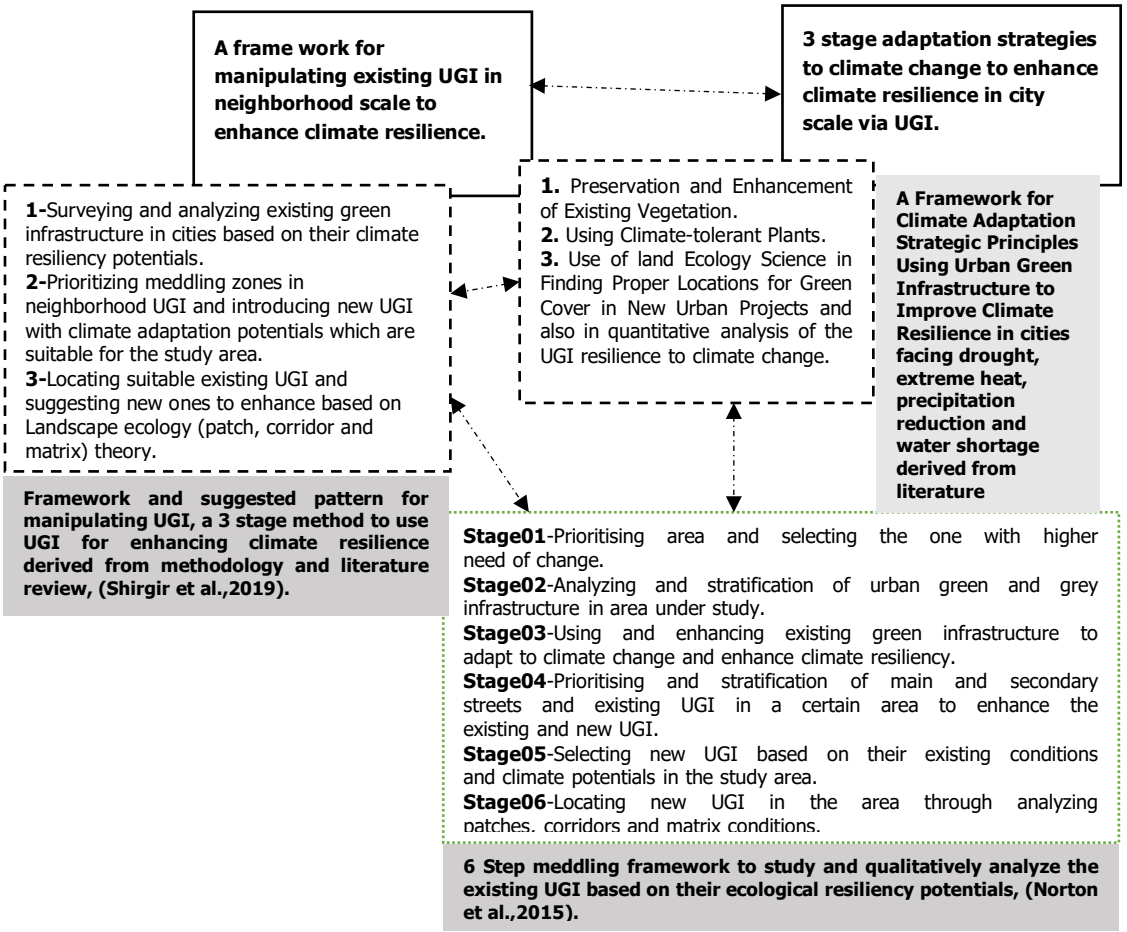

Fig. 6 Framework for meddling in UGI in city and neighborhood scale to enhance resilience to climate change

The 6 steps in a city scale are: 1. Prioritizing neighborhoods and choosing a neighborhood with a higher priority, 2. Identifying and categorizing green and gray infrastructure existing in the selected area, 3. Using

and strengthening existing green infrastructure to adapt to climate change and increasing climate resilience, 4. Sequencing and prioritizing streets in the area of study based on strengthening of existing and new green infrastructure, 5. Selecting new and appropriate green infrastructure, taking current situation of neighborhood and its climate potential into account, 6. Accurately locating green infrastructure of the area by qualitative analysis of green patch, corridor and matrix situation (Norton et al., 2015).

Here, by combining, the 3 strategic principles derived from the literature review section (Gill et al., 2007) (Fig. 4), with the '6 step framework to qualitatively analyze the existing UGI based on their ecological resiliency potentials' (Norton et al., 2015), and landscape ecology principles to read the existing UGI in order to integrate climate resilience (Forman & Gordon, 1986) (Fig. 6), a method is produced in this research. In other words this combination, provides a framework and pattern, for manipulating UGI in city and neighborhood scale to enhance resilience to climate change (Shirgir et al., 2019).

3.1 AREA OF STUDY: YOUSEF ABAD NEIGHBORHOOD IN TEHRAN

Tehran is of the most suitable city for assessing the resilience to climate change. Due to global warming and rapid growth of the city and the population growth, the climate change has affected the city severely. As a result, the necessary measures should be taken into account on all factors affecting urban ecological resilience and especially, climate resilience. Given the climate change situation in Tehran, including air pollution, temperature rise over recent years, rainfall shortage and rainfall variations and decrease, lack of water resources and their decreased quality, increase of dust and drought, all quarters and areas of Tehran and the suburban areas are at risk of climate change (Sheikhi & Rafeian, 2016). As a result, conducting the study.

Fig. 7 Situation of plant species in Yousef Abad, Tehran (left), aerial image of Yousef Abad quarter (right) (Source. Author),(Aerial image Google n.d., 2019)

Yousef Abad area of Tehran is one of the old quarters of Tehran, located in the 6th district of Tehran (Fig. 7).

UGI situation in Yousef Abad area was qualitatively analyzed and evaluated using the aerial images, GIS software and field surveys. This method and its results can change the scale from the neighborhood to the city and can be used to analyze the current situation in cities. It is important to clarify that based on the papers' main goal, the first 2 stages of the framework above were skipped to focus more on stages that would lead to the exact results.

4 RESULTS

The 6 stages that were used, are summarized in part A and B:

A) The first step taken here is a combination of stage 03 and 04 (Fig. 6). In order to use and enhance existing green infrastructure to adapt to climate change and enhance climate resiliency, the existing green infrastructure was documented on a map in Yousef Abad neighborhood of Tehran, to determine the type, position and situation of green spaces by conducting the field study, using the GIS software and aerial images (Bartesaghi-Koc, 2019).

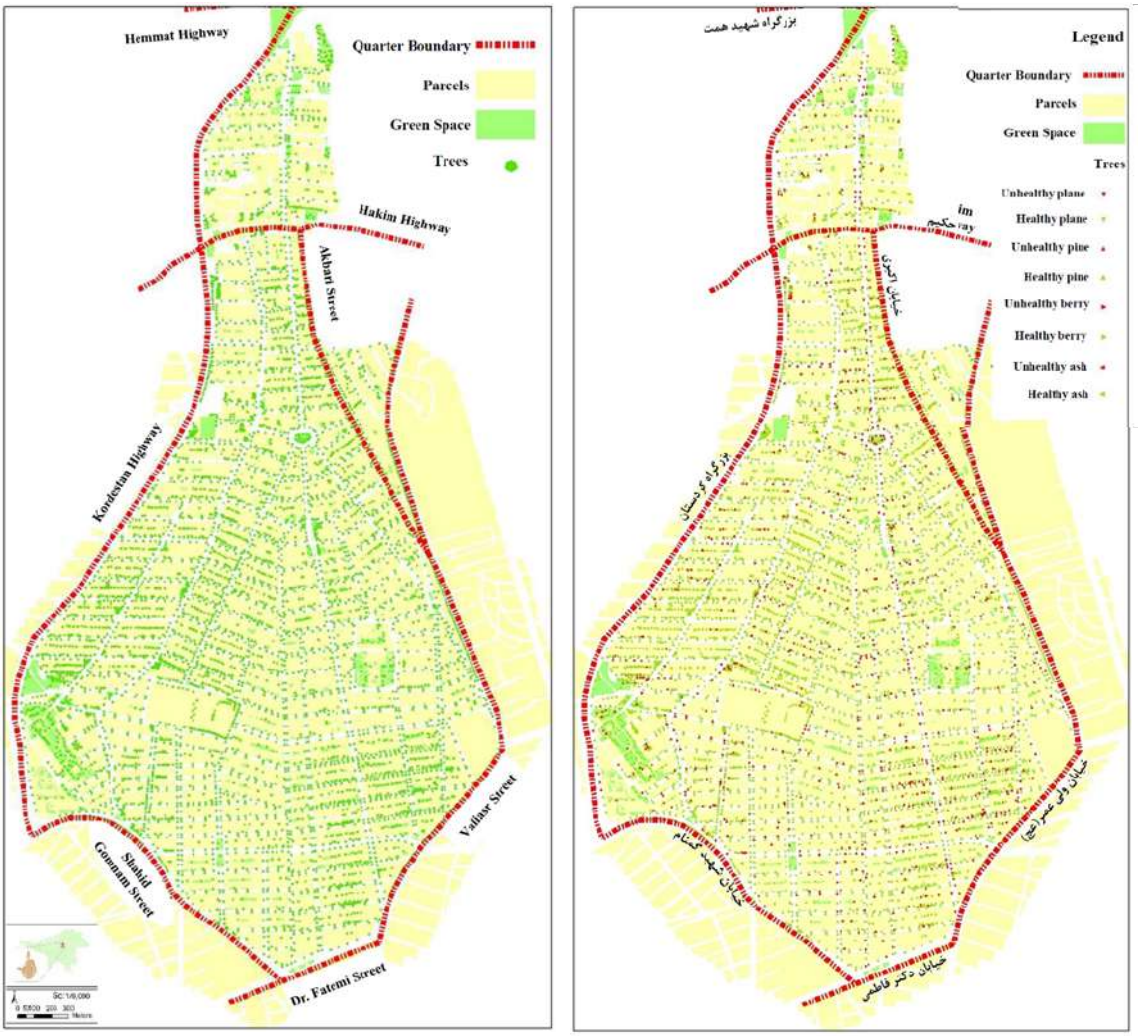

Fig. 8 Basic and analytical (qualitative) maps prepared from location of green infrastructure (left), type of plant species and their health status (right) using GIS

By examining the situation of green infrastructure in the related maps (Fig. 9), the existing plant species with their exact location, in this area, were specified. These species in some points are located in groups (masses=patches), in rows (green corridors), or individually. The analysis shows that, there is a great discontinuity (fragmentation) between them, along the Yousef Abad area. Also, by checking the health status

of plant species, it was found that some of these species are unhealthy, which could reduce their climate enhancement capabilities. These species were also investigated based on their effective climate resilience potentials: water demand, air pollution resistance and shading (Norton et al., 2015), all of which can affect the climate challenges of the city of Tehran such as air pollution, drought, lack of water resources, and increased temperature. It is important to choose plant species based on their resilience potentials for future decisions. Also, the type, number and location of plant species were documented.

Stage 4, Prioritizing and stratification of main and secondary streets and existing UGI in a certain area to enhance the existing and new UGI, was qualitatively analyzed in field surveys and the results are documented in Tab. 2. Plant species were identified along with the scientific name, health status, water demand, air pollution resistance, shading, location (in the main and secondary roads) and the number of species are displayed in Tab. 2.

Tab. 3 is also presented, to introduce the suggested plants based on their climate resilience based on Stage 05 of the framework, 'Selecting new UGI based on their existing conditions and climate potentials in the study area'. In this table, the plant species are suggested to be replaced with unhealthy plant species or with low properties to reduce the climate effects, and proper positioning is determined according to their ecological characteristics.

SPECIES	SCIENTIFIC NAME	HEALTH STATUS	WATER DEMAND	AIR POLLUTION RESISTANCE	SHADING	LOCATION IN AREA	NUMBER OF SPECIES
Plane	Platanus Spp. (Platanus orientalis)	Unhealthy	High	Resistant	Low	Main/North-South	Dominant
Mulberry	Morus Spp. (Morus alba)	Healthy (Inappropriate for footpath)	High	Non-resistant	High	Main/North-South	Dominant
Tree of heaven	Ailanthus altissima	Healthy	Low	Resistant	Low	Main/North-South	Limited
Judas tree	Cercis siliquastrum	Healthy	Low	Resistant	Low	Main/North-South	Limited
Black locust	Robinia pseudoacacia	Healthy	Low	Resistant	High	Secondary /East-West	Limited
Field Elm	Ulmus carpinifolia	Unhealthy	Low	Non-resistant	High	Secondary /East-West	Limited
Eldar Pine	Pinus eldarica	Unhealthy	Low	Resistant	High	Main/North-South	Limited
Mediterranean Cypress	Cupressus sempervirens	Healthy	Low	Resistant	Low	Main/North-South	Limited
European Ash	Fraxinus excelsior	Healthy	Low	Non-resistant	High	Main/North-South	Limited
Fig	Ficus carica	Healthy	High	Non-resistant	Low	Main/North-South	Limited
Eastern Cottonwood	Populus deltoid	Healthy	High	Non-resistant	High	Main/North-South	Very Limited

Tab. 2 Qualitative analysis of UGI status in Yousef Abad area of Tehran based on climate resilience,(Shirgir et al.,2019)*

***-About the importance of location:** Prioritization of main and secondary streets are an important factor, since they display the amount of solar radiation, the streets are exposed to during the day, and how warm it gets. The streets that are northern-southern usually get more sun and are warmer therefore they need plants with higher shadowing capacity.

-Shadowing (shading) capacity: The amount of shade, trees provide depends on their architectural form and canopy density, these can all be listed in a field survey in small areas such as neighborhoods,(Pataki et al., 2011).Thick or dense canopy trees provide good shade, meaning that broad leaf trees are generally more effective than needle-leaf trees, (Norton et al., 2015).

-Tolerance to air pollution: Some trees are more tolerant to air pollution that's why they are a proper choice for a city like Tehran with severe air pollution challenge.

-Watering need: Also, water demand is an important factor, and the trees are water stressed. Stress from low water availability during hot weather can lead to defoliation and possibly death,(Gill et al., 2007).Therefore by examining the existing plants health status, it can be cleared that some plants are not suitable for the existing climate conditions and the amount of irrigation water available in the area (Coutts & Harris, 2013).

-Plants health conditions: Vegetation health information obtained from on-ground study and GIS based maps, can be used most efficiently to enhance existing UGI. Shading capacity in trees depends on both trunk and branches, as well as, the leafy canopy. Therefore the healthier the plants are the more shading and cooling benefits they will have, (Leuzinger et al., 2010).

-The data about green species climate resilience characteristics were derived from the book by H.Sabeti in 2008, called Forests, trees and shrubs of Iran and also from the author's knowledge of the green species characteristics based on her background in the field of landscape architecture.

SPECIES	SCIENTIFIC NAME	HEALTH STATUS	WATER DEMAND	AIR POLLUTION RESISTANCE	SHADING	LOCATION IN AREA	NUMBER OF SPECIES
Plane	Platanus Spp. (Platanus orientalis)	Unhealthy	High	Resistant	Low	Main/North-South	Dominant
Mulberry	Morus Spp. (Morus alba)	Healthy (Inappropriate for footpath)	High	Non-resistant	High	Main/North-South	Dominant
Tree of heaven	Ailanthus altissima	Healthy	Low	Resistant	Low	Main/North-South	Limited
Judas tree	Cercis siliquastrum	Healthy	Low	Resistant	Low	Main/North-South	Limited
Black locust	Robinia pseudoacacia	Healthy	Low	Resistant	High	Secondary/East-West	Limited
Field Elm	Ulmus carpinifolia	Unhealthy	Low	Non-resistant	High	Secondary/East-West	Limited
Eldar Pine	Pinus eldarica	Unhealthy	Low	Resistant	High	Main/North-South	Limited
Mediterranean Cypress	Cupressus sempervirens	Healthy	Low	Resistant	Low	Main/North-South	Limited
European Ash	Fraxinus excelsior	Healthy	Low	Non-resistant	High	Main/North-South	Limited
Fig	Ficus carica	Healthy	High	Non-resistant	Low	Main/North-South	Limited
Eastern Cottonwood	Populus deltoid	Healthy	High	Non-resistant	High	Main/North-South	Very Limited

Tab. 3 Proposed plant species for Tehran Yousef Abad quarter with emphasis on increased climate resilience,(Shirgir et al.,2019)*

Shadowing (shading) capacity: The amount of shade, trees provide depends on their architectural form and canopy density, these can all be listed in a field survey in small areas such as neighborhoods,(Pataki et al., 2011).Thick or dense canopy trees provide good shade, meaning that broad leaf trees are generally more effective than needle-leaf trees, (Norton et al., 2015).

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-The data about green species climate resilience characteristics were derived from the book by H. Sabeti in 2008, called Forests, trees and shrubs of Iran and also from the author's knowledge of the green species characteristics based on her background in the field of landscape architecture.

B) Based on stage 06, 'locating new UGI in the area through analyzing patches, corridors and matrix conditions', the location and size of the patches, corridors and finally the matrix were reviewed here by analyzing the available aerial images (Fig. 9). In the existing situation (on the left), the green patches are fragmented and not fully connected, the number of them are also very limited. The green corridors have been disrupted and discontinued due to new building projects during the years, which has resulted in a broken green matrix in the area. Therefore in the suggested pattern, more continued corridors and patches and a more conformed matrix were suggested (on the right).

In Fig. 9, the situation of UGI was identified using the principles derived in landscape ecology. In the present situation of the area of study in Tehran, the current situation of the green patches, corridors and matrixes in the Yousef Abad neighborhood of Tehran in the right aerial image (current situation) is presented. The results from surveying location and size of green patches includes. In this area, after the construction of successive buildings, the green patches have been discontinued. These patches are fragmented and have a very weak connection. Based on the presented theoretical framework, the more continued and the greater number of corridors and the wider and more interrelated the patches, the more continued the matrix in this neighborhood, the higher the climate resilience of the area, based on the principles, the proposed model was provided in the right side in terms of the principles of landscape ecology (patch, corridor and matrix) for the Yousef Abad neighborhood.

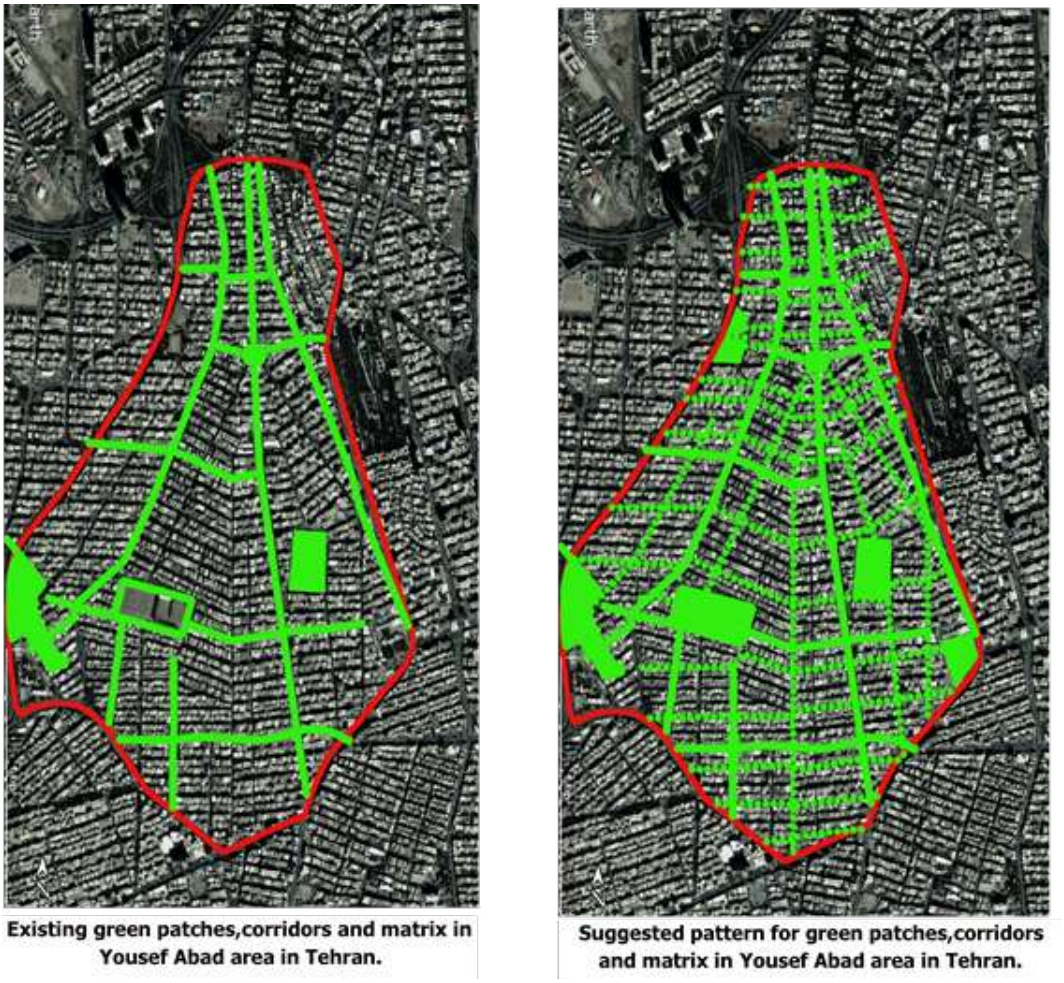

Fig. 9 Existing and suggested pattern green patches, corridors and matrix based on the science of landscape ecology (green patches, corridors & matrix) (Google n.d., 2019), (Shirgir et al., 2019)

5 DISCUSSION

In this paper, by going through the existing literature on UGI as a major climate change mitigation strategy, landscape ecology, urban climate change and urban climate resilience and on cities with dry climate facing drought, air pollution and lack of water resources etc., a major framework was produced by having combined the UGI climate change adaptation strategies with the 6 step method with landscape ecology theories, to study and analyze UGI, to manipulate UGI in cities and neighborhoods to enhance resilience to climate change and to reach a method and a pattern for a qualitative analysis.

This framework was later used as a practical method to study the existing UGI situation in a neighborhood in the city of Tehran, the capital of Iran. This method led to qualitative analysis of UGI status in Yousef Abad area of Tehran based on climate resilience and suggestion of new plant species based on their ecological characteristics and tolerance to specific climate conditions.

One of the important findings of this paper was that, climate resilience can be enhanced by introducing 'climate tolerant plants', whether drought tolerant or any kind of tolerance related to the climate challenge that a city is facing. This way climate resilience of the new or existing UGI can be ensured. This strategy can be specified to cities or neighborhoods facing drought and drier climates.

Choosing the right plant type is also very important, different plants survive in different climates and they vary in each city or region. According to the studies done for this paper, this step, which provides a list of plant species that could ensure resilience to climate conditions, has not been done officially as of today. This could be a step to further the studies done on UGI and urban resilience. It is important to say that, plant types, their location and health status of species are of great significance to reach higher resiliency.

Prioritization of main and secondary streets are an important factor, too. Since they display the amount of solar radiation the street is exposed to during the day, and how warm it gets. The streets that are northern-southern usually get more sun and are warmer, therefore they are in more need of plants that have shading capacities to cool the surfaces, that is another reason why shading capacities of plants are also surveyed on the field (Norton et al., 2015).The amount of shade, trees provide depends on their architectural form and canopy density, these can all be listed in a field survey in small areas such as neighborhoods (Pataki et al., 2011). Thick or dense canopy trees provide good shade, meaning that broad leaf trees are generally more effective than needle-leaf trees (Leuzinger et al., 2010).Also, water demand is an important factor, and trees are water stressed. Stress from low water availability during hot weather can lead to defoliation and possibly death (Gill et al., 2007). Therefore by examining the existing plants health status, it can be cleared that some plants are not suitable for the existing climate conditions and the amount of irrigation water available in the area (Coutts & Harris, 2013).Moreover, appropriate plant selection is very important (Tab. 3).

Implementing UGI is one of the easiest ways to modify street canyon microclimate other than façade awnings and overhangs to shade foot paths (Ali-Toudert & Mayer, 2007). Number of trees was qualitatively documented here, (dominant or limited), this is also to show which trees should be replaced and increased in numbers based on climate adaptation goals. It is clear that not all tree species possess the same capacities for heat and drought tolerance, a diversity of tree species can be important in moderating temperatures throughout the day, (Norton et al., 2015).

Regarding the green infrastructure in particular, it can be stated that the analysis of the situation of plant species in a region based on the type of plant species, location, covering area, number, area covered by them, health status of plant species, and comparison of these factors, can be a proper way to analyze the potential of climate resilience in the green infrastructure of an area in a city.

In principle, for the first time, in this research, a qualitative method was obtained for assessing the situation of green infrastructure based on climate resilience and changing of this green infrastructure in order to increase the climate resilience.

As displayed in Fig. 10, UGI's number, health status, type of species, location and covering area are the five important characteristics of UGI to assist with the analysis of climate resiliency. This diagram and its results can assist with 'qualitative' analysis of the above mentioned factors. More research must be done to result in more details of this analysis in a quantitative manor. For example a 'quantitative matrix' could be used to score the existing UGI in an area based on the five characteristics mentioned above, to do measurements based on quantities. In Fig. 10, to examine the qualitative characteristics of the gray infrastructure, some points are also presented which can be elaborated and completed in future studies.

These important factors can be categorized after the quantitative survey and measurement, and then, after overlaying the information about each factor, a general map can be achieved, which leads to a plan for deciding on the interference with the quality(and somewhat the quantity) of the existing and proposed green infrastructure.

By having reached these factors, the main question of the research: "How and based on which features of the green infrastructure can we assess and analyze climate resilience in a city? "Has been answered.

Other outcomes of this research are, using Forman and Godron's landscape ecology principles, as a reading language for a spatial interpretation of heterogeneity of the green patches, corridors and matrix. The design and location of UGI and on the whole their existing situation, can be translated into patches, corridors and matrixes in a city or neighborhood scale. This is a language that can be used to read the existing situation of UGI and to develop principles to enhance this situation into a more climate resilient city.

One of the most important points here is that the strategies and the method, that were mentioned earlier which are related to green urban infrastructure and their role on adapting to climate change conditions, can be applied to cities or neighborhoods and on the whole to countries facing four major climatic challenges which are: drought, extreme heat, precipitation reduction and water shortage.

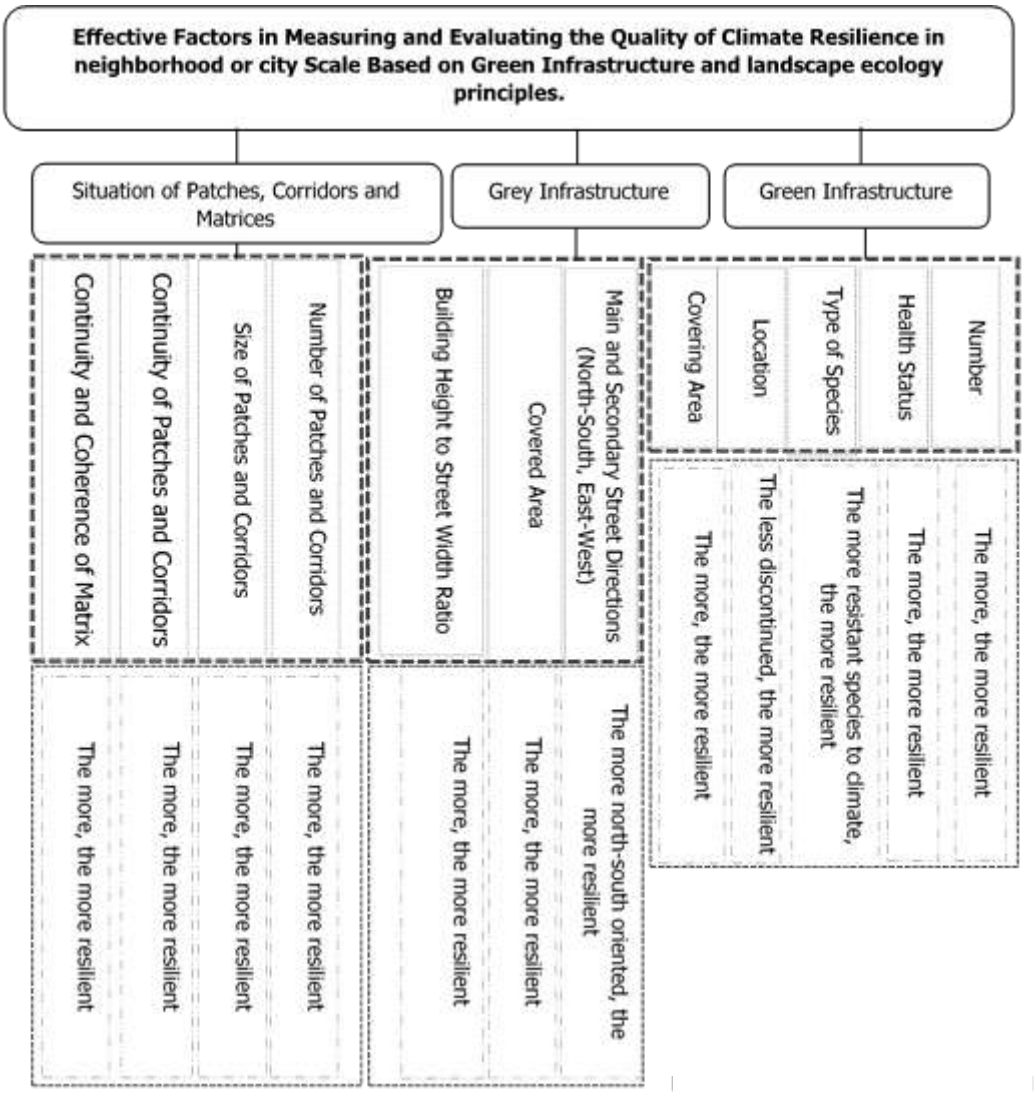

Fig. 10 Effective qualities in assessment of urban climate resilience in terms of green infrastructure based on the language of landscape ecology, (Shirgir et al., 2019)

6 CONCLUSION

Climate change has a negative impact on urban-scale. Climate resilience is beyond the scope of urban planning and decision-making, but adverse climatic changes lead to a reduction in environmental resilience. Instead, there are variables for controlling and intervening in the environment such as the strategies for adaptation to climate change through urban green infrastructures which can be effective on climate resilience for the reasons mentioned before.

It is clear that climate changes are hard to control since they require a wide comprehensive global network of decision making. One way to somehow control and reduce these negative impacts is by interfering in green infrastructure in the cities by analyzing their existing conditions and evaluating their resilience potentials based on the way they are located and connected on one hand and the type of species they are composed of on the other hand and to later on, make suggestions for each city based on these qualities and quantities to enhance their resilience conditions. Also these principles can also be used for new projects and for making decisions about the green spaces and their species beforehand.

It seems that studies in the areas mentioned are less oriented towards improving the situation of the neighborhoods. To take the first steps, a neighborhood was selected here as the study area. In addition, standards, indicators and components for measuring resilience in this scale have not been properly elaborated. This could also be suggested for further studies on the issue.

According to the studies conducted in this research, it seems that so far, urban green infrastructure and their role in urban design and planning have not been properly cleared.

While it is proven that the use of urban green infrastructure is one of the key strategies to reduce and adapt to climate impacts in the areas with Mediterranean, hot and arid climates, the exact strategies for the correct use of these infrastructures in the cities have not yet been provided. Here, by conducting this research on the city of Tehran, a framework was obtained for documenting and measuring the quality of urban green infrastructures in order to improve the quality and location for the adaptation to climate change. These findings can be generalized to the cities and neighborhoods according to geographic location and their similar negative impact of the particular climate change which is mostly heat waves and extreme heat. More research needs to be done to generalize this method to other cities with other climate change challenges.

Also, there is still a gap for a *quantitative method* to assess climate resilience in cities based on green and even gray infrastructure and their characteristics, which can be found in future research. However, the scale issue is also important. Finding a quantitative-qualitative method for intervening in urban green infrastructure can also be considered for future studies to promote ecological resilience to climate change.

Analysis of the current situation, quantity and quality of vegetation, the way green infrastructure is located in the neighborhood, and the standards for achieving climate resiliency through this infrastructure can be part of the existing shortcomings in this area of study. Urban neighborhoods are considered as the best scale for applying new concepts of urban design and planning. Therefore doing a study on the neighborhood scale is a suggestion for further reading. And finally, using nature and its natural capabilities, is the best way to save the planet from the issues it is facing due to human actions.

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IMAGE SOURCES

Fig.1: Shirgir et al., 2019; Fig.2: Shirgir et al., 2019; Fig.3: Demuzere et al., 2014; Fig.4: Shirgir et al., 2019; Fig.5: Shirgir et al., 2019; Fig.6: Shirgir et al., 2019; Fig.7: Shirgir et al., 2019; Fig.8: Shirgir et al., 2019 & Google n.d., 2019; Fig.9: Shirgir et al., 2019.

AUTHOR'S PROFILE

Elmira Shirgir, since joining the Iran University of Science and Technology, school of architecture and Environmental design's PhD program in 2016, she has been involved with studies related to urban green infrastructures and their effects on mitigating climate change effects in cities. Environmental issues, climate change and its effects on cities has been a major concern for her many years. Before joining this program at IUST, she has had many years of experience working as a senior Landscape Architect and environmental expert, at companies in Tehran, Iran and Sydney, Australia. She received a master's degree in Environmental design engineering from the university of Tehran in Iran in the year 2005.She also got a bachelors degree in Environmental engineering from university of Tehran in 2002.

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TeMA
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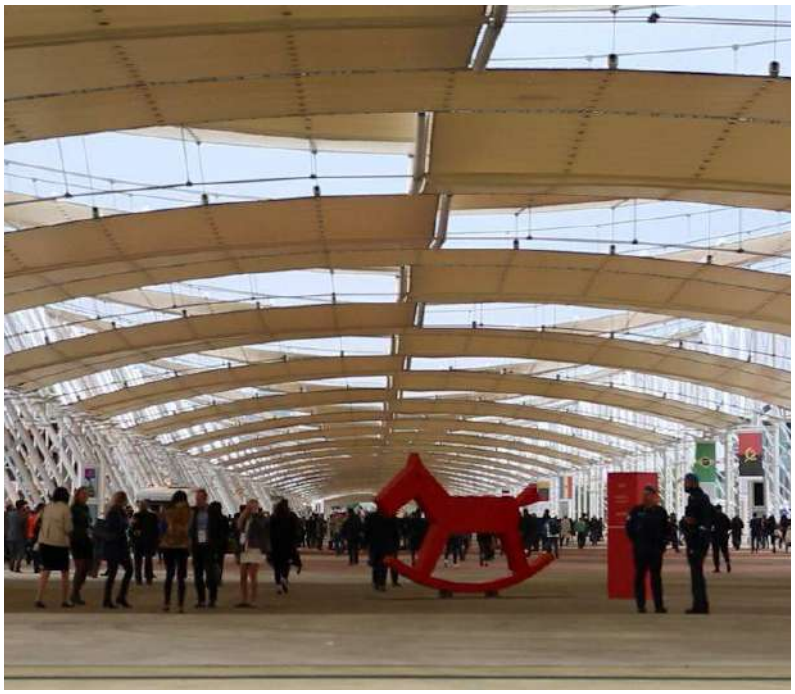
Land Use, Mobility and Environment

TeMA 3 (2019) 249-264
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6269

paper received 10th September 2019, accepted 2nd December 2019

www.tema.unina.it

How to cite item in APA format:
Atun Girgin, F. & Edizel Tasci, O. (2019). Mega-event Organization Considering Safety, Security and Resilience. *Tema. Journal of Land Use, Mobility and Environment*, *12* (3), 249-264. doi: http://dx.doi.org/10.6092/1970-9870/6269



MEGA-EVENT ORGANIZATION CONSIDERING SAFETY, SECURITY AND RESILIENCE

INSIGHTS FROM THE MILAN WORLD EXPO 2015 AND LONDON OLYMPIC AND PARALYMPIC GAMES 2012

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ABSTRACT

Cities become globally significant and attract national and international interest from all over the world with the help of mega-events, such as World EXPO and the Olympic Games. Mega-events highly require the involvement of various actors working together for the same overall purpose, although these actors have the responsibility of diverse target groups and require to use different resources. In his paper, we aim to understand the role of organizations in mega-events in relation to the socio-technical systems they operate. We consider security, safety and resilience articulated in six areas: planning, construction of the site, training, collaboration, communication and legacy, in three different time slots: before, during and after the event. Results include insights to enhance multi-organizational culture-based practice. The field studies conducted in Milan in 2015 and 2016 on Milan World EXPO 2015, and in London in 2012 and 2016 on the London Olympic and Paralympic Games 2012. The research findings are based on the experience of the real actors involved in these two events. The findings suggest several courses of action for decision-makers and emergency planners to safety and security design strategies that can facilitate resilience as a legacy of a mega-event.

KEYWORDS:
Mega-event, Disaster Risk Reduction; Milan EXPO 2015; London Olympic Games 2012; Resilience; Safety; Security

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有关土地使用、交通和环境的杂志

TeMA 3 (2019) 249-264
print ISSN 1970-9889, e- ISSN 1970-9870
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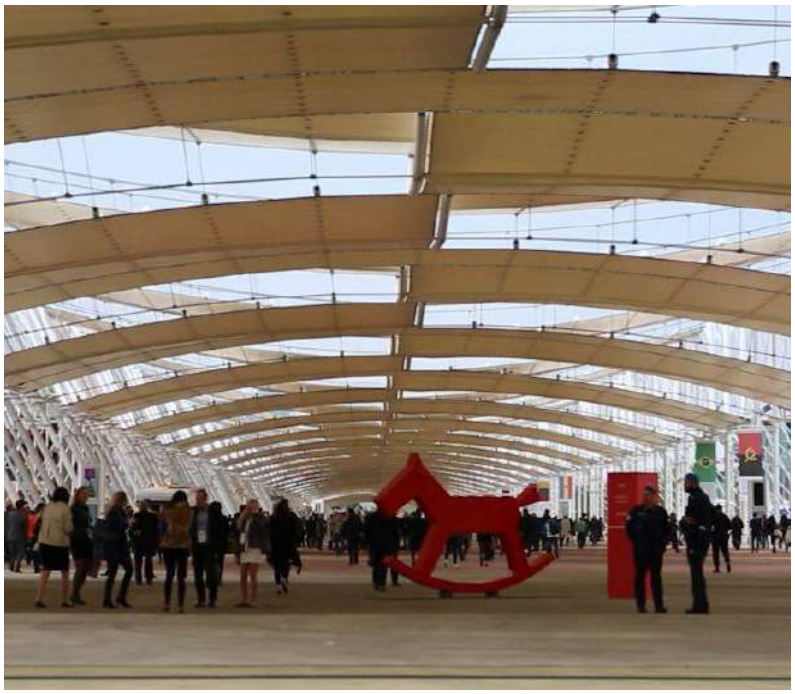

考虑安全、保障和弹性度的大型活动组织

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摘要

城市在世博会、奥运会等大型活动的帮助下变得全球知名，吸引来自世界各地的目光。为了实现共同的整体目标，大型活动离不开相关各方的参与，尽管这些角色承担的目标群体责任各不相同，并且需要使用不同的资源。在他的论文中，我们旨在了解组织在大型活动中与它们运作的社会技术体系相关的作用。我们认为安全、保障和弹性度体现在六个方面：规划、场地建设、培训、协作、沟通和遗产，并且分为三个不同的时间段：活动前、活动期间以及活动后。结果包括促进基于多元组织文化的实践的深入见解。2015 年和 2016 年在米兰对 2015 年米兰世博会以及 2012 年和 2016 年在伦敦对 2012 年伦敦奥运会和残奥会都进行了实地调研。研究结果基于两次活动的真实参与者的经验。研究结果为决策者和紧急事件规划者制定安全与保障设计策略提供了一系列行动方案，从而让弹性度成为大型活动留下的遗产。

关键词：
大型活动；减少灾害风险；2015 年米兰世博会；2012 年伦敦奥运会；弹性度；安全；保障

1 INTRODUCTION

Due to the wide range and scope of the events, it is difficult to provide a single definition of a mega-event. The categorization and definition of a mega-event may vary according to its rationale, frequency, and location (Edizel, 2014; Mazzeo, 2008; Smith, 2012). Getz (1991) defines mega-events as events with a global reputation attracting visitors to the host city to participate in sporting, cultural, religious and political activities, while Smith (2012) simply names mega-events as those which sell over a million tickets. Overall, mega-events are "high profile spectacles held in a limited time, which change the built environment, have global significance and attract national and international interest to the city" (Edizel, 2013). According to this definition, only three events can be named as mega-events: the Olympic Games, the World Expo and the Football World Cup. In this paper, we will focus on the Milan World Expo 2015 and the London Olympic and Paralympic Games 2012 as case studies.

Mega-events have been considered as an effective economic development tool by local and national actors all over the world since the early 1990s (Edizel, 2013). Hosting mega-events increases the appeal of both the host city and country by attracting international visitors and media attention as well as contributing to the regeneration of the built environment and enhancing the strategic organizational structure of the local area. However, there are important challenges related to hosting a mega-event, such as financing the event, environmental impacts, social dimensions or under-utilized facilities and safety, and security issues. For example, significant urban intervention associated with the 1992 Barcelona Olympic Games were seen to make a very direct contribution to redevelopment through the upgrading and rehabilitation of spaces in the city (Richards & Palmer, 2010). Indirect impacts of Barcelona Games include flagship buildings of internationally renowned architects and promotion of the city's architectural heritage as well as enhancements in public transport and redevelopment of the seafront which helped economic and social regeneration of the city (Julier, 2000). Although the 1992 Barcelona Games are accepted as a success story since the city used the Olympic project as a tool for long-term urban planning and made a positive transfer of the sports and other venues to everyday, community use (Monclus, 2011); they have also experienced facility under-use problems to a certain degree, and the 1992 Games only made $3 million from $10 billion invested (Coaffee & Johnston, 2007; Gastaldi & Camerin, 2018).

The study of mega-events is particularly an important area in the tourism and leisure literature (Chalip & Leyns, 2002; Richards, 1996). Along with tourism studies, the growing use of events as an economic development tool has grabbed the attention of researchers and policymakers. Some of the areas researched, which form the baseline of mega-event analyses include the cost of the event to the host nation, expenditures on bidding/preparation and revenues obtained from short-term and post-event stages (Burton 2003, Gratton & Henry 2001, Roche 2000). On the other hand, there has been increasing research on the spatial impacts of mega-events which consider post-event urban development and built environment/landscapes (Essex & Chalkley, 1998; Evans, 2011; Galderisi, 2008; Hiller, 1999; Smith, 2013). Approaching mega-events as a governance issue is a current research concern. Olympic governance and legacy have been studied from different perspectives in the 2000s (Burbank et al., 2001; Cashman, 2006; Edizel, 2013; Girginov, 2012; Poynter & MacRury, 2009; Smith et al., 2011). However, the discussion of the actors' involvement in a mega-event organization regarding security, safety and resilience is still missing from the literature.

Hence, this paper will provide a new insight from the perspective of the actors involved in the safety, security and resilience of mega-events, and some clues about the legacy for the continuation of the multi-organizational structure. The overall purpose of this research is to have a clear understanding of the role of organizations in relation to the socio-technical systems they operate and the reaction of users, such as visitors, exhibitors coming from different cultures, as well as the citizens, to any kind of disruption in the system.

The objectives are:

- having a critical understanding of the multi-organizational culture that has been formed during the preparation of mega-events;
- collecting information about ways to increase the effectiveness of those who respond to emergencies during mega-events;
- providing insights that can be used in different localities even after the completion of the event.

The paper includes information from two case studies: the London Olympic Games, 2012 and Milan EXPO 2015. We adapted a mutual learning approach while conducting the research by having meetings with the related actors and desktop research on the published reports, as well as emergency plans, risk maps and development plans of the municipalities involved in the organization of the mega-event.

1.1 INTRODUCING THE MILAN EXPO 2015

Milan hosted the World EXPO 2015 starting from May 2015 until the end of October 2015 for six months. "Feeding the Planet, Energy for Life" was proposed as the theme of EXPO 2015. The proposed theme had involved issues related to food shortages, food and food solidarity education, GMO, new technologies and innovation as well. The selected location for the EXPO exhibition area was the Rho area, in in the Northern part of the Milan Municipality. The main reason for selecting this area was the presence of infrastructures (highways, high-speed rail, regional rail system, the metro line), as well as the Rho Fair area.

Milan is the second-largest city in Italy with more than 1.3 million inhabitants within the city borders of Milan and more than 3.2 million inhabitants within the Milan Province (ISTAT, 2019). Although Milan is the second largest city in Italy, the Milan Province has a central role in the Italian economy due to its economic, cultural and political influence (Please see COMPASS project).

Milan is well-connected with Lombardy region, which has a population of around 10 million inhabitants that are distributed over an area of approximately 24,000 square kilometers. During EXPO both Milan and surrounding municipalities were affected by major urban transformation processes, such as the fifth metro line in Milan (Lilla), the extension of the bicycle path from Milan to the EXPO site and extending the bicycle fleet with electric bicycles, the Via Water project, which starts from Garbagnate. The latter is a water channel connected with a pedestrian and cycle path is used as an element of a promoter of extensive territorial rehabilitation.

EXPO was a 6-month length mega-event in Milan with the involvement of 134 countries, 5 international organizations and 21.5 million visitors from different countries (EXPO S.p.A., 2015). The Milan World EXPO 2015 was coordinated by the Prefecture of Milan, and the team involved all the related actors, such as civil protection, fire brigades, police, volunteers, ambulance services, Lombardy Region, Milan Municipality, etc., the organizations were grouped into sections, according to their functions in the COM (Central Operation Room) by considering the Augustus Method[1].

1.2 INTRODUCING THE LONDON OLYMPIC GAMES 2012

The London Olympic and Paralympic Games 2012 were staged between July 27th and August 12, 2012. With its 9.1 million population, London is ranked 27th in size by the year 2019 as the most populous metropolitan area in the World in the world's cities ranking (Office for National Statistics, 2019). London has always been a

[1] In Italy, Civil Protection has carried out its activities according to the "Augustus" method since its establishment in 1997.The Augustus method involves the setting up of up to 14 (regional and national) "support functions". F1: Planning and technique; F2: Health, social and veterinary assistance; F3: Media and information; F4: Volunteers; F5: Means and materials; F6: Transportation and viability; F7: TLC; F8: Essential services; F9: Damage assessment; F10: Operative structures; F11: Local authorities; F12: Dangerous materials; F13: Assistance to the population; F14: Coordination of operational centres.

city of spectacles, and the London Olympic Games 2012 event grabbed worldwide attention, following other events in the city. The Royal Wedding in 2011 was the first of this series of events where an extra 350,000 visitors came to the UK over the month of April compared to the previous year (ONS, 2012). The Diamond Jubilee on June 2012 attracted hundreds of thousands of visitors flowing in London's hotels, restaurants, bars and shops (Parker & Rainey, 2012). Government data showed that the UK welcomed 590,000 visits for either the Olympics or Paralympics, or attendance at a ticketed event, who spent an average of £1,290 during their visit compared with £650 by other visitors (ONS, 2012). The majority of these visits were to Olympic Park, which is in the Lower Lea Valley, one of the most deprived areas in the UK. The Lea Valley was subject to a major regeneration project with the arrival of the Olympic Games coming, which fast-tracked the regeneration of the area and drew investment from public and private sources. Olympics brought a considerable amount of infrastructure to London, besides unique venues and facilities.

However, there was a dark side to the event. Right after London was awarded the 2012 Olympic Games, a suicide bomber killed fifty-six people in London, which raised security concerns and underestimated the budget of the bid. In March 2012, the Government announced the revised Olympic budget as £9.235 billion for the construction and security costs, which were £5.3 billion higher than the bid stage (Evans & Edizel, 2016), and the initial security budget increased to £1 billion from £225 million (Coaffee & Fussey, 2016). In fact, the Metropolitan Police Authority stressed that the London Olympic and Paralympic Games 2012 required the largest security operation ever held in the UK.

Therefore, London 2012 involved several actors in delivering the Games successfully. The vision for London 2012 was on hosting "an inspirational, safe and inclusive Olympic Games and Paralympic Games and leave a sustainable legacy for London and the UK" (CSL2012, 2011). London 2012 actors wanted to inspire change in many ways. They aimed to demonstrate that the London Olympic Games 2012 would be about more than sport by including culture and education programmes with wider benefits like the Cultural Olympiad and beyond London, where the benefits and excitement were felt across the UK and around the world. The events were fully accessible to everyone via tickets to watch the Olympic competitions or via watching on TV or attending other Olympic-related events (festivals, cultural events).

2 MEGA-EVENTS IN LITERATURE

There is a wide range of urban events hence different event classifications according to their rationale and location help to define mega-events. Researchers use various indicators while making a classification of mega-events such as duration, size, scale, volume of visitors and prestige. Aiming to cover all important dimensions when defining the events, Jago and Shaw (1998) identify the key attributes of mega-events by making a detailed examination of the usage of different terms in event literature and introduced a typology of special event types. On the other hand, Getz (1991) considers this classification from the tourism perspective and identify the amount of attractiveness as the only indicator to categorize mega-events. He states that the definition must focus on the proportion and number of international visitors. From a different perspective, Roche (2000) considers three events as 'mega': The Olympic Games, the World Fairs (EXPOs) and the World Football Cup. His classification is related to this cultural context, such as target attendance, type of media interest and so on and his grouping of mega-events depends on ranking the events in accordance with their scale of significance. Considering all different classifications, only three events can be named as mega-events: the Olympic Games, the World Expo and the Football World Cup. This paper will focus on two of them as case studies: Milan World Expo 2015 and London Olympic Games 2012.

Up until the 1990s, mega-events are mostly studied by tourism researchers regarding visitor numbers, iconic venues and economists regarding the cost-benefit analysis. Although it has a long history, the spatial dimension of mega-events only received attention after the 1990s. Using events to promote urban

development gained significant importance, especially after the 1992 Barcelona Games, which is accepted as a successful example, mega-events had started to be even more associated with their impact and legacy on the urban environment. It is fair to claim that the events before the 1930s did not aim to leave a permanent legacy in the built environment (Monclus, 2011) in a holistic way, but only specific urban problems are addressed through the event, such as infrastructural development and legacies; for example, the 1900 Paris EXPO and 1935 San Francisco EXPO. Public-private partnerships started to grow in the 1990s. Events were used to regenerate post-industrial cities since the main strategy of the 1990s period was reinventing cities rather than building on existing strengths. In the 2000s, events gained importance as a catalyst for urban development. While the events of the nineteenth century were more about displaying technology and trade (e.g., EXPOs), celebrating arts and culture (e.g., Garden Festivals) and establishing links between different cultures and nationalities via sport (e.g., Olympics), city authorities had started to approach these events as an opportunity to introduce their regeneration plans in recent decades.

Regenerating the host city through culture rather than the desire of putting on a good show has become the main purpose. Gold and Gold (2005, xii) also support this approach by stating "it may be an exaggeration to say that promotion of culture has become the preferred route for regenerating ailing economies, but its importance cannot be minimised". In the early 1930s, the regeneration benefits of mega-events, especially the EXPO and Olympic Games, were mostly associated with the physical infrastructure projects. However, after the 2000s, mega-events target not only interventions to the physical environment, but social, environmental and economic problems are also pointed as a part of the sustainability and legacy plans of mega-events (Fussey et al., 2011; Pitts & Liao, 2009). Therefore, Olympic-led regeneration can be a part of Getz's sustainable events since he defines sustainable events as not only the ones that can endure indefinitely but also ones "that fulfil important social, cultural, economic and environmental roles that people value" (Getz, 1997). This comprehensive approach to mega-events has become more visible after the 2000s.

Recently, hosting mega-events is claimed to bring several social benefits to the host communities. According to Ritchie (1984), mega-events offer at least two important benefits to community development; the first one being the reinforcement of the social fabric of the community through better quality of personal relationships derived from the extensive volunteer efforts frequently associated with the event, and the second one being the possibility of reinforcing activities and behaviours that can contribute to the community culture. According to anthropologists Kroeber and Kluckhohn (1952) culture involves all the materials and spirituality created by human and added to the nature. On one hand culture is a dynamic notion that can be traced by perceptions, on the other hand cultural legacy in a society determines specific norms and rules (Kroeber & Kluckhohn, 1952). As Ritchie (1984) states, mega-events can be catalysts of change both in the community culture and organizational culture.

Today, one of the biggest challenges of the world cities is to host people from different backgrounds (Sassen, 1991). Mega-events are tools to promote community cohesion with the help of the high level local involvement, such as volunteering (Smith, 2012). Roche (2000) notes that EXPOs and the Olympic Games, "together with the event movements and networks and cycles connected with them, decisively influenced and helped create a new level and form of international public culture." Therefore, mega-events are considered as a powerful method for promoting versions of citizenship, social cohesion and cultural inclusion (Misener & Mason, 2006; Mohan & Mohan, 2002; Roche, 2000; Smith, 2012). However, there is also considerable controversy about the extent that mega-events create community cohesion and inclusion.

On the other hand, another challenge is to meet resilience targets, while hosting a mega-event, due to the increased exposure of the population that involves both residents and visitors coming to the event. That increase in exposed populations that are coming from different cultures does not necessarily add new risks but concentrates the current risks in the city in one place. Hence, disaster risk reduction (DRR) that should

consider the increased exposure to enhance the resilience of the current infrastructure systems. There are also other issues, such as the new risk landscape**,** including terrorism, traffic jams and changing hazard conditions that increase the vulnerability of cities and the multiple interaction patterns of infrastructure systems.

Therefore, to obtain a mega-event, improving the structural condition of a city is not sufficient, it is necessary to ensure a well-maintained infrastructure system. Providing resilience against disruption to infrastructure and services is also vital to ensure the functions of the mega-event, to guarantee competitive advantage of the host city, as well as ensuring the safety and security of infrastructures.

Both Milan EXPO 2015 and London Olympic Games 2012 welcomed international attention in terms of visitors, volunteers and investors. While this diversity celebrated the multi-cultural spirit that these events target, the cities also become more vulnerable to outside threats. Both Milan and London had gone through significant infrastructure and service improvements in order to deliver the mega-events in a resilient way.

3 METHODOLOGY

Milan EXPO 2015 was a case study in EDUCEN Horizon 2020 Project to investigate the relation of organizational culture and mega-events from the perspective of safety, security and resilience. The case study was supported by the interviews with people who were actively involved in the preparation of the Milan World Expo 2015 and the London Olympic Games 2012. Both events were analysed using a qualitative approach. Interviews were targeted to discover information about safety, security and resilience notions. Questions were directed to reach the related information in previously defined sections. Semi-structured interviews were conducted face to face in the working environments of the interviewees. The primarily collected data supported by the reports and scientific literature.

In Tab. 1, we matched the objectives with methods and related activities. As a part of EDUCEN Horizon 2020 project, organizing a workshop on mega-events in Politecnico di Milano was one of the main activities in addition to interviews. On one hand, the workshop in Milan provided the opportunity to learn more about the stakeholders' experience, on the other hand, being in one location for two days let them exchange their experience and ideas.

OBJECTIVE	LAYER / PATTERN	METHOD	ACTIVITIES
Understanding the way that the multi-organizational culture has been formed	Multi-organizational pattern	Secondary data collection	Literature study on mega-events regarding
		Primary data collection in Milan	Interviews with the representatives of organizations who were actively involved in Milan EXPO 2015
		Primary data collection in London	Interviews with the representatives of organizations who were actively involved in the London Olympics
Lessons Learned - effectiveness	Multi-organizational pattern & Spatial Layer	Primary data collection and analysis	Analysis of innovative information sharing strategies
Lessons learned – gathering insights	Multi-organizational pattern & Spatial Layer	Primary data analysis	Transcription of interviews

Tab.1 Table OBJECTIVES. Source: adapted from EDUCEN Project Deliverable 7.5, 2017

For Milan World Expo 2015, we contacted with the representatives from the Lombardy Region Fire Brigade, the Municipality of Milan, and the Prefecture of Milan. To collect information on London Olympic and Paralympic Games 2012, we conducted interviews with the members of resilience team, emergency personnel, London Fire Brigade, and the Resilience team from Transport for London. Conducting interviews helped us to understand the differences between what was planned following the normative patterns, and the reality

occurred during the event. Indeed, the findings of the case study suggest several courses of action for decision-makers and emergency planners.

Interviews were conducted in London by one of the authors using open-ended questions. The purpose of the conducting interviews was to understand the differences and similarities between organizations that were involved in safety and security planning before, during and after the mega-events. In tab. 3, we listed the organizations and the role of the interviewed people. In tab. 4, there are all the open-ended questions that were asked during the interviews.

METHODOLOGY	RATIONALE
Workshop in Milan in March 2016 All presenters had 8-minute time-slot during the workshop	Participants from Milan: all the organizations which were involved in preparation and management of the Milan Expo 2015. (EXPO 2015 SPA, Milan Prefecture, State Police, Milan Municipality, Medical Emergency, Milan Firemen Department, Lombardy Region, Regional Department of Fire Brigade of Lombardy). Participants from London: one speaker for each subject (safety, security and resilience), including the Ex-Met Police Department Security Design Advisor, an expert on Safety Management involved in preparation of the Games, and Head of the Resilience Planning in Transport for London during the Games (TfL).
London Olympic and Paralympic Games 2012	We involved the London Olympic and Paralympic Games 2012 in the EDUCEN project as a good case to collect more information on the issue. We had a site visit to London on June 2016. We conducted in depth interviews with representatives from the London Resilience Team, London Fire Brigade, London Metropolitan Police, two London Boroughs and Transport for London (resilience team, London surface travel, London tube network).

Tab.2 Additional data collection activities. Source: adopted from EDUCEN Project Deliverable 7.5, 2017

ORGANIZATION	THE ROLE OF THE RESPONDENT
London Fire Brigade	Contingency Planning, Operational Resilience Group Manager
London Resilience	Exercise Unified Response | Command Post Exercise Lead London Resilience Officer London Fire Brigade
London Underground	Line General Manager Piccadilly Line, London Underground
Transport for London - Resilience	Head of Resilience Planning Transport for London
Transport for London	Resilience and Business Continuity Manager, business recovery and business continuity activities
Transport for London	Resilience Training and Exercises Manager who delivers command and incident management training and desktop and seminar exercises for Surface Transport
ODA - Security	Security boss
A borough	Emergency Planner
Transport for London	Events Planning Manager, London Buses, Surface Transport

Tab. 3 The list of the organizations where the interviews were conducted in London in June 2016. Source: adapted from EDUCEN Project Deliverable 7.5, 2017

ASPECT		QUESTION
Background information	The background of the respondent	What is your role in this organization? What was your role during the mega-event (such as London Olympic Games or Milan EXPO)?
Planning	Planning: the first step to enhance the resilience of society against natural and man-made disasters.	What were the specific objectives? Do you think that considering culture in DRR is relevant in mega-events? How can you anticipate and identify solutions or cultural problems that may arise in the event of an emergency?
Collaboration	Mega-events are organized and governed by the several and heterogeneous organizational coalitions working at and/or responsible for different spatial or temporal scales.	With whom did you collaborate? According to your observation, what are the differences in the operational culture between the different institutions (such as local authorities, rescuers, etc.)? What is the set of procedures/configurations/institutions involved?
Communication	New crisis management tools to communication & cultural aspects in communication.	What is the best way to convey messages to people during emergencies? What are the impacts of cultural aspects on the effectiveness of risk communication? Have you ever encountered any specific problems related to specific/diverse cultural aspects? Which cultural factors, important insights, specific communication styles for a given cultural group should be taken into consideration during disaster situations in an urban area?
Learning		What was the worst thing that happened? How did you respond? How do you define the success of the mega-events? What did you learn? What were the benefits/advantages/problems which were identified? What would you do differently if it happens again?
Effects / Legacy		How did your planning/routines change after the mega-event?

Tab. 4 Questions asked during the interviews. Source: adapted from EDUCEN Project Deliverable 7.5, 2017

4 INSIGHTS

Although this research focused on Milan World EXPO 2015 and London Olympic and Paralympic Games 2012 as case studies, the insights could also apply to a wider level of mega-events and may help policymakers develop strategies for safe, secure and resilient events. Therefore, assessing how organizers can enhance the safety, security and resilience with the help of development principles in event-led regeneration is the main contribution of this research to knowledge.

Safety: It is about the protection of people and properties from hazards caused by incidents. According to one respondent, in such big events, however, absolute safety is not possible (interview with an officer of the fire-brigade, June 2016, London).

Security: It means the protection of people and properties from external threats and terrorist attacks, which has become a central issue while budgeting mega-events following 9/11 attacks. Security is on the concern of the organizers during the construction of the event site before the event starts. Security measures include all the issues to protect the construction site before and during the event against any kind of attack. An ex-

military officer who was responsible for the security of the Olympics in London mentioned the difficulty of the issue by saying that "you need to find the right balance between making people alert and interested in security and not alarming them" (interview with an ex-military officer, June 2016, London).

Resilience: Mega-events' resilience means, first, being able to keep the event functioning even after potential incidents. Second, a mega-event can help to promote resilience through international programs as well. Especially a World EXPO about nutrition and sustainability shall contribute to making environmentally effective development strategies. According to one of the officials from Milan, auto-protection and accepting the inevitable phase of chaos are the keys to resilience. As it is mentioned in Norton et al. (2015) to achieve resilience it is necessary to consider the knowledge and information channels through networks as their capability to bring stakeholders together to share experiences, increase the knowledge base, and thus facilitate improved decision-making by stakeholders in policy and practice.

The notions in this research are articulated in six main groups: planning, construction of the site, training, collaboration, communication and legacy, in three different time periods; before, during and after the event (Fig. 1).

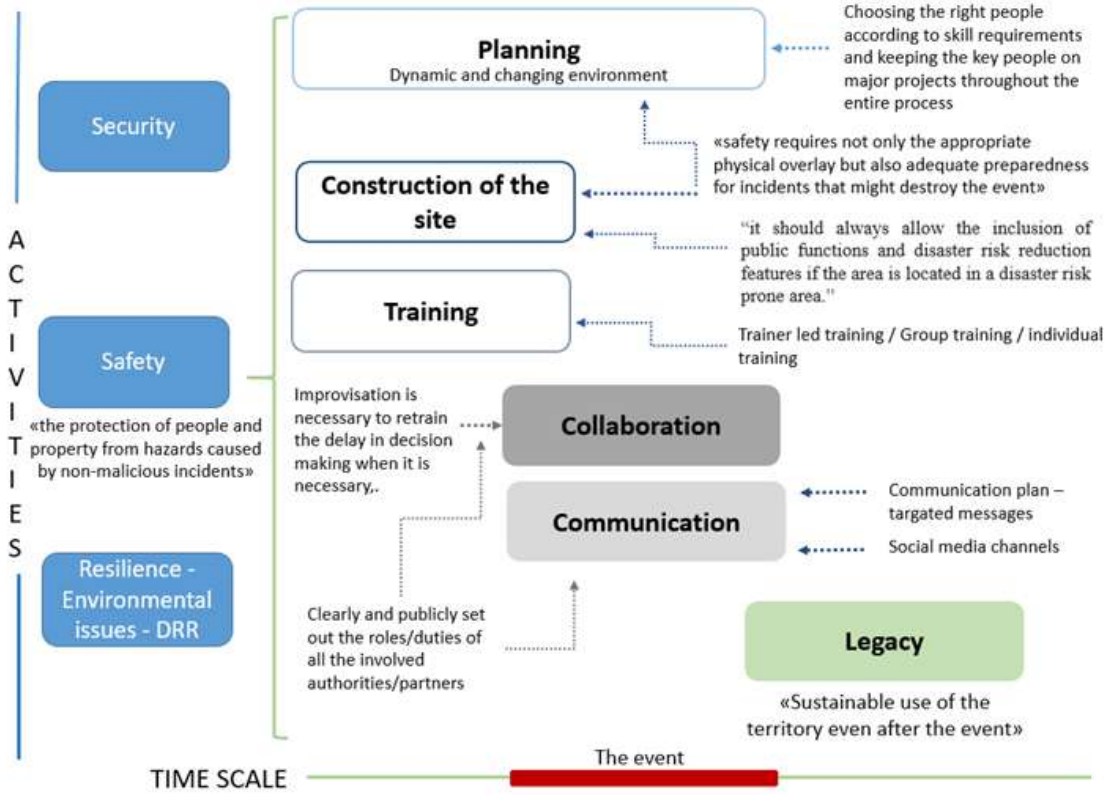

Fig. 1 The systematic schema of the activities and timing in mega-events (Source: EDUCEN Project Deliverable 7.5, 2017)

4.1 DISRUPTIONS/EMERGENCIES DURING THE EVENT

In the case of Milan World EXPO 2015, the potential flood risk maps, potential industrial accident information and emergency plans were already ready before the event. The 24h/7days surveillance-camera service in the center was in place to monitor the real-time traffic flow together with the geo-referenced vehicles. These biometric cameras were directly connected to the database. Additionally, excellent signalization of Ferrovie Nord (rail-road company) was ensured by the surveillance-camera service. During the event, the team in Milan had to deal with two big challenges. One of them occurred in August 2015. The Regional Civil Protection Authority was having a big wave of migrants (in total 1 million) in the central train station of Milan (from an interview with a regional civil protection official, February 2016, Milan). The second challenge was the blockage

of the railway system in August 2015 due to a broken train at the railway before Florence. All the trains passing through Florence returned to Milan Central Station together with their 1,500 passengers. The mobility plan helped the authorities to handle these challenges. Through the mobility plan, they alerted the central train station and all the taxis. All passengers were successfully placed in hotels at between 23:30 p.m. – 03:00 a.m. (interview with a Fire brigade officer, February 2016, Milan). In London, respondents did not report a big challenge, some incidents in the vicinity of the Olympic Stadium and an abandoned bag by journalists.

4.2 PLANNING OF THE EVENT

Definition of organizations, selection of personnel, preparation of budget and timing are the planning activities. Choosing the right people according to skill requirements and keeping the key people on major projects throughout the entire process are essentials of a successful planning. The budget estimation is a challenge in the planning of mega-events. Especially due to increasing security cost. According to one of the respondents, who is responsible from the security, the main tendency in such events is underestimating the cost of a mega-event and overestimating the funding (House of Commons, 2007). Timing is another issue that can pave the way to success or failure. In both events, respondents were agreed on the success of the definition of roles/duties of all involved authorities/personnel. However, as an official from the fire brigade in Milan mentioned that being able to improvise is necessary to be quick in decision-making for a timely response to an incident (interview with a fire brigade officer, February 2016, Milan).

4.3 NEW CONSTRUCTION

Newly constructed areas must include disaster risk reduction norms as a part of all development and infrastructure system investments to increase the resilience of the systems. The maximum building rights and any specific requirements and rules should be included in the plans for the areas of transformation. It is a must to pay more attention to requirements and rules in a disaster risk-prone area. Additionally, the newly developed areas and the increased number of people create new risk landscapes, including terrorism, traffic jams and changing hazard conditions that increase the vulnerability of the city and infrastructure systems. Other issues are cultural heritage, agricultural land and environmental and water resources. It is crucial to consider the integration and enhancement of policies in development plans to ensure coordinated actions for the development of sustainable use of the territory.

4.4 TRAINING

Technology, which has zero cost in some of the cases, might be the solution to every problem according to a respondent from Milan (interview with an emergency officer, February 2016, Milan). However, he continued saying that the main problem is the involvement of human error. To decrease the risk of human error, in Milan they conducted at least ten drills with a blind control station to test the communication system before the event. Training and drills helped them to test the system, as well as learning their role and what to do. Additionally, they knew each other and built trust between officials from different organizations during training and drills.

4.5 COLLABORATION

Activities, therefore, requires high level of collaboration. Almost all the respondents mentioned that trust is the key to flexibility during collaboration and communication activities. In addition to trust, innovative IT tools play a vital role in supporting the organization and operation activities. It is important to involve all the stakeholders, independent from their role at different temporal and spatial scales, in the meetings and during

the decision-making processes. Besides, the actors should be organized according to their target group and context.

As it is mentioned in the training section, trust building starts before the event on vertical and horizontal levels between actors. That helps to achieve an understandable, co-produced, shared knowledge, and, most importantly flexibility when a decision has to be made rapidly in an urgent situation. Another issue mentioned by respondents is that the importance of being in contact with actors from different practical backgrounds, such as academia, businesses and NGOs.

ACTIVITY	TIMING	AUDIENCE	KEY-ISSUE	GUIDELINES
Planning	Before and during the event	Prefecture Civil Protection Municipalities Public and private bodies that are involved in the planning of the event	Security and safety	- Selecting the right people according to their skills - Keeping the key people on major projects throughout the entire process - Inclusion of both public and private authorities in the estimation of budget - Improvising when necessary
Construction of the site	Before the event	Municipalities, planners, architects and engineers	Security	- Improving the safety of facilities - Making disaster risk reduction a part of all development and infrastructure related investments - Coordinated actions for development should consider sustainable use of the territory
Training and drills	Before the event	Prefecture Civil Protection Municipalities	Security and safety	- Learning roles and duties - Knowing each other - Building trust
Collaboration	During the event	Public and private bodies that are involved in the planning of the event	Security safety and resilience	- Extensive engagement of people, including the public - Involvement of all the governmental authorities - Involving communication and transportation agencies in the plan - Building synergy; having a common purpose
Communication	During the event	Public Prefecture Civil Protection Municipalities	Security and safety	- Flexibility - Trust building - Enhanced data grouping methods - Supporting traditional media with social media - Civil servants as volunteers communicate with public in the event area - Multi-ethnicity practice
Legacy	After the event	Public Prefecture Civil Protection Municipalities	Resilience	- Increased visibility in the social media, increased potential to reach a wider public even after the completion of the event - Increased use of innovative technology - Testing the current safety and security mechanisms - Regeneration and renewal of deprived areas - Enhanced tourism potential - Volunteer teams still active in the case of large events - Sustainable use of the event site - Improved supply conditions, enhanced visibility

Tab. 5 Insights. Source: adapted from EDUCEN Project Deliverable 7.5, 2017

4.6 BETTER COMMUNICATION

In the Milan World EXPO 2015, the communication plan was established before the event by considering the current one, which was a communication system between the municipality and the province. Through this system, they were able to deal with ordinary information. For emergencies, they issued a communication protocol that had to be signed and filled in by prefecture and all the other related institutions. It was updated every 1.5 and 3 hours after inserting the information into the common platform. Then, a situation report was prepared continuously according to the collected data. In communication, the key message was "filtering the data" to be able to find particular information when it is necessary. As data arrives casually, the huge amount of collected data could turn into a big challenge. The state of the emergency declaration was via SMS, and the dissemination of warnings was via megaphones. Inside the EXPO area, the organizations had their own systems to warn people. Additionally, there was a connected video and radio communication system inside and outside the EXPO area.

4.7 LEGACY ACHIEVEMENT

Increased tourism potential in the medium- and long-term, the introduction of advanced technology in certain areas, being able to test current safety and security mechanisms are some of the legacies that cities gained by hosting a mega-event. Indeed, mega-events are engines of urban developments and regeneration of deprived areas. Moreover, due to organizations' active accounts in social media, the public have learned more about the organizations and followed them through social media channels even after the completion of the event. Besides, in both cases, the volunteer teams, which were created during the event, are still active in case of big concerts, or necessity. A well-organized mega-event is helpful for the formation of human capital. If the social inclusion strategy is adapted well during the implementation phase of a mega-event, the labor market can be adapted and allow access to those from a lower social status as well.

5 CONCLUSION

To conclude, the paper includes two different mega-events, one of them is the Olympic and Paralympic Games in which visitors are accumulated within a short period of time, less than a month. On the other hand, a World EXPO is also considered as a mega-event due to the duration of the event, which is 6 months. Both examples provide opportunities in terms of economic and spatial development in their host cities and require several institutions working together in harmony before, during, and even after the event.

The purpose of this study was threefold. First, understanding how the multi-organizational culture has been formed during mega-events; second, how to increase the effectiveness of responders to disasters with the multi-organizational interaction takes place during mega-events; third, providing insights considering different phases of a mega-event (i.e. before, during and after) on safety, security and resilience of main activities and the event itself.

Indeed, mega-events involves multi-organizational interaction that takes place among public and private organizations. These organizations behave in a casual manner and share their experience and knowledge before, during and even after the event. Therefore, a mega event helps to strengthen the multi-organizational culture due to the high level of collaboration through mutual knowledge sharing about the norms and resources of each organization. As a result of this high level of collaboration, a common terminology can be established, and several communication tools and methods can be evolved during the management of a mega-event. As we saw in London case, the constructed multi-organizational culture remains stable and continuous over time even after the mega-event as a result of the new norms and agreements that have been formed among organizations.

Although mega-events are the main concern of tourism and leisure literature as an economic tool, recently, it has also entered into disaster risk and resilience studies as a research topic.

The reason is that mega-events have been considered as a tool that is strengthening cooperation and collaboration among multi-organizations, which is an essential asset for disaster risk and resilience studies.

ACKNOWLEDGEMENT

The discussed case studies were part of the EDUCEN Project, which had received funding from the European Union's Horizon 2020 research and innovation programmer under grant agreement NO: 653874. Authors would like to thank all the participants of the research from various organizations both in Milan and London, and to project consortium, especially Jeroen Warner from Wageningen University and Scira Menoni and Giulia Pesaro from Politecnico di Milano for their guidance and research support. Additionally, the authors wish to thank two anonymous reviewers for their helpful comments on the earlier versions of this paper.

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IMAGE

Fig. 1: EDUCEN Project Deliverable 7.5. Atun, F., Menoni, S. (2017), Mega-event (Milan-EXPO) Case Study Manuel, EDUCEN Project: European Disasters in Urban centres: a Culture Expert Network (3C – Cities, Cultures, Catastrophes).

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TeMA Journal of Land Use, Mobility and Environment

TeMA 3 (2019) 265-282
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6072

paper received 18th April 2019, accepted 06th October 2019

www.tema.unina.it

How to cite item in APA format:
Pucci, P. & Lanza, G. (2019). High speed rail and airport. Future scenarios for Marco Polo Airport in Venice. *Tema. Journal of Land Use, Mobility and Environment*, *12* (3), 265-282. doi: http://dx.doi.org/10.6092/1970-9870/6072

HIGH SPEED RAIL AND AIRPORT. FUTURE SCENARIOS FOR MARCO POLO AIRPORT IN VENICE

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ABSTRACT

This paper introduces an analysis of the possible extension of the catchment area of the Venice Marco Polo Airport, due to the implementation of a direct rail connection and the completion of the high speed/high capacity railway between Milan and Trieste. Both interventions are expected to generate an increase in the access thresholds by rail to the airport. By constructing different scenarios based on the analysis of the evolution in mobility trends and settling patterns, retraced considering both demographic dynamics and large scale projects, this article estimates the effects generated by the new railway connections in terms of extension of the Marco Polo airport's catchment area and the possible related impacts on air traffic, in terms of potential new passengers.

KEYWORDS:
Airport; High-speed Rail; Catchment Area; Intermodal Complementarity; Scenario

TeMA
有关土地使用、交通和环境的杂志

TeMA 3 (2019) 265-282
print ISSN 1970-9889, e- ISSN 1970-9870
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paper received 18th April 2019, accepted 06th October 2019

www.tema.unina.it

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高铁和机场。威尼斯马可波罗机场的未来发展

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摘要

威尼斯马可波罗机场开始推行直达轨道交通，加之米兰和里雅斯特之间的高铁高速/大容量铁路建成，这将让机场辐射区在未来成扩大之势。预计这两项干预措施会增加乘坐铁路去机场乘客人数。本文将对机场的这一发展前景进行分析。通过对流动性趋势和服务区模式的演变进行分析，构造不同的情境，对人口动态和大型项目进行回溯思考。本文预估了新铁路连接对马可波罗机场服务区扩展产生的影响进行了预测，从潜在新乘客的角度探讨对空中交通可能的影响。

关键词：
机场；高铁，集水区；联运互补；方案

1 INTRODUCTION: HIGH SPEED RAIL AND AIRPORT

Venice Marco Polo is one of the most relevant airports in Italy[1]. There are several reasons behind this success that can be explained considering the proximity of the airport to the city of Venice (around 15 km) and the peculiarities of the North-East area, served by the airport. This territory appears as a functional polycentric system where the increasing differences in the economic structure with some important niches and a relevant diffused cultural heritage both produce a strong complementarity among cities: university, knowledge production and R&D in Padua; international culture and tourism in Venice; relevant specialization in logistics and transport-related activities in Verona and Venice; local manufacture productive systems in Vicenza and Treviso (Boschetto & Bove, 2012; Fregolent & Ventoretto, 2017).

In this context, throughout the years, the airport has known a constant process of expansion and renewal that has contributed to foster its competitiveness, in a national and global frame where an ever-growing demand of air mobility can be registered[2].

The Marco Polo "*Masterplan 2021*" (2014) with the aim to enhance its competitiveness and to respond to the continuous and solid growth of the civil aviation sector, has defined the main projects for developing the airport activity, identifying also some crucial challenges for the future of the Marco Polo airport. This program is congruent with respect to the strategies of the European Commission that, in the White paper "Roadmap for a single European transport area" approved in 2011, has considered as the primary transportation policy goal to promote the multi-modal integration among different transport and communication networks (airports, ports, railways and roads), in order to support the creation of new connections for passengers and goods linking urban areas, relevant economic platforms and infrastructural nodes. Based on this, the EU was expecting that by 2050, all the major European airports should be linked to the railway system with a stated preference for high-speed rail (HSR) to guarantee a more efficient integration among networks. This transport policy goal has been experienced in France since 1995 where the intermodal complementarity between HSR and air transportation has been promoted in Paris Charles de Gaulle and Lyon Satolas, furtherly supported by other national policies such as the environment program "Grenelle II" (2010), and by a policy framework aimed at facilitating the cooperation among different stakeholders and operators, to optimize the integration in different transport facilities and services (code share, single ticketing and one-stop baggage check agreements between airlines and SNCF – the French railway operator) (Mell, 2013).

In the literature, at least starting from the end of the 80s, the analysis of the effects produced by rail-air intermodality has been devoted to highlight the competition between both transport modes (Bonnafous, 1987; Vickerman, 1997). Based on ex-post evaluation of the impacts on travel demand[3] determined by the intermodal integration between HSR and air transport, these studies have proved the competitiveness of HSR on medium-distance routes (Capon et al., 2003; Gao, 2009;Janic, 1993; IATA Air Transport Consultancy, 2003), allowing the acquisition of a relatively large market share, primarily over distances around 400 km (Albalate and Bel, 2012; Klein, 1997; Román et al., 2007). The most recent supply-oriented analysis on the ex-post effects of HSR on air transport (Albalate et al., 2015; Dobruszkes et al., 2014) highlighted relevant new evidence of the effects of HSR–air intermodality not only in terms of competition, but also of potential

[1] Among the Italian airports, in 2018 Marco Polo airport ranked fourth for the passenger traffic, following Rome Fiumicino, Milan Malpensa and Bergamo Orio al Serio airports and showing an increase by 33% with respect to 2013. In 2018, 11.163.736 passengers travelled to and from the airport (6% of the total transits through the Italian airport system), 86% of whom are international (7,9% of the total amount of international passenger traffic at the national level). Concerning cargo traffic, Venice airport ranked fourth at the national level in 2018, with 67.940 tons of goods handled by the airport, with a general increase by 11,8% with respect to 2017 and by 49% with respect to 2013.

[2] Figures show an increase, in 2018, by 5,9% nationally and 6,5% globally in passenger traffic with respect to the previous year (source: Assoaeroporti, IATA).

[3] See Dobruszkes et al. (2914) for a synthetic literature review on ex-post evidence from research on the intermodal impacts induced by HSR on air services and traffic.

complementarities between the two services: the interconnection with the railway leaded several airports to substitute short-haul services, transferring passenger to the HSR lines, to support medium and long-haul airline services with the side effect of alleviating airport congestion by freeing up slots and generating positive outcomes, especially for the busiest airports. Moreover, it has been recognized that a railway connection contributes to the generation of an integrated *Multi Airport System,* guaranteeing the possibility to manage, in a more efficient and balanced way, landside and airside traffic volumes and the relative congestion-related issues (Xia et al., 2019). Albalate et al. (2015) have also demonstrated that the reduction in the number of flights is higher for the airports that are not served by HSR, because HSR lines allow a potential increase in the number of incoming passengers to the airport, serving as successful feeders for international air traffic as in the cases of Frankfurt Airport and Paris-Charles de Gaulle. However, this side effect, that partially contributes to compensate the decrease in the number of air travelers following the implementation of air-rail inter modality, is not expected to generate a growth in the demand for the flights that were already operated before the realization of the HSR line (Albalate et al., 2015). Furthermore, the presence of low-cost carriers in the airline market guarantees a higher protection from the competitive pressure exerted by HSR, because the emergence of low-cost air companies pushed both air and rail transport companies to reconsider their pricing strategies (Antes et al., 2004).

Once highlighted that ex-post studies carried out concerning air-rail intermodality and its impacts on travel demand and supply don't define a univocal framework, wider range evaluations bring to light different potentialities that may determine broad consequences. From an environmental perspective, air-rail integration may contribute to alleviate congestion and pollution produced by the large amount of displacements to and from the airports, offering a modal solution that is more sustainable (Givoni & Banister, 2006; Xia & Zhang, 2017), considering that a significant amount of CO_2 produced in the airport derives from the displacements of workers and travelers to reach the airport (LAirA Project, 2017) However, despite HSR does not increase neither LAP (Local air pollution) nor GHG (GreenHouse Gas emissions), D'Alfonso et al. (2016) suggest to consider that any environmental impact is closely related to the mix of energy sources from which electric power to feed the HSR network is obtained; this aspect is strongly influenced by the energy policies and mitigation strategies that are in force in every national context of analysis. Concerning an economic perspective, air rail integration produces cross-scale advantages: if the availability of a fast, frequent and reliable connection to reach the airport represents a competitive determinant in passenger's modal choices (DLR-EC, 2010), a modal integration among different networks, by extending the catchment area of the airport, generates opportunities for the local economy and the real estate development (LAirA Project, 2017). Moreover, for the airports characterized by consistent cargo activity, a dedicated railway connection opens opportunities for economic development (EC – CO-ACT Project, 2004). It should also be noted that until the 1970s the airports attracted mostly warehousing and storage activities. Only since the 1980s, in a context of decentralization of the business activities from the central urban areas and in an increased economic competitiveness that rewards multimodal accessibility, a process of polarization has been triggered around airports characterized by good multimodal accessibility, sometimes supported by national and regional policies (see for example among the earlier in Europe the *Schémas Directeurs d'Aménagement et d'Urbanisme* of the Ile de France region and Rhone Alpes region, respectively for Charles de Gaulle and Satolas airports). In these experiences the airport becomes a gateway to international cities and a new polarity in the regional development (Pucci, 1998). The HSR plays an important role in qualifying the airport as an attractive polarity and supporting its real estate developments, because, according to Varlet (1992), it offers the "trinomial of interconnection" (Air, HSR, Motorway).

Additional challenges are related to market competitivity and to the articulated decision-making frame, involving stakeholders with different interests. Both elements, that concur in increasing the level of complexity

of the design process, can tangle the realization of the air rail integrations. The promotion of air rail intermodality strategies implies the activation of multi-level decisional processes, involving a plurality of actors and operators, some of whom may not be prone to cooperate due to the potential loss of consolidated relevance and interests that may follow this kind of interventions (LAirA Project, 2017). It is well known that the specificity of each context – the air supply and the flights offered by an airport, the geography of HSR connections, the integration between air and train timetables, the degree of commercial and technical integration between air and rail networks (Givoni & Banister, 2006) – conditions the possibility to define replicable development scenarios and specific thresholds in the number of passengers that can justify, in terms of economic efficiency, the realization of an air-rail integration.

Despite this, European development strategies still push towards the implementation of air-HSR integration for communitarian airports (UE, 2011) and at the Italian national level, the new draft of the Piano Nazionale degli Aeroporti (2019) promotes the strengthening of intermodal complementarities of HSR and air transportation, so to comply with the European standards. In Italy are currently reachable by train, with a station directly serving the terminal(s), the airports of Turin, Milan Malpensa, Trieste, Ancona, Rome Fiumicino, Cagliari, Bari and Palermo. Among them, Rome Fiumicino and Trieste are served by HSR, while Milan Malpensa and Triste are linked to Austria, Slovenia and Switzerland by direct international services. Pisa and Bologna (the latter not yet in operation) are connected to the respective cities' main railway stations by people movers. In the next future, new projects of integration are foreseen as stated in the "Contratto di programma 2017-2021" signed between RFI and Italian Ministry of Infrastructures and transport (MIT), where new rail connections to the airport of Genoa and to Marco Polo airport in Venice are outlined and financed. In this framework, the paper introduces in the Section 2 the infrastructure projects affecting Venice Marco Polo Airport, for analyzing the possible extension of the catchment area of Airport, due to the implementation of a direct rail connection and the completion of the high speed/high capacity railway between Milan and Trieste (Section 3). By constructing different scenarios based on the analysis of the evolution in mobility trends and settling patterns, Section 4 estimates the effects generated by the new railway connections in terms of extension of the Marco Polo airport's catchment area and the related impacts on air traffic, in terms of potential new passengers.

2 MARCO POLO AIRPORT AND THE HSR CONNECTION

Marco Polo airport is affected by important short-to-medium period infrastructure projects, both at the local and national scale, that may significantly contribute to extend its catchment area by rail and by sea. Currently, the airport confirms its growing importance when considering passenger traffic, a trend that has been also fostered by the implementation of several direct international routes, which have stimulated indirect flows too, resulting in more than 1 million passengers to/from North America and 500.000 passengers to/from the Far East, growing respectively by +11% and +6% in comparison to the previous year (Assoaeroporti, 2018). In 2018, the international relevance of the airport has furtherly grown, thanks to the presence of more than 50 airlines serving the airport and offering flights to more than 100 destinations, including 10 long-haul and 4 medium-haul relations[4], that will be sided by a new service to Madrid (starting from march, 2018) providing new opportunities for the south American market. This scenario is expected to change due to the ongoing projects for the airport (Masterplan 2021 Marco Polo Domani) and the new railway connection. The frame that emerges by consulting the available planning documents and legal agreements that have been signed by

[4] They are the flights to New York JFK, Atlanta, Philadelphia, Chicago, Montreal, Toronto, Seoul, Doha, Dubai and four medium-haul flights to Casablanca, Tunis, Tel Aviv and Shark el Sheik (starting from the winter season).

public and private stakeholders[5], confirms the intention to expand the airport and to transform the surrounding area for creating a super-local hub fulfilled with relevant territorial-scale functions[6]. In contrast, a relevant change in the strategies of infrastructural development can be highlighted with the overcoming of the hypothesis, foreseen by territorial plans (but already excluded by *PAT Piano Assetto Territoriale*, drafted by the Venice Municipality in 2014), to implement a new HSR line between Venice and Trieste, directly serving the airport. This change has been due to the decision, taken at the national level, to upgrade the existing infrastructure that runs 5 km in the North of the airport, instead of realizing a new HSR line (Fig. 1).

The upgrading of the existing railway line into a "High Capacity Railway" (HCR) will allow to reach a maximum speed of 200 km/h (with respect to the current limit of 150 km/h, RFI), saving around 30 minutes from Venezia S.ta Lucia to Trieste Centrale. The project is expected to be completed in an over-2026 scenario. However, a new rail connection to link, by a 6km spur, the airport with a new station is confirmed. This solution, expected to be operative by 2026 (RFI), would allow HSR/HCR and local trains to directly connect the airport terminal to the city (Mestre, Venezia S.ta Lucia), to the main urban areas in Veneto region and to the most important European transportation corridors (TEN-T). This project has been featured in the contract signed in 2016 by SAVE s.p.a. and RFI and included as a relevant strategy in the Masterplan 2021 *Progetto Marco Polo domani.*

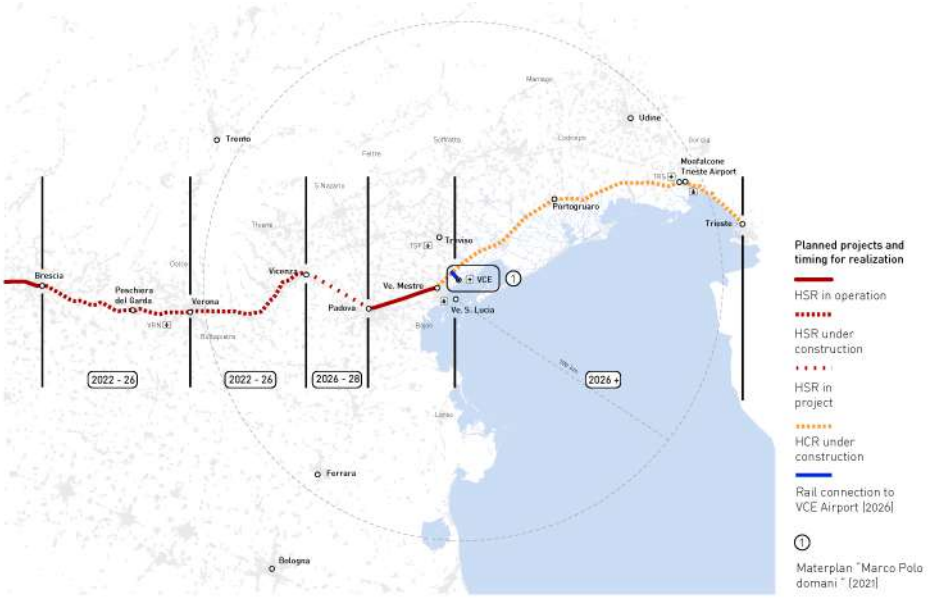

Fig. 1 Planned projects and timing for realization

This Masterplan, that has been modified several times during the years, represents the final outcome of a long and complex decision-making process that has been developed since the signing of an agreement (*Accordo Quadro per il Quadrante Tessera*) between SAVE s.p.a., ENAC and the Venice Municipality (2006-2007). In particular, the Masterplan 2021 (2014) defines a general improvement of the internal nd the external infrastructural system, with an expansion of the runway, the apron and the air terminal, new parking lots,the construction of the "*Moving Walkway"* and "*Porta d'acqua*". *Moving walkway* (a pedestrian covered bridge

[5] To reconstruct the future scenario for the Marco Polo airport, in a first phase, the most relevant territorial planning documents (PTRC Veneto region 2009, approved in 2013; PTCP Venice province 2010) and local urban plans (PAT Venice municipality, 2014) were consulted. In a second phase, it has been conducted an analysis on the legal agreements and contracts between the municipality of Venice and SAVE s.p.a. as well as on the infrastructural projects, relevant for the future of the airport.

[6] On 18th October 2018, the City Council of Venice, with the deliberazione n.42, approved the declaration of public interest for the project, aimed at developing a new pole of activities close to the airport to host a new soccer stadium (18.000 – 25.000 seats), a new retail/entertainment park with commercial and food-related activities and a hotel (around 150 rooms). This decision is an important milestone in the transformation process of the area that was already defined in the previously plans and has been the object of a long and complex decision-making process.

equipped with tapis roulants) and *Porta d'acqua* (a system of connected marine piers) are conceived as an integrated system that can serve potentially relevant flows of passengers willing to reach by sea Venice and other localities of the venetian Lagoon. The interventions foreseen in the Masterplan 2021 for the airport, outline a scenario characterized by an increasing competitiveness of the airport in term of passengers (with an estimated growth of 3,2 million/ passengers by year) and air supply (11.000 new flights/years) (SAVE , 2014). These dynamics will be supported by the completion of the HSR between Venice Mestre and Milan, currently operative only between Venice Mestre and Padua and between Brescia and Milan. This infrastructure, which completion is expected by 2028, will allow to save from 20 to 35 minutes on the entire relation with respect to the current travel times.

3 HOW DOES THE CATCHMENT AREA OF MARCO POLO AIRPORT CHANGE IN THE NEAR FUTURE?

The new infrastructural connections, in particular the HSR/HCR, can produce relevant impacts on the role that Venice airport can play in the near future, which will be furtherly confirmed following the completion of the projects outlined in the Masterplan 2021. With the aim of analyzing the possible changes occurring to the role of Marco Polo Airport, due to the realization of the new rail connection to Mestre, we start our analysis defining the catchment area of the airport by train both in the current and future scenario, affecting the basin of potential users. The potential catchment area of the airport has been defined providing a simulation of the impacts that the expected development projects could determine, by considering accessibility thresholds by train and accessibility isochrones by road.

This approach simplifies the accessibility concept and related measures of which Geurs and van Wee (2004) provide an exhaustive example[7], considering only the time component of the accessibility measures by rail and road. Because accessibility describes "the extent to which land-use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s)" (Geurs & Wee 2004), their measures depend strongly on what accessibility you want to analyse or to promote, how (mode, speed, reliability, density) and for who.

These conditions also explain why accessibility has been receiving increasing attention from a wide range of transport planning approaches, recently concerned also with the social dimensions of mobility (Pucci & Vecchio, 2019). From the pioneer definition by Hansen (1959) in "*How accessibility shapes land use*"[8], the accessibility measures are evolving towards multimodal approaches, finalised to analyse the range of available opportunities with respect to their distribution in space and time. In our approach we focus on *infrastructure - based accessibility measures* founded on the observed and simulated performances of the rail transport system, in terms of travel time to reach Marco Polo airport. The goal is to understand the extent of the catchment area of the airport by railway, due to the implementation of the infrastructural projects and considering a 3-hour travel time threshold[9]. By consequence, the concept of accessibility, in this research, is related to the increased number of people that may find convenient, in terms of travel time, to choose the Marco Polo airport as a departure hub for their flights. This is calculated, in a first step, considering the current and future geographical extension of the catchment area and, in a second step, for the scenario construction, by forecasting the trends in mobility habits of the inhabitants of the catchment area.

[7] Geurs and van Wee (2004) identify four main components of accessibility affecting its meaning and measures: land use, transportation, time and individuals. These elements interact with one another in various ways, influencing themselves and contributing differently to the overall available accessibility.

[8] According to Hansen (1959), accessibility is "the potential of opportunities for interactions".

[9] A maximum 3 hours travel time by train from VCE Marco Polo airport was imposed. The reason for this choice is related to the geographical location of Venice: when overcoming this threshold, it is more convenient in terms of travel time by train, to reach other national airports providing a similar (or greater) level of service, such as Milan Malpensa.

The former has been calculated starting from the current railway services supply and in relation to territorial development scenarios. By consequence, current train travel times have been re-adapted to simulate the presence of the new direct connection based on the estimations provided by RFI on expected travel times from the new airport station to Mestre (Fig. 2).

By calculating train accessibility thresholds (1, 2 and 3 hours respectively) to the airport, three basins of potential users have been identified, each of which constituted by municipalities falling under one of the three isochrones and selected according to their spatial proximity (5 km) to a railway station classified considering the accessibility threshold granted to the new airport station. The analysis revealed also a fourth basin, defined as "residual", composed of municipalities that, even if located in the study area, do not meet the previous conditions (Fig. 3).

Fig. 2 Isochrones by rail to the new Marco Polo airport station

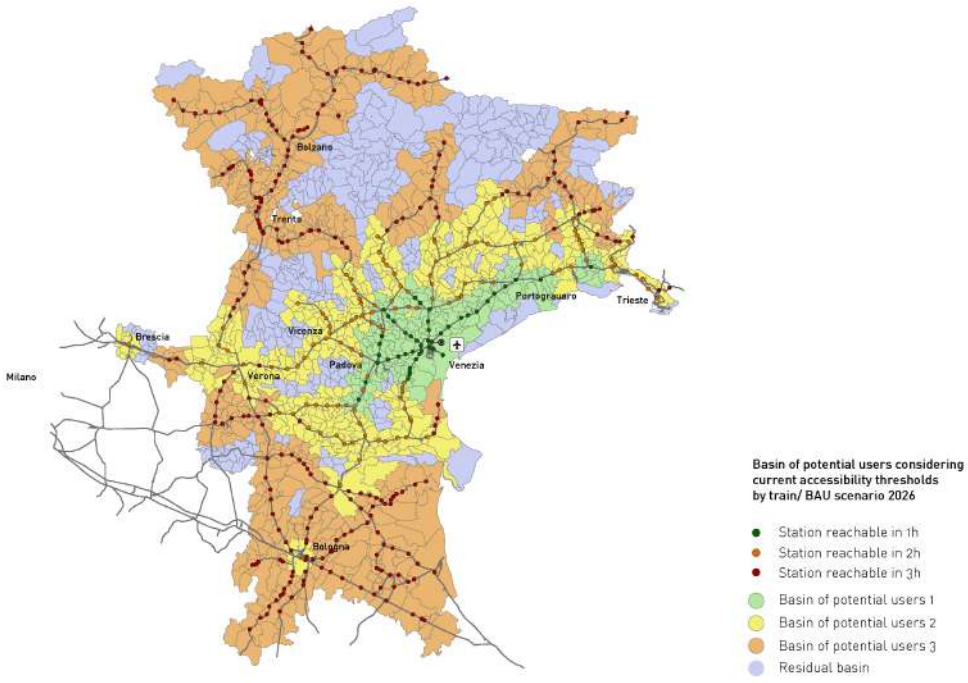

Fig. 3 Basins of potential users, considering current accessibility thresholds by train to the new airport station

To confirm the validity of the achieved results based on the railway network, an analysis on the road accessibility to the airport has been conducted. Isochrones, used in this process, represent an effective criterion to define the airport's catchment area both in the current and future scenario. Isochrones allow to define the potential airport's catchment area by road, considering travel times in a range between 15 and 60 minutes. The indicator is calculated by using a sampling function of the isochrones in which the centroid of a municipality is falling10. The outcome (Fig. 4), allowing to compare the Marco Polo airport catchment area by road with the ones of other relevant airports in the North East (Verona and Bologna), shows a widespread and balanced road accessibility in each airport; however, in terms of commercial air supply, the airport of Venice is the main hub for the international/intercontinental traffic in the North East of Italy.

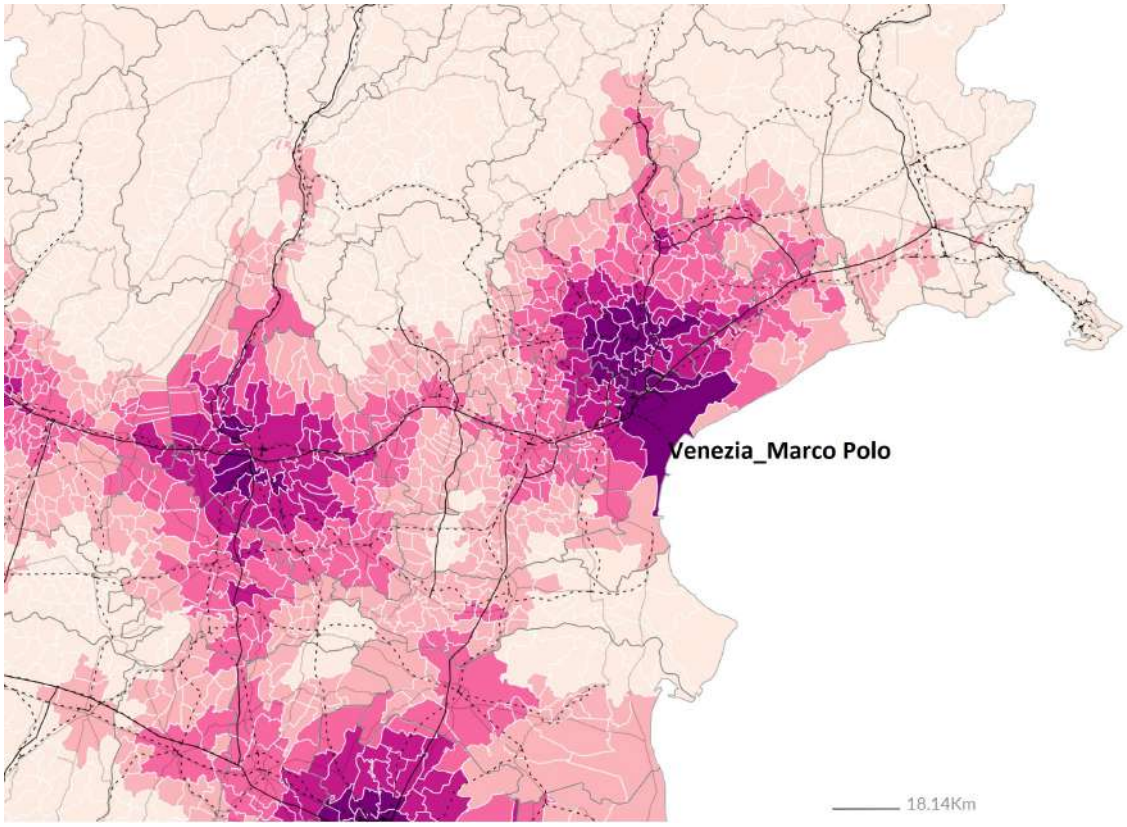

Fig. 4 Catchment area of Marco Polo airport: isochrones of accessibility by road and comparison with other relevant airports in the North East of Italy (source: Postmetropoli, Dastu, Polimi)

4 THE INTERMODAL COMPLEMENTARITIES OF RAIL AND AIR TRANSPORTATION: FUTURE SCENARIOS IN MARCO POLO AIRPORT

With the aim of providing an evaluation of the impacts of the infrastructure projects and the territorial interventions in Marco Polo airport's catchment area, the research defines two scenarios to estimate the evolution on mobility trends and the potential new users:

- a BAU (Business as usual) scenario assumes that the current socio-economic and mobility trends can be expected to continue unchanged to 2026, considering that HSR/HCR lines will not be in exercise, but the dedicated rail connection to the airport will be already operative;

[10] Source: routable road network (OpenStreetMap) featuring information on average speed (data referred to 2014) and the localization of the airport. The results identify a study area at the territorial scale defined according to the following thresholds: class 1 (1-1)= average travel time between 45 and 60 minutes; class 2 (1-2)= average travel time between 30 and 45 minutes; class 3 (2-3)=average travel time between 15 and 30 minutes; class 4 (3-4)= average travel time less than 15 minutes.

- a Project scenario considers the evolutions of mobility trends to 2026, assuming the realization both of HSR/HCR lines and the dedicated rail connection to the airport.

The evolution of mobility trends has been estimated considering the current demand and its evolutions based on socio-demographic trends and to the territorial-scale projects that contribute to modify settling patterns. Data processed are commuter flows for work reasons by Istat Census data (2011), demographic census data (2011, 2017), the average income per capita (MEF 2012-2017) and mobility demand survey by Isfort (2018). The time horizon that was considered is related to the time of completion of the HSR line from Milan to Venice and to the upgrading to a HCR line between Venice and Trieste, as declared by RFI[11].

BAU: approach to calculate the scenario

The evolution in the demand for mobility by 2026 has been estimated considering the following hypothesis:

- population trends will remain unchanged due to the stable trend registered between 2011 and 2017 (+0.82% for the whole area of analysis and +0.9% for the Venice city catchment area);
- commuting mobility at the municipal level will increase following the average annual mobility rate[12] registered in the study area in 2018 (84.9). An additional evaluation has been provided assuming that the mobile population (composed by the employed) takes an average of 2.3 daily displacements (Isfort, 2018). By consequence, two different BAU scenarios were calculated, a first "low" scenario, based on the annual mobility rate and a second "high" scenario based on 2.3 average number of displacements per day;
- the modal split at 2026 for the displacements directed to Venice will remain stable, considering that the BAU scenario does not foresee the HSR/HCR line and the rate of car ownership shows a little increase (as observed in the whole area of analysis);
- flows directed to Venice will show the same trends as in the period 2011-2018;
- passenger traffic in the airport will increase by 4% average rate per year, according to the estimations provided by ENAC[13] in the "Studio trasportistico aeroporto Marco Polo" (2014).

	CURRENT SITUATION (2018)			BAU SCENARIO (2026)
	Population	Employees*	Flows**	Flows
Catchment area of Venice	5,303,020	2,323,658.92	1,970,664.8	1,987,429.239

Tab. 1 Business as usual scenario

* Employees are estimated based on the population in 2018, and according to the previous employment rate

** Flows are estimated based on the n. of employees in 2018 multiplied by the number of average daily displacements by Isfort (2018).

BAU Scenario has been calculated applying a linear function and considering for the flows estimation a constant mobility rate in line with that of the previous period (84.9). The following maps depict the trends of growth in the number of total flows by 2026 for the municipalities located into the study area considering both BAU scenarios (Figg. 5, 6) and in reference to the flows from the same municipalities to Venice (Fig. 7).

[11] Since 2007, HSR line between Padova and Mestre (25 km) is working, while the section between Verona and Vicenza (51.2 km) is under construction and its completion is expected by 2024; the section between Vicenza and Padua (27,6 km) has been financed at the 30% of the total cost (3.1 billion euro) and it is expected to be operative between 2026 and 2028; the section between Venice and Trieste is under upgrading to increase its speed (200 km/h) and the works are expected to be completed by 2024.

[12] Mobility rate is the percentage of employees that make at least one trip in a typical working day.

[13] The estimation of passenger traffic is based on the scenario by ENAC (2014) that evaluates a consistent increase in the extra-Schengen movements (29% of the total in 2014) until 38% in 2021 with an annual increase rate by 7.5%; as well as a lower increase for Schengen passengers, with an average annual rate by 2.5%-3.0%.

Rail accessibility remains substantially unchanged with respect to the current condition (Fig. 3) in both scenarios, with the only difference due to the openings of the dedicated rail connection and a new station to the airport.

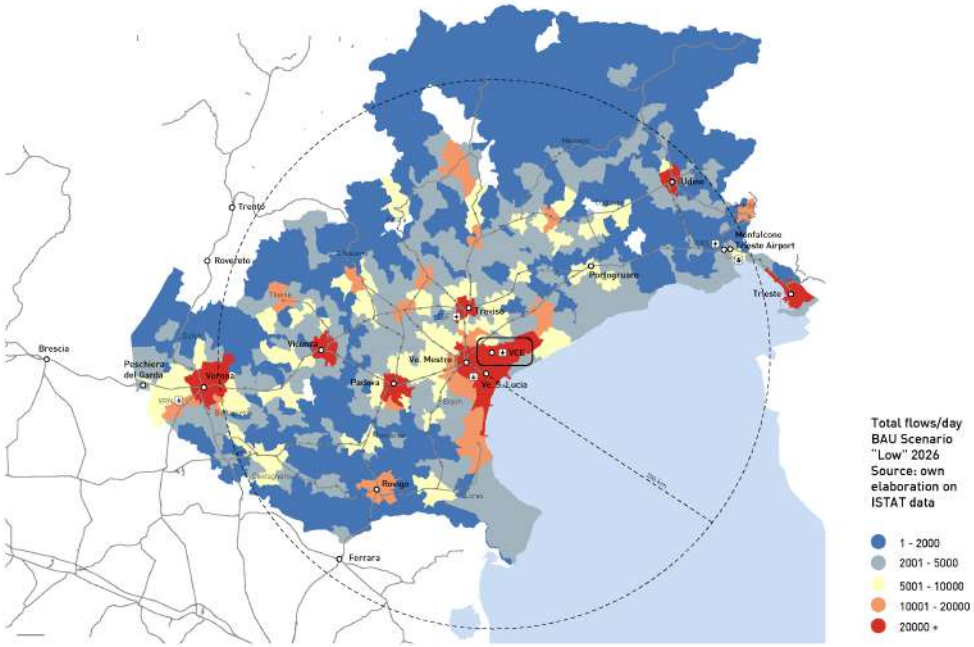

Fig. 5 Estimation of the total daily flows (inflows and outflows, all travel mode) at the municipal level – BAU scenario 2026 "low"

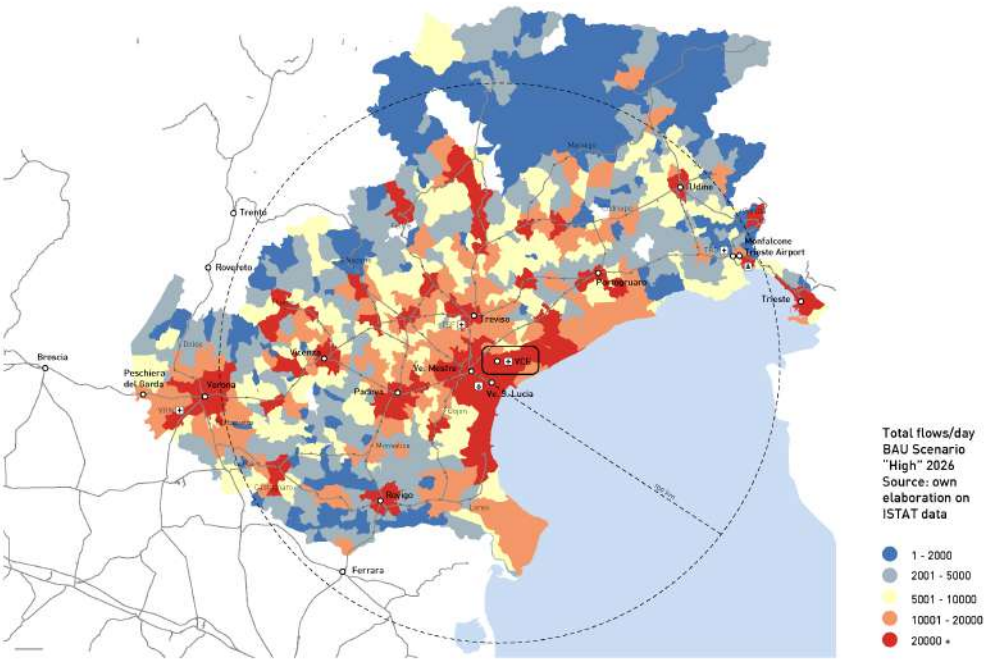

Fig. 6 Estimation of the total daily flows (inflows and outflows, all travel mode) at the municipal level – BAU scenario 2026 "high"

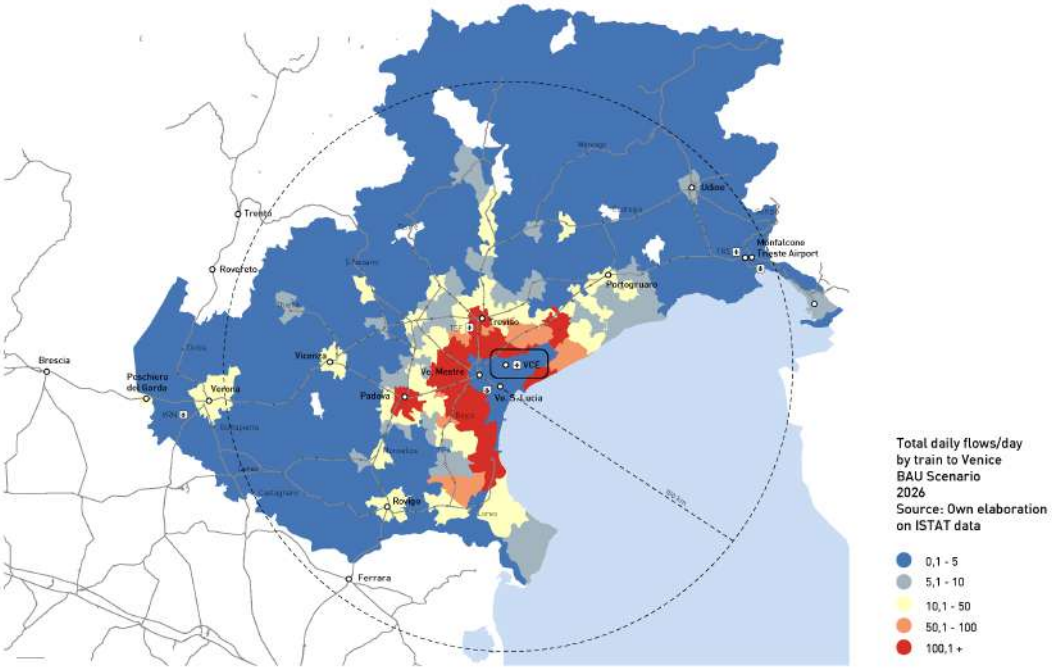

Fig. 7 Estimation of the total daily flows by train at the municipal level directed to Venice – BAU scenario 2026

Project scenario: approach to calculate the scenario

The evolution in the demand for mobility by 2026, when the HSR/HCR lines from Milan to Trieste is expected to be completed, has been estimated considering the following hypothesis:

- population trends will remain unchanged due to the stable trend registered between 2011 and 2017(+0.82% for the whole area of analysis and +0.9% for the Venice city catchment area);
- commuting mobility at the municipal level will increase according to the prevision on annual mobility average rate provided by Isfort (2018) for the North East of Italy (88.7%);
- considering the displacement directed to Venice from the municipalities hosting stations that will be served by HSR/HCR lines, the modal split for train could attest on values between 29.3% and 32.8% of the total flows directed to the airport[14] (SAVE s.p.a. – Oneworks, 2014);
- the use of the local train network (SFMR) for displacements directed to the airport could reach 22.2% (SAVE s.p.a.- Oneworks, 2014);
- passenger traffic from the airport could increase by 4.5% on an average annual basis, exceeding the estimations provided by the ENAC report (*Studio Trasportistico Aeroporto Marco Polo*, 2014) due to the new dedicated connection between the HST/HCT lines and the airport;
- the new HST/HCT lines, once completed, will generate a significant reduction in travel times between Milano C.le and Trieste C.le (50/65 minutes according to RFI) determining the extension of the catchment area of the airport by rail (Fig. 8) and producing a relevant impact on long-distance relations.

Rail accessibility has been calculated considering the current supply, but a re-organization of the services could lead to a better integration with local/regional lines, strengthening the attractiveness of the inter modal air-rail solution, even for short-to-medium relations.

[14] According to the available analysis (SAVE engineering – OneWorks, Studio Nodo Intermodale 2014), the following modal split has been hypothesized: taxi and bus-shuttles 9,7%; bus 11,3%; private car 32,4%; water transit 16,1%; railway 29,3%, others 1,2%. In a 2026 scenario, when the HST/HCT between Venice and Trieste will work, the following split can be hypothesized: taxi and bus-shuttles 9,7%; bus 11,3%, private cars 28,9%; water transport 16,1%; railway 32,8%, others 1,2%. These figures show a transfer of a share by 3,3% from private cars to the railway.

Project Scenario has been calculated applying a linear function and considering for the low scenario a constant mobility rate (commuter flows/employees) in line with the previous period, and for the high scenario an average, the daily displacements calculated by Isfort (2018) as a benchmark.

	CURRENT SITUATION (2018)			BAU SCENARIO (2026) - FLOWS	
	Population	Employees*	Flows**	Low	High
Catchment area of Venice	5,303,020	2,323,658.92	1,970,664.8	2,075,935.507	5,382,921.8

Tab. 2 Project scenario

* Employees are estimated based on the population in 2018, and according to the previous employment rate

** Flows are estimated based on the n. of employees in 2018 multiplied by the number of average daily displacements by Isfort (2018).

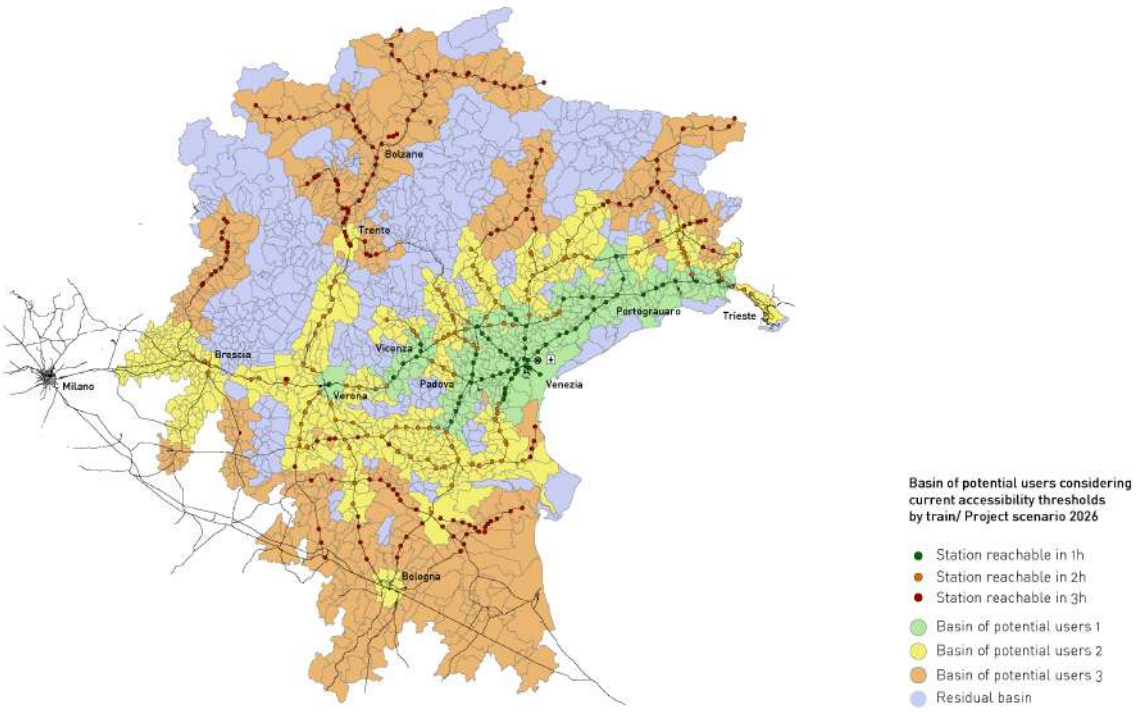

Fig. 8 Basins of potential users by train to the new airport station in the project scenario

As for the BAU scenario, two different scenarios were proposed: the first assuming that socio economic and mobility trend will remain stable (project scenario "low") and the second project scenario considering 2.3 daily/displacements for employee (project scenario "high"). The following maps (Figg. 9, 10, 11) depict the trends of growth in the number of total flows by 2026 for the municipalities located into the study area.

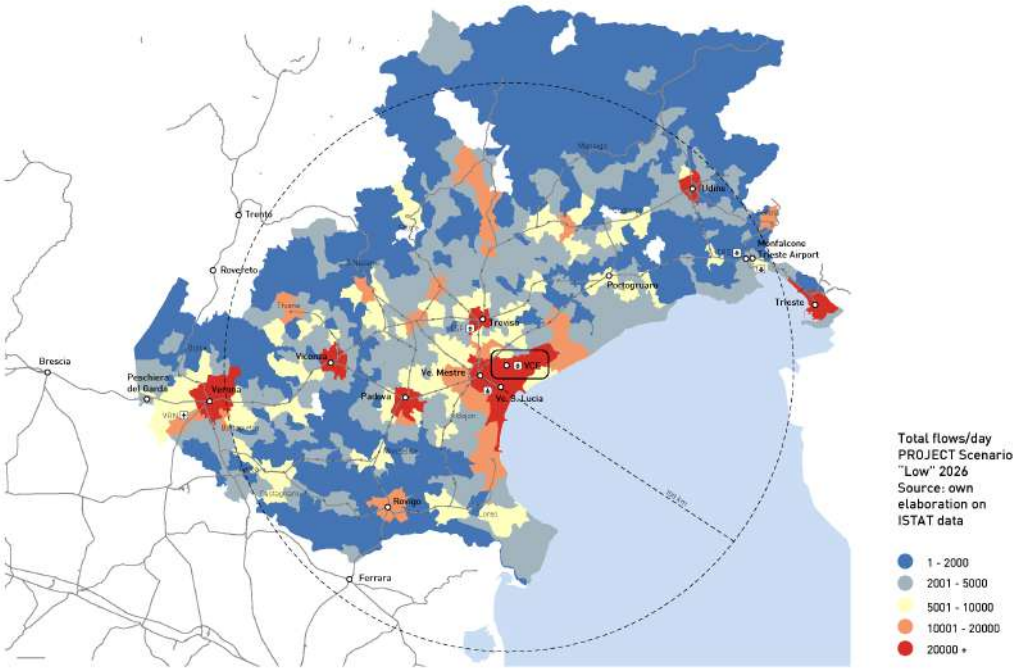

Fig. 9 Estimation of the total daily flows (inflows and outflows, all travel mode) at the municipal level – Project scenario 2026 "low"

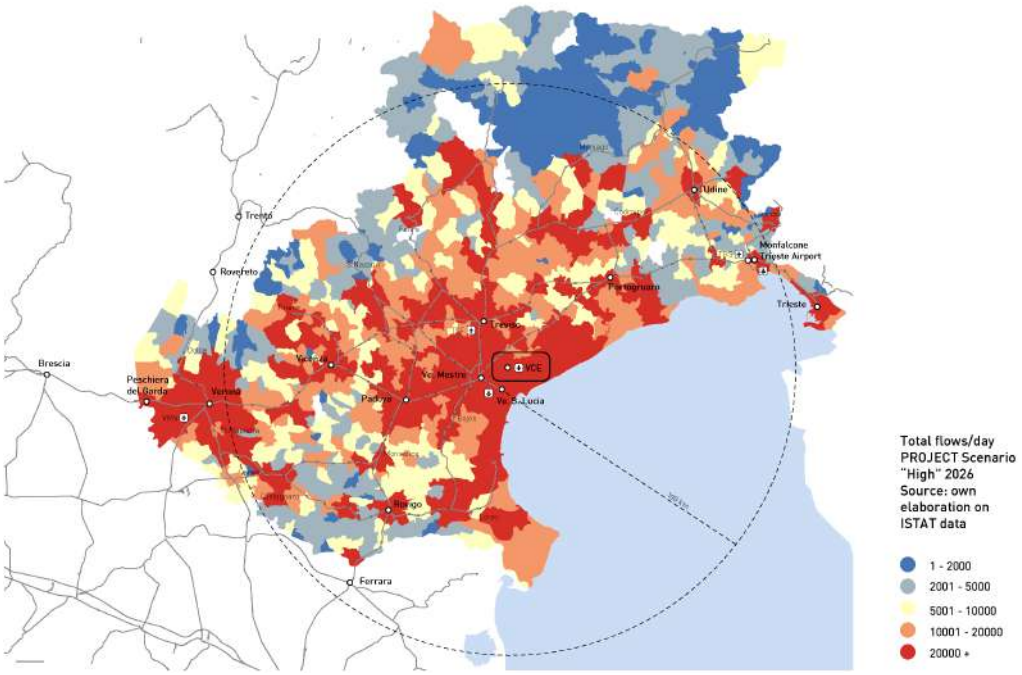

Fig. 10 Estimation of the total daily flows (inflows and outflows, all travel mode) at the municipal level - Project scenario 2026 "high"

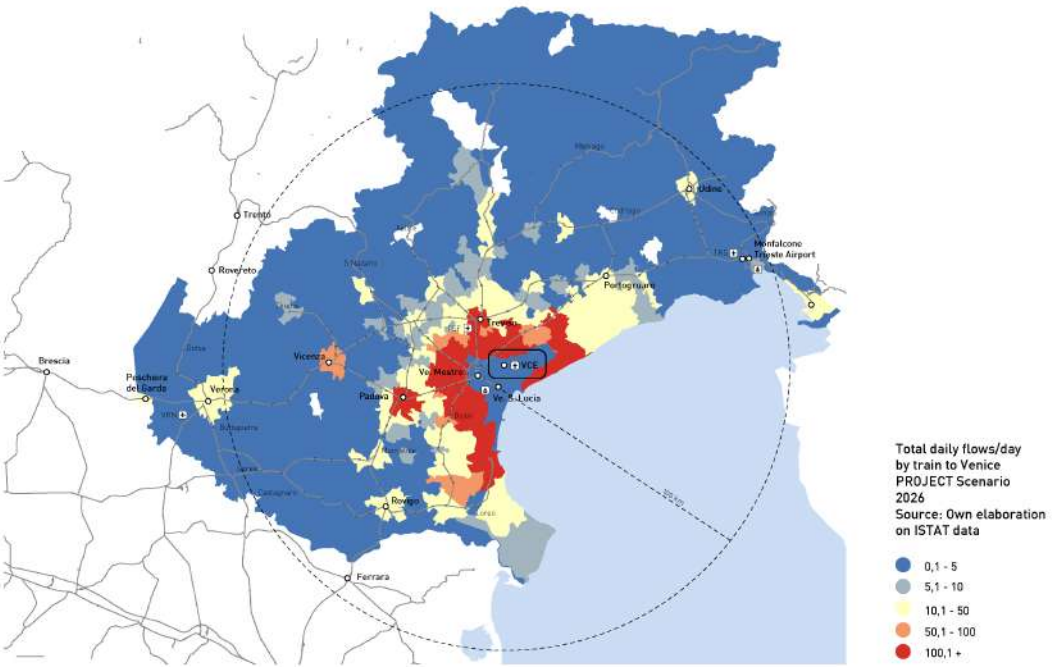

Fig. 11 Estimation of the total daily flows by train at the municipal level directed to Venice – Project scenario 2026

5 CONCLUSIONS AND DISCUSSIONS

In the next years, a further increase of the relevance of Venice Marco Polo airport into the national airport system is expected, thanks to the steady growth in passenger traffic and to the relevant infrastructure projects that will increase the airport's efficiency. Among them, the opening of the dedicated rail connection and the completion of the HSR/HCR line between Milan and Triste are the most relevant, due to their effects on the extension of the airport's catchment area. This effect will be granted by a sensible reduction in travel times by train between Milan Centrale and Trieste Centrale, widening the accessibility thresholds by rail to the airport. Moreover, the dedicated rail connection will allow to directly link the airport with the local and national rail networks, determining the conditions for an efficient air-rail intermodality in accordance with European strategies and with other national and international airports that have already followed this path. This research estimates that, in a project scenario 2026, and considering an accessibility threshold by train of 3 hours, an extension of the basin of potential users of the airport could increase by 18% compared to the current condition, potentially concurring to the increase of the airport's users.

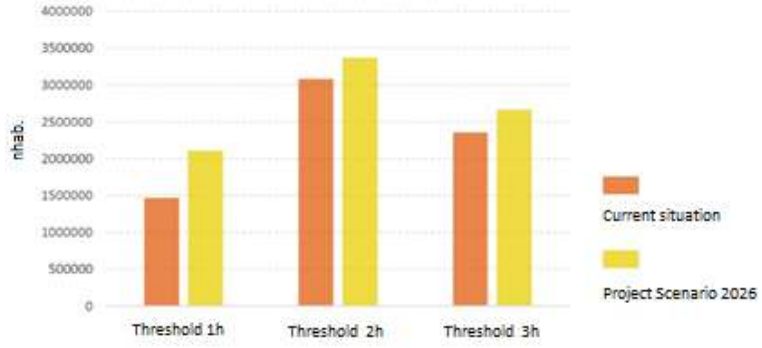

Fig.12 Variation of the inhabitants in the catchment areas of the Marco Polo airport, based on three isochrones (1h, 2h and 3 hour thresholds)

Even though the most relevant extention in the catchment area can be observed in the 1 hour threshold from the airport – namely the territory of "*Veneto centrale*" – it can be assumed that an increased accessibility by

train may produce significant benefits also for more remote areas such as eastern Lombardy (Brescia), Romagna and the settlements that are located along the main HSR/HCR corridors which are already characterized by a significant concentration of economic activities and business facilities and where mobility trends highlight a wider growth than the average per-capita income[15]. Furthermore, the new HSR long-distance connections will provide an increased competitiveness for the airport, also in comparison with the hub of Milan Malpensa, both for tourists and business travelers[16]. Considering Brescia as an example, the airport of Venice would be reached in around 80 minutes by train, thanks to the completion of the HSR line, while from Brescia to Malpensa airport around 100 minutes, with an intermediate reloading, are required. Considering short-to-medium distance rail connections, the project for a dedicated rail link to the airport will allow both national and local trains transit to reach the new airport station. In addition, the upgrade of the railway line to Trieste, combined with the completion of high speed rail between Venice and Milan, will lead both a decrease in travel times for the medium-long distances, and new time slots for improving the local railway supply in the historical decongested line. The contextual conditions mentioned above, relating not only to the new infrastructural supply, but also to some excellences and peculiarities of the Veneto region, contribute to enhancing the opportunities of the Marco Polo airport under some conditions that may play a significant role in fostering the positive outcomes granted by the development of the ongoing projects. These conditions are related, in particular, to the design solutions for the new dedicated rail connection and terminal rail station, to optimize the passengers transfer and ensure an efficient, integrated and livable interchange with the existing infrastructures (among them an important role is played by the Darsena).

In this framework, to facilitate the integration between rail-air services (code share, single ticketing, one-stop baggage check agreements) and new cooperation among different operators can play a relevant role to fully exploit the intermodal complementarities of HSR and air transportation in Marco Polo airport, with positive effects also for the involved territories. Final remarks refer to the approach followed in this paper and its limits. Estimating the access to the airport using only the travel times on the rail network, we assume that the reduction of these times increases the rail catchment area of the airport. This assumption does not take into account the combined effect of the different means of transport in the definition of the infrastructure accessibility to the airport that a multimodal approach to the airport accessibility should allow. However, the aim of our research focusses on the estimation not of the "new air passengers" but on the "potential users" of the airport, on the basis of a new railway supply and travel opportunities that widen the catchment area of the airport and the target populations affected. Using the definition of "potential users" of the airport, we estimate the inhabitants with a better condition for reaching the airport by train, even if we are aware that this population living in the catchment area does not involve a consequent increase in the air passengers, in particular because the new railway supply could even shift users from road transport to railways, without affecting the airport.

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[15] Beside the analysis on commuter displacements (Istat 2011) and demographic trends (Istat 2011-2018), the research considered also the evolution of the average income per capita (MEF 2012-2017) to introduce the socio-economic dynamisms of our study area.

[16] This scenario does not take into account the possible competition between Venice Marco Polo airport and Bergamo Orio al Serio, even if the two airports are very similar in terms of passenger traffic (Bergamo is the third airport in Italy for passenger traffic with 12.938.572 transits in 2018). This choice is due to the fact that Orio al Serio airport is not reached by the railway network and its commercial air supply is mostly oriented to the low-cost market.

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TeMA Journal of Land Use, Mobility and Environment

TeMA 3 (2019) 283-294
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6088

paper received 1st May 2019, accepted 12th September 2019

www.tema.unina.it

How to cite item in APA format:
Reynolds Walsh, L., Xian, T., Levinson, D. & , Rayaprolu, H.S. (2019). Walking and talking. The effect of smartphone use and group conversation on pedestrian speed. *Tema. Journal of Land Use, Mobility and Environment*, *12* (3), 283-294. doi: http://dx.doi.org/10.6092/1970-9870/6088

WALKING AND TALKING

THE EFFECT OF SMARTPHONE USE AND GROUP CONVERSATION ON PEDESTRIAN SPEED

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ABSTRACT

Distracted walking due to smartphone use is on the rise resulting in growing concern over pedestrian safety and well-being. Our study measured the walking speeds of pedestrian groups differentiated by their smartphone use in two different environments - a wide pedestrian bridge at a university, and a narrow footpath on a busy commercial street. The results show that groups of people, phone users, and often followers of phone users, walk significantly slower than solo walkers uninfluenced by phone. Especially on the narrow street, people in groups and phone users are seen to not only slow themselves down but also slow the people walking behind them.

KEYWORDS:
Walking; High-speed Rail; Catchment Area; Intermodal Complementarity; Scenario

TeMA
有关土地使用、交通和环境的杂志

TeMA 3 (2019) 283-294
print ISSN 1970-9889, e- ISSN 1970-9870
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行与说：智能手机使用和群聊对行人走路速度的影响

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摘要

使用智能手机让越来越多的人在走路的时候分心，也让行人安全和福祉问题日益受到关注。我们的研究通过两个不同的环境：大学里的宽阔人行天桥，狭窄的繁忙商业街人行道。研究不同的智能手机使用方式对行人群体步行速度的影响。结果表明，人群、电话用户以及频繁关注电话用户的行走速度，明显慢于没有电话影响的独行者。
尤其是在狭窄的街道上，人群中使用电话的用户不仅放慢了自己的脚步，也让其身后的人群步伐变慢。

关键词：
步行；高速火车；集水区；多式联运的互补性； 情境

1 INTRODUCTION

Growing environmental and health concerns have directed a multitude of research into walking, pedestrian behaviour and safety (Papa, 2008; Rahaman & Lourenco, 2010; Shbeeb & Awad, 2013; Soltani et al., 2018). Our study examines the impact of smartphone use on pedestrian movement. While walking is a multi-dimensional activity serving various purposes like mobility, leisure, exercise, social interaction, etc., this study focuses mainly on the transport aspect of walking, especially walking speed. Walking speed has been measured in a variety of contexts ranging from pace of life studies to human factors and behavioural to transportation studies (Chandra & Bharti, 2013, Clark-Carter et al., 1986; Finnis & Walton, 2008; Fitzpatrick et al., 2006; Franek, 2013; Levine & Norenzayan, 1999; Moussa et al., 2010; Tanaboriboon, 1986; Tarawneh, 2001; Walmsley & Lewis, 1989). But as smartphones have come to be almost ubiquitous across the world, the issue of smartphone use while walking arises. With increasing phone-related injuries and incidents among pedestrians (Nasar & Troyer, 2013; Smith et al., 2013;, the behavior of distracted pedestrians has been widely investigated. The majority of the studies are however experimental (Mwakalonge et al., 2015) and report diverse findings. While (Haga et al., 2015; Nasar et al., 2008) and (Schwebel et al., 2012) find distracted pedestrians to exhibit unsafe behaviour, (Lopresti-Goodman et al., 2012) find them to act with more caution, and (Stavrinos et al., 2011) and (Timmis et al., 2017) find their behaviour to be unaffected by distractions. Nevertheless, when pedestrians were observed in their natural environments, those that were distracted with activities using phones were found to walk slower and display less caution (Nasar et al., 2008; Bungum et al., 2005; Hyman et al., 2010; Thompson et al., 2012). Bumgum et al., (2005) assessed the relationship between distracted walking and routine cautionary behaviours of pedestrians crossing a street. Trained observers recorded the distractions (wearing headphones, talking on a mobile-phone, eating, drinking, smoking, or talking with another pedestrian) and cautionary behavior (looking left and right before crossing, entering the crosswalk only during the 'walk' phase) of 866 pedestrians. Using regression analysis, they found that distraction was negatively but weakly correlated with displaying caution.

In one of their studies, (Nasar et al., 2008) observed the behaviour of 127 pedestrians at three cross walks to estimate their safety. They found that mobile phone users crossed more unsafely than those using iPods or none of the devices. (Hyman t al., 2010) observed 317 pedestrians crossing a square at Western Washington University and investigated the effects of divided attention during walking. They observed that mobile phone-users walked slower, changed directions more frequently, and were less likely to acknowledge people and notice unusual activities in the surroundings in comparison to the others. They did not find any significant differences in behaviour across genders, in contrast to (Ortiz et al., 2017) who found females and the young to be more prone to distraction by phone use or talking to others in their observation of pedestrian and driver interactions. In another study, (Thompson, 2013) observed 1102 pedestrians at 20 high-risk intersections in Seattle, Washington to investigate the impact of technological and social distraction on pedestrian cautionary behaviours and crossing times.

They found mobile phone use and talking with a companion to increase crossing times. In an examination of the association between distracted behaviours and optimal crossing behaviour, they found text messaging while crossing to be associated with the highest risk. While many studies show smartphone use reduces the walking speed of the distracted pedestrian, the impact of the smartphone using pedestrians on the walking speed of those following them and the pedestrian traffic in general has been unexplored.

Our study addresses this gap. We investigate the impact of smartphone using pedestrians on others and the overall walking speed in different pedestrian environments in Sydney, Australia, by recording and examining ideo footage. Our hypothesis is that smartphone using pedestrians become obstacles for the non-smartphone users, who thus slow their walking speed.

The alternative hypothesis I that pedestrians not using smartphones adapt their behaviour to accommodate the smartphone users by perhaps weaving around them and increase their walking speed to overtake.
In this scenario, the use of smartphones would primarily affect the walking speeds of individual pedestrians using the devices but would not actually have any effect on the average speed of other travelers. In addition, the behaviour of pedestrians in groups is studied and posited to have similar effects.

2 METHODOLOGY

We examined pedestrian movements at two sites:

- on a university pedestrian bridge - City Road Bridge;
- on a busy commercial street - Bay Street.

At each of the sites, we recorded the pedestrian activity and measured walking speeds based on the collected footage. From the videos, we carefully logged the distance covered in the frame, and the time taken for each pedestrian to pass through the frame to extract their walking speed. Speed was calculated by dividing the distance walked by the time taken to walk. Each pedestrian was time stamped, and their direction of travel was noted. Other characteristics recorded include gender, whether they walked alone or in a group, and whether or not they were using their phone while walking.

Fig. 1 Site 1: City Road Bridge. (a-left) Camera Layout (b-right) Measuring Zone: 24 m on the west (far) side of the Bridge, 18 m on the east (near)

The datasets for sites 1 and 2 have 180 and 477 reference items respectively, each one corresponding to a pedestrian, and include the relevant information on that pedestrian as outlined above. The data were broken down for analysis based on gender, walking in groups, and smartphone usage: the walking speeds of the pedestrians in various categories were then evaluated.
Further, to explore the impact that phone users had, the walking speeds of pedestrians following phone users with a headway less than 5 seconds were also evaluated. Finally, the results were tested for statistical using z-tests. Details of each of the sites are discussed in turn.

3 SITE 1: CITY ROAD BRIDGE

Site 1 (Fig. 1) consists of a pedestrian bridge over City Road on the University of Sydney campus. Video footage was recorded during a school day, April 24, 2018 between 11:24am and 12:34pm, just prior to lunchtime to ensure maximum pedestrian traffic. During the recording period, the conditions were clear, with light breeze and approximately 23°C. Pedestrian movements in the first ten minutes of the video were logged for speed measurement.

The logged data were then analyzed in conjunction with a more general observation of the rest of the footage. The general observation of the footage offered insights into trends that the logged data did not pick up.
For example, the most obvious trend seen in the video observation is that pedestrians who were texting while walking were careful to keep to the left in their direction of travel (in Australia, pedestrians generally walk on the left). In this people walking in groups.
Based on this observation, further information was logged from the videos: the number of times that pedestrians overtook one another and whether the pedestrians overtaken were using smartphones or not.

Fig. 2 Site 2: Bay Street. (a-left) Camera layout Bay St (b-right) Measuring zone Bay St

4 SITE 2: BAY STREET

Three videos were collected at Bay St, Ultimo, NSW, a busy street in a commercial district. They had been collected from 4:42 pm to 4:55pm on a Tuesday, 1 May, 2018, and from 11:11 am to 11:28am and from 4:22 pm to 4:38 pm on a Wednesday, 13 June, 2018.
The camera was located about halfway on the east sidewalk facing west between Grose St and Broadway (refer to Fig 2(a) and (c)). The camera was facing West and was placed on the other side of the road in order not to narrow the walkway under observation. The segment observed is shorter than in site 1 to avoid distractions in movements caused by shop entrances and exits. We expect this to aid the comparability of the results.

5 RESULTS AND DISCUSSION

5.1 CHARACTERISTICS OF PEDESTRIANS

The characteristics of pedestrians observed at sites 1 and 2 are shown in Tab. 1. Pedestrians at site 1 were mainly university students, which explains the similar share of female and male pedestrians. The greater number of female pedestrians at site 2 could be due to its location in a commercial shopping district, as shopping remains gendered (Roy Dholakia,1999; Taylor et al., 2015).
Interestingly, an equal share of female and male students used their phones while walking, while male pedestrians on Bay Street were seen to use phones more than their female counterparts, an observation that contrasts the findings of studies where female pedestrians were observed to be equally or more likely to be distracted (Hyman et al., 2010; Ortiz et al., 2017; Smith et al., 2013).
Phone usage was nevertheless observed to be higher among students than pedestrians in the commercial district, as one would expect. Gender was significant in another dimension: women were more likely to walk in groups than men at both sites, and the likeliness was significant at site 1. Pedestrians following phone users with a headway less than 5 seconds were sporadic at both sites.

	SITE 1			SITE 2		
	Total	Male	Female	Total	Male	Female
Number of Pedestrians	180	92	88	477	207	270
Using phones	17%	17%	17%	12%	14%	11%
Not using phones	83%	83%	83%	88%	86%	89%
Phone user followers	7%	6%	1%	12%	5%	7%
Walking alone	72%	82%	61%	67%	71%	64%
Walking in a group	28%	18%	39%	33%	29%	36%

Tab. 1 Descriptive statistics

5.2 WALKING SPEED ANALYSIS

Walking speeds of pedestrians observed at both sites differentiated by gender, phone use, and walking companions are shown in Tab. 2. As one would expect, the average walking speed on the busy Bay Street (site 2) was higher than that on the wide, dedicated pedestrian bridge on campus (site 1).

As expected, pedestrians using phones had lower walking speeds than those not using phones and the general walking speeds, but the difference was not significant enough to fall outside the standard deviation of the general walking speed at both sites. The results for phone use followers do not align with our initial hypothesis that pedestrians using phones would slow down the other pedestrians around them.

Pedestrians using phones had no discernible effect on the walking speed of the pedestrians following them. While the walking speeds of phone user followers at site 2.

	SITE 1			SITE 2		
	All	Male	Female	All	Male	Female
All	1.21	1.24	1.17	1.31	1.34	1.29
	(0.32)	(0.32)	(0.31)	(0.25)	(0.25)	(0.25)
Using phones	1.16	1.09	1.22	1.20	1.25	1.15
	(0.30)	(0.33)	(0.24)	(0.20)	(0.24)	(0.16)
Not using phones	1.22	1.28	1.16	1.33	1.36	1.30
	(0.32)	(0.31)	(0.33)	(0.25)	(0.25)	(0.26)
Phone user followers	1.34	1.33	1.38	1.25	1.30	1.22
	(0.29)	(0.28)	(0.47)	(0.24)	(0.15)	(0.29)
Walking alone	1.31	1.32	1.28	1.36	1.40	1.32
	(0.26)	(0.26)	(0.26)	(0.24)	(0.21)	(0.25)
Walking in a group	0.97	0.90	1.00	1.22	1.21	1.23
	(0.32)	(0.34)	(0.31)	(0.26)	(0.29)	(0.24)

Tab. 2 Walking speed (m/s) of all pedestrians, phone-users, groups, and pedestrians following phone-users and groups (The values in brackets correspond to the standard deviation)

were comparable to the speeds of phone users, at site 1, pedestrians following phone users had speeds higher than the average. This is perhaps because phone using pedestrians were overtaken by the surrounding pedestrians who increased their walking speed temporarily during the overtaking, thereby producing no net effect on the general pedestrian speed.

To investigate this hypothesis, further analysis on overtaking patterns was undertaken at site 1 - discussed in the subsequent section.

The general walking speed of male pedestrians was slightly higher than that of the female pedestrians at both sites. This difference was fairly consistent across the categories except for male phone users at site 1, however the difference fell within the standard deviation.

The average walking speeds of male phone user followers at site 1, and male pedestrians walking in groups at both sites are almost negligibly lower than that of their female counterparts. Pedestrians walking in groups had lower walking speeds than those walking alone and the general population at both sites.
Although a clear slowing in the tempo of pedestrians walking in groups as compared to those walking alone was evident at site 1, the difference was not large enough to fall outside the standard deviation of the general walking speed. The difference was even smaller at site 2.

	MALE	FEMALE	OVERALL
People overtaken	13	20	33
Texting	2	3	5
Calling	0	0	0
Holding phone only	1	5	6
In a group	3	13	16
Alone with no phone	7	2	9
People that overtook others	13	9	22
Texting	0	1	1
Calling	0	0	0
Holding phone only	1	0	1
In a group	1	1	2
Alone	12	8	20
Not using phone	13	8	21

Tab. 3 Data on the Overtaken: Site 1

5.3 OVERTAKING PATTERNS AT SITE 1

Tab. 3 details characteristics of the overtaken and the overtaking pedestrians. For the analysis of overtaking patterns, we differentiated phone using pedestrians by what they appeared to be doing on their phones - texting, calling or just holding their phones while walking to identify patterns at a greater detail. Among all the observed pedestrians, only 33 (18%) were overtaken.
The data show that female pedestrians were more likely to be overtaken than male pedestrians. This is likely because most female pedestrians who were overtaken were walking in groups, and of the people who were overtaken, 48% were walking in groups. It may be that women are more likely to be overtaken simply because they are more likely to walk in groups, as seen in Tab.1, or there could be another unknown reason for this that has not been captured by this investigation. Male pedestrians were more likely to overtake than female pedestrians, perhaps because they tend to walk faster as seen in 1.
Overtaking pedestrians were likely to be walking alone (91%), and not using their phones (95%). A group of two people, one male and one female, was the only group to overtake in the footage. One male pedestrian held his phone as he overtook, and one female pedestrian managed to overtake while texting - in fact, she overtook two people. The analysis on overtaking patterns was undertaken with the expectation that most pedestrians who were using phones would be overtaken.
However, results show that the vast majority of people who were using phones were not overtaken.
The following additional points were noted during observation of the footage:

- texters kept to the left (Australia is a drive/walk on the left country) in their direction of travel - they tended to hug the wall as they passed over the bridge, and most looked up periodically;
- people in groups appeared to be less aware of their surroundings and took up more space than texters;
- no collisions or near misses were noted;
- pedestrians more easily overtook people using smartphones than people walking in groups;

- A slightly higher number of women (5%) than men carried their phones without using them: this could be explained by the fact that women's clothing has less functional pockets than men's clothing. If a female pedestrian was between texts, she may be less likely to put her phone away in her bag where she would be unlikely to hear or feel notifications, whereas a male pedestrian may be more likely to slip his phone back in his pocket while waiting for a reply. In addition, some women may keep their phone in their hand while listening to music for a similar reason. Without examining all the female pedestrians' pockets or asking them why they were holding their phones without using them, it is hard to make a definitive statement on this.

Overall, the results from the data collected on the City Road Bridge indicate that smartphone usage among pedestrians has little effect on overall pedestrian speed. However, this seems counter-intuitive given that people using smartphones have been shown to walk more slowly than without a smartphone, and walk with a reduced ability to follow a set pathway correctly (Bugum et al., 2005; Haga et al., 2015; Hyman et al., 2010; Lopresti-Goodman, 2012; Nasar et al., 2008; Thompson et al., 2010). Increases in injury rates have also been documented (Nasar & Troyer, 2013; Smith et al., 2013). It is thought that the effect of smartphone use would be more significant in areas with heavier pedestrian traffic, at different times of day, and perhaps with a slightly different demographic.

Most of the pedestrians seen in the video footage were almost certainly university students, around 18-35 years. At around 11:30 am, these students would not yet be late for a 12pm class, and so would not likely be rushing. Further, just before 12pm is about the time friends may meet for lunch, and therefore be more likely to be walking in groups than using their phones. Another location and time of day may yield different results. At 8am in Sydney CBD for example, a high volume of pedestrians aged 18 years and up would more likely to be walking alone on their way to work.

It is possible that under this scenario, smartphone use is more prolific and the effect on general pedestrian speed would be more significant and obvious. Further, a higher number of people walking past one another may mean that smartphone usage among some pedestrians does slow the walking speeds of other people. The barricades on the sides of the pedestrian bridge may also be affecting pedestrian behaviour. It is noted that most texters kept to the left and stayed very close to the barricade as they walked.

However, if the edge of the footpath met a busy road this may not be the case: people using smartphones may be more likely to walk close to the centre of the footpath where they would be more difficult to overtake.

6 SIGNIFICANCE OF RESULTS

To test the observed results for validity, we performed a series of Z-tests and found that the Z-testgenerally corroborate the observations, as shown in Tab.4.

The differences in walking speeds between most groups are significant beyond an 80% level. This is also true for the comparisons between sites. The results can hence be validated to be significant.

7 CONCLUSION

Observation of walking behaviour reveals or confirms the following: Males walk faster than females, females are more likely to walk in groups, females are more likely to carry articles in their hands than males. The results of the investigation from site 1, a wide university bridge, show that pedestrians using smartphones did not have a significant impact on overall pedestrian speed on the pedestrian bridge. Average walking speeds of pedestrians walking near smartphone users were not significantly different from the average speed. Overtaking pattern analysis showed that most people using smartphones were not overtaken either. It was found that people walking in groups were most likely to be overtaken by other pedestrians. In contrast, site

2, a more crowded city sidewalk, clearly indicated that pedestrians using smartphones slowed down themselves and others.

On a crowded walkway, administrators may consider discouraging or prohibiting looking at phones, or separating phone users and non-users to increase efficiency. Developing and applying pedestrians rules as customs, such as keeping left (right in right-hand rule countries) unless overtaking and no stopping or turning, could also increase the overall efficiency of walkways. This might be done with reminder signage. While rules and signage improve the safety and speed, they restrict the spontaneity and diversity of the use of public spaces. The alternative solution would be to expand public spaces to accommodate different utilities and speeds. Future research should expand on the preliminary analysis of overtaking patterns conducted. Extending this analysis to consider pedestrian crowd movement behavior as in (Helbing et al., 2001)would be valuable. Another direction for future research could be to explore the influence of culture on distracted pedestrian behaviour and walking speed. Recent research provides evidence for variation in walking speeds of groups across cultures (Bouterse & Wall-Scheffler, 2018).

GROUP 1	GROUP 2	SITE 1 Z-Test*	SITE 2 Z-Test*
Female pedestrians	Male pedestrians	93.42%	99.35%
Pedestrians using phone	Pedestrians not using phone	86.12%	99.99%
Pedestrians using phones	Pedestrians following phone users	96.77%	89.73%
Female pedestrians using phone	Female pedestrians not using phone	79.68%	99.99%
Male pedestrians using phone	Male pedestrians not using phone	97.83%	98.48%
Female pedestrians using phone	Male pedestrians using phone	89.51%	96.65%
Female pedestrians not using phone	Male pedestrians not using phone	98.55%	98.62%
Pedestrians walking alone	Pedestrians walking in groups	99.99%	99.99%
Female pedestrians walking alone	Female pedestrians walking in groups	99.99%	99.88%
Male pedestrians walking alone	Male pedestrians walking in groups	99.99%	99.99%
Female pedestrians walking alone	Male pedestrians walking alone	80.76%	99.87%
Female pedestrians walking in groups	Male pedestrians walking in groups	85.24%	60.35%
Site Comparisons:			
Group 1	Group 2	Z-Test*	
Site 1 All pedestrians	Site 2 All pedestrians	99.99%	
Site 1 Female pedestrians	Site 2 Female pedestrians	99.89%	
Site 1 Male pedestrians	Site 2 Male pedestrians	99.59%	
Site 1 Pedestrians using phones	Site 2 Pedestrians using phones	77.08%	
Site 1 Pedestrians not using phone	Site 2 Pedestrians not using phone	99.99%	
Site 1 Pedestrians following phone users	Site 2 Pedestrians following phone users	83.37%	
Site 1 Pedestrians walking alone	Site 2 Pedestrians walking alone	96.92%	
Site 1 Pedestrians walking in groups	Site 2 Pedestrians walking in groups	99.99%	

Tab. 4 Z-test for Validity of Differences in Walking Speeds
(* Z-Test column indicates confidence with which null hypothesis is rejected)

ETHICS STATEMENT

Our research is not subject to the jurisdiction of Institutional Review Board (IRB) any more than observing cars in traffic or stars in the sky is subject to IRB. The study is not about "human subjects" in the IRB meaning of the word. There was neither (1) intervention or interaction with the individuals involved, nor (2) identifiable private information about a human subject, who cannot be identified from the data that was collected after processing.

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TeMA Journal of
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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 3 (2019) 295-312
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6272

paper received 11th Septmeber 2019, accepted 16th December 2019

www.tema.unina.it

How to cite item in APA format:
Gaglione, F., Gargiulo, C. & Zucaro, F. (2019). Elders' quality of life.A method to optimize pedestrian accessibility to urban services. *Tema. Journal of Land Use, Mobility and Environment*, *12* (3), 295-312. doi: http://dx.doi.org/10.6092/1970-9870/6272

ELDERS' QUALITY OF LIFE

A METHOD TO OPTIMIZE PEDESTRIAN ACCESSIBILITY TO URBAN SERVICES

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ABSTRACT

The progressive ageing of population requires rethinking the spatial planning of the urban spaces and activities to guarantee the best accessibility and usability to urban services of interest for the elderly segment of the population. In this perspective, the paper provides a methodology oriented to reorganize the urban services to better satisfy the renewed needs of over 65, by classifying the areas of a city according to (i) the levels of urban accessibility and (ii) the Functional Accessibility Soft zones (FASzones). In fact, the FASzones are the parts of the city where elderly can easily reach their services of interest due to the presence of "optimal" pedestrian routes fitting their behaviours. The results provide local decision-makers with useful suggestions for deciding where and how to in on the distribution and location of services, in order to increase urban accessibility for the over 65 by improving their quality of life.

This methodological aim represents a first step in the broader MOBILAGE research work aimed at defining strategies, tools and actions to improve the pedestrian accessibility to urban services and places for elderly users.

KEYWORDS:
Spatial planning; Urban accessibility; Elderly; GIS; Walkability

TeMA
有关土地使用、交通和环境的杂志

TeMA 3 (2019) 295-312
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6272

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老年人生活质量与城市可达性：空间规划的方法建议

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摘要

人口逐渐老龄化是每个城市如今在满足相关的新承诺时必须应对的挑战。回应老年人的需求意味着要重新考虑城市空间的整治与规划，以确保老年人群对感兴趣的城市服务享有最佳的可达性和可用性。从这个角度来看，本文提供了一种根据 65 岁以上人口的流动性和城市服务水平对城市区域进行分类的方法。该方法学的目标代表了一项更广泛的研究工作的第一步，后者的目的在于确定策略、工具和行动，以便提高老年人在城市中获得服务和前往各种场所的机会。

关键词：
老年人；空间规划；gis；城市可达性

1 INTRODUCTION

Over the last twenty years, improvements in quality of life and scientific and technological advances have led to an increase in life expectancy.

In some countries, such as Italy, the rise in life expectancy combined with the low birth rate has completely altered the age structure of the population. Taking into account the life expectancy statistics of the last four decades, it can be observed that the age for males increased from 69.6 in 1976 to 80.6 in 2016 and for females from 76.1 to 85.1; the percentage of people over 65 rose from 15% in 1991 (it was 8.2% in 1951) to 22.3% as of 1 January 2017, and in parallel also the percentage of the "older old" (90 plus) went from 0.06% in 1951 and 0.4% in 1991 to the current percentage of 1.2% of the total Italian residents (723000 people) (ISTAT, 2015). This new demographic trend requires many changes: (i) a social change, which could enable older people to "exercise their skills and maintain or establish solidarity relationships" (Ombuen, 2017), recognizing them as a resource and no longer as a burden for a cohesive development of society; (ii) an economic change, because the rise in life expectancy and the increasingly unfavorable relationship between the active and non-active population will also led to an increase in the health and social security expenses mainly for the elderly, causing the so-called longevity shock, recently underlined by the International Monetary Fund; (iii) an urban change, since a better organization of the spaces, channels and activities will increase the possibility of movement of the elderly. In this perspective, to make local decision-makers aware of the needs of this segment of the population, in 2006 the WHO addressed the problem of population aging (through the "Global Age-friendly Cities" project) by identifying the basis for developing age-friendly cities and communities.

In this study, urban accessibility depends not only on the physical characteristics (places) and functional features (activities) of a city, but also on people's behaviours (lifestyles). In this logic, the paper tries to integrate and overcome the more traditional studies referring to place-accessibility and acitivity-based approaches, by introducing the variable of "needs" linked to the behavior of specific population segments. Therefore, in addition to the common consideration of urban places and activities, accessibility levels are defined by a system of relationships referring to spaces, activities and needs of the people who use them, according to the abilities of individuals and not only to their expectations.

The scientific community addresses the issue of improving the accessibility of the elderly by intervening mainly on the transport networks. In fact, scholars have focused extensively on how to increase the supply of local public transport and on identifying some geomorphological factors influencing the decision of people over 65 to get around the city, (such as the slope of the territory) (Arentze et al., 2008; Frochen et al., 2019; Padeiro, 2018). Few studies have focused on identifying the physical and functional features of the city that influence the pedestrian accessibility (walkability) of the elderly (Elsawahli et al., 2014).

To this end, the MOBILAGE project is aimed at defining a decision support tool for public administrations to improve elders' pedestrian accessibility to services, thus contributing to enhance their quality of life. This paper, which represents a step of the research project, has a twofold objectives: the first concerns the classification of urban areas, after defining physical and functional accessibility levels; the second refers to the definition of the Functional Accessibility Soft zones (FASZones) that identify the urban portions where services can be reached by suitable pedestrian routes for elderly (Cottrill et al., 2020). This work allow to support local decision makers in defining interventions oriented to improve the urban accessibility of the over 65. Against the scientific literature that provides a plethora of interpretations of accessibility, because of its interdisciplinary nature (e.g. Cheng et al., 2007; Litman, 2017; Sola et al., 2018), this study refers to the "urban accessibility" concept according to the holistic-systemic approach of the governance of urban transformations. Urban accessibility can be meant as the possibility of a person with any ability to reach and make use of places and activities of interest without barriers. In other words, the defining elements of urban accessibility are the services reachable on the urban level (functional component of urban accessibility) and the set of pedestrian

networks (physical component of urban accessibility), in close proximity to houses, all of them related to the behaviour of the older users.
Improving both the distribution of urban places and services and the usability of the paths to reach all of them results in contributing to increase the quality of life of the elderly by intervening on urban accessibility.
The paper is articulated as follows: the first section proposes a review of the scientific literature on the issue of accessibility for the elderly population; the second section presents a methodology to define the different levels of urban accessibility; the third section outlines the application of this method in the GIS environment to the Fifth Municipality (Vomero and Arenella districts) of the city of Naples; the fourth section describes the results obtained.

2 POPULATION AGING AND URBAN ACCESSIBILITY

Even though the influence of built environment on people habits, behaviors, expectations and aspirations has been debated by several authors for decades (see, e.g. Edwards et al, 1998; Grzeskowiak et al., 2003; Steinfeld and Maisel, 2012), just in the last years this discussion has been focusing on the "late life" segment of the population by connecting it with the spatial and urban accessibility field (Boudiny, 2012; Bricocoli et al., 2018; Henkin and Zapf, 2006; Pinto and Sufineyestani, 2018; Yuen, 2018).
The duality in the relation between the habits of the elderly (demand) and the organization of the urban system (supply) has prompted scientific debate on how to improve both the accessibility to urban places and services and the pedestrian network, given that soft mobility is the preferred transport mode among elder people: elders aged 60-74 years walk and cycle (64% of trips) more frequently than they drive within urban areas and for short distances (EC, 2012; Eurostat, 2017; Rosenbloom, 2004;). However, few studies have dealt with integrating the above matters, due to the complex spatial relationships between activities and mobility. In particular, Guagliardo (2004), Mao and Nekorchuk (2013) Wang (2012; 2015) and Zhu et al. (2019) have simultaneously focused on the two issues with the aim of measuring the "spatial accessibility to public services, especially healthcare services" (Tao and Cheng, 2018) and mainly by private transport. Such studies use a new accessibility indicator which, by measuring some characteristics (such as the travel distance to reach a specific activity and the related journey time), allows identifying those areas characterized by a lack of services. The possibility of reaching places and services, as well as the use of local public transport and the pedestrian network represent important steps towards improving overall urban accessibility and reducing social exclusion (Gargiulo, 2014; Khosravi et al, 2015; Zali et al., 2016). In this regard, there is an extensive body of scientific literature concerning the increase of the local public transport supply. Some of the studies developed (Broome et al., 2012; Fobker and Grotz, 2006; Kotval, 2017; Morency et al., 2011; Wong et al., 2017) have deepened the issues of the most frequent and preferred transport mode for the elderly (mainly the bus) and the quality of public transport offered. These studies were based on surveys conducted through questionnaires that provide information on the lifestyles of the elderly population, on the use of multivariate statistical techniques for assigning weights and the correlated identification of significant variables, and on the application of accessibility models, in order to understand how the elderly can reach a specific transport service. For example, the extensive scientific literature aimed at understanding the key factors influencing travel decisions among people aged 65 and older – which relate to the spatio-temporal constraints in achieving a given service of interest (Hildebrand, 2003; Szeto et al., 2017; Witten et al., 2003;) - makes wide use of this type of statistical methods. Even the most recent research segment concerning the reorganization of outdoor spaces (not specifically aimed at encouraging "active aging"), adopts multivariate statistical techniques to determine the impact of the built environment on the accessibility to places. In fact, the scientific community has dedicated particular attention to identifying, on a neighborhood scale, the physical and environmental characteristics that influence the participation and social aggregation of the elderly (Curvers et al., 2018;

Hawkesworth et al., 2018; Siu, 2019). Other studies have highlighted the physical and environmental characteristics of the built environment to detect which factors influence the "walkability" of the elderly (Feng et al., 2018; Meshur, 2016; Tseng and Wu, 2018; Van Cauwenberg et al 2011; Wang and Cao, 2017; Zang et al., 2018), so as to provide useful information for improving the pedestrian accessibility of the road network. Within the scientific framework of reference, very few studies link the needs and habits of the elderly (demand) to the matter of accessibility to urban places and services. Starting from this gap, this work intends to define the levels of urban accessibility, according to its physical and functional features, comparing them with the elderly density distribution and with the FASZones in order to identify the different demand-supply ratio degrees.

3 METHODOLOGY AND STUDY AREA

In order to classify the portions of a city according to their physical and functional accessibility levels of the older population at the neighborhood scale, a four-stage methodology was developed.

It is worth noting that this study goes a step further than a previous work (Gargiulo et al., 2018) and use a set of 13 variables classified according to the four main urban subsystems (Table 1). These 13 variables are the most significant ones due to their statistical weight, according to literature.

By referring to the performance approach (Gargiulo, 2009), the variables within the functional, physical and environmental subsystems define the supply of urban accessibility, while the variables within the socio-economic subsystem define the demand of urban accessibility of the elderly segment of the population.

The numerous services of interest for the elderly (functional subsystem) have been also geolocated in accordance with the following types of services:

- health services: hospitals, pharmacies, diagnostic centers and ASL;
- cultural and leisure services: cinema, theater and libraries, green areas;
- economic-financial services: banks and post offices;
- commercial services: supermarkets and shopping fronts.

This further classification has been introduced to cluster the numerous kind of services, as well as for facilitating the reading and the interpretations of the results obtained.

ID	VARIABLE	WEIGHT	MEASURE	SOURCE
		SOCIO-ECONOMIC SUBSYSTEM		
1	Population over 60 divided into age groups (60-70,70-80,> 80)	p=-0.25 p<0.001 p=0.37 p=- 0.55	Inhabitant (Inhab.)	Istat-Municipality
2	*Old index*		*(%)*	
		ENVIRONMENTAL SUBSYSTEM		
3	*Orography (elevation)*		*m*	GIS
		PHYSICAL SUBSYSTEM		
4	Metro stations	p=0.7 p=0.5 p=0.3	R.i.= 500m	Geographic information system GIS_Open street map
5	Bus and tram stops	p=0.94 p=0.80 p=0.50	R.i.= 500m	
6	Network of protected paths	p=0.02 p=0.005 p=0.86	Km	GIS

	FUNCTIONAL SUBSYSTEM (services of local interest)			
7	*ASL*		*Radius of influence (R.i.)= 500m*	Geographic information system GIS_Open street map
8	*Pharmacies*		*R.i.= 500 m*	
9	*Poly-diagnostic center*		*R.i.= 560 m*	
10	*Local market*		*R.i.= 600 m*	
11	*Social center*		*R.i.= 200 m*	
12	*Churches*		*R.i.= 400 m*	
13	*Cinema*		*R.i.= 515 m*	
14	*Theater*		*R.i.= 1000 m*	
15	*Green areas*	*p=0.67 p=0.50*	*R.i.= 100 m*	
16	*Municipal library*		*R.i.= 600 m*	
17	*Sports center*		*R.i.= 1000 m*	
18	*Post office*		*R.i.= 500 m*	
19	*Bank*		*R.i.= 500 m*	
20	*Police and Carabinieri*		*R.i.= 500 m*	
21	*Supermarket*		*R.i.= 500 m*	
	FUNCTIONAL SUBSYSTEM (services of general interest)			
22	*Hospital*		*R.i.= 1100 m*	Geographic information system GIS_Open street map
23	*Private Clinic*		*R.i.= 1100 m*	
24	*Urban park*		*R.i.= 1000 m*	
25	*Museums*		*R.i.= 1100 m*	
26	*Cemetery*		*R.i.= 1100 m*	
27	*Stadium*		*R.i.= 1100 m*	

Tab. 1. Classification and parameterization of the variable set. The variables in italic are the ones that have been introduced by authors, as they are significant for the aim of the work

The 13 variables, as well as the methodology, have been applied to the municipality of Vomero and Arenella, in the central area of the city of Naples (Figure 1). The choice of this area of study is linked to two main aspects: on the one hand; the morphological, settlement and functional characteristics, whose diversification makes these districts a significant test area for the whole MOBILAGE project. For example, the hilly orographical conformation of the area (from 150 to 375 m above sea level) influences the choices of mobility and the use of spaces and services of interest for the elderly, thus representing an important element in the definition of strategies and policies aimed at improving urban accessibility. On the other hand; the municipality of Vomero and Arenella are both characterized by an older demographic structure, which percentage of the population over 60 is higher than any other municipality of Naples, equal to 34.3% (City of Naples, 2016). The ageing index, which is the synthetic indicator of the degree of population ageing (the ratio of the population aged 65 and over and the number of people younger than 15), is above 100. In particular, in 2010, this indicator amounted to 188.8% and the value rose up to 210.2% in 2016, with a growth of 21.4%, the latter percentage being higher than any other municipality of Naples (City of Naples, 2016).

The selected variables were parameterized and geolocated, in order to measure the main urban features seen as significant both in literature and in the urban planning tools to foster ageing friendly

environments/communities. This operation made use of quantitative data, compared to previous studies that used mostly qualitative ones (Gargiulo et al., 2018).

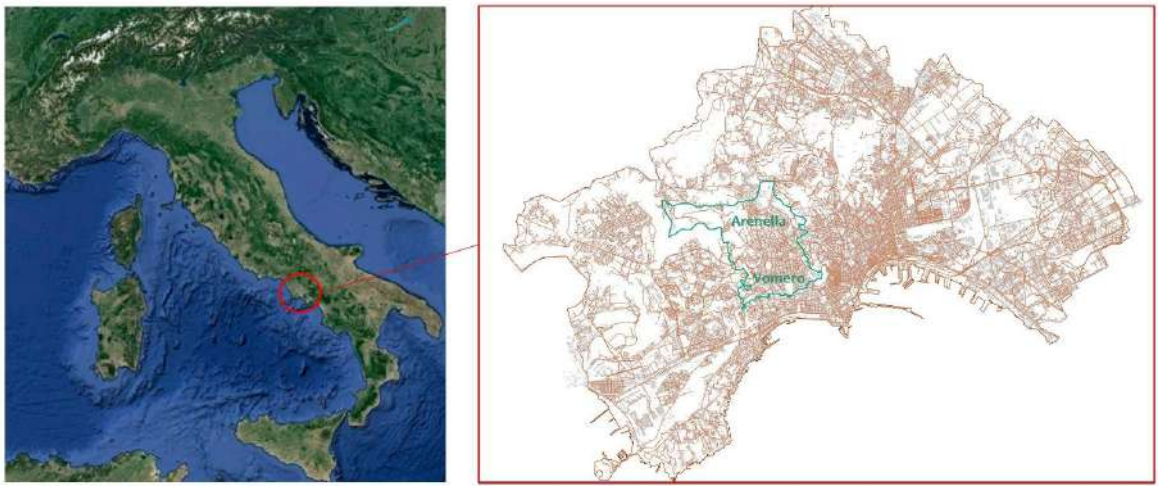
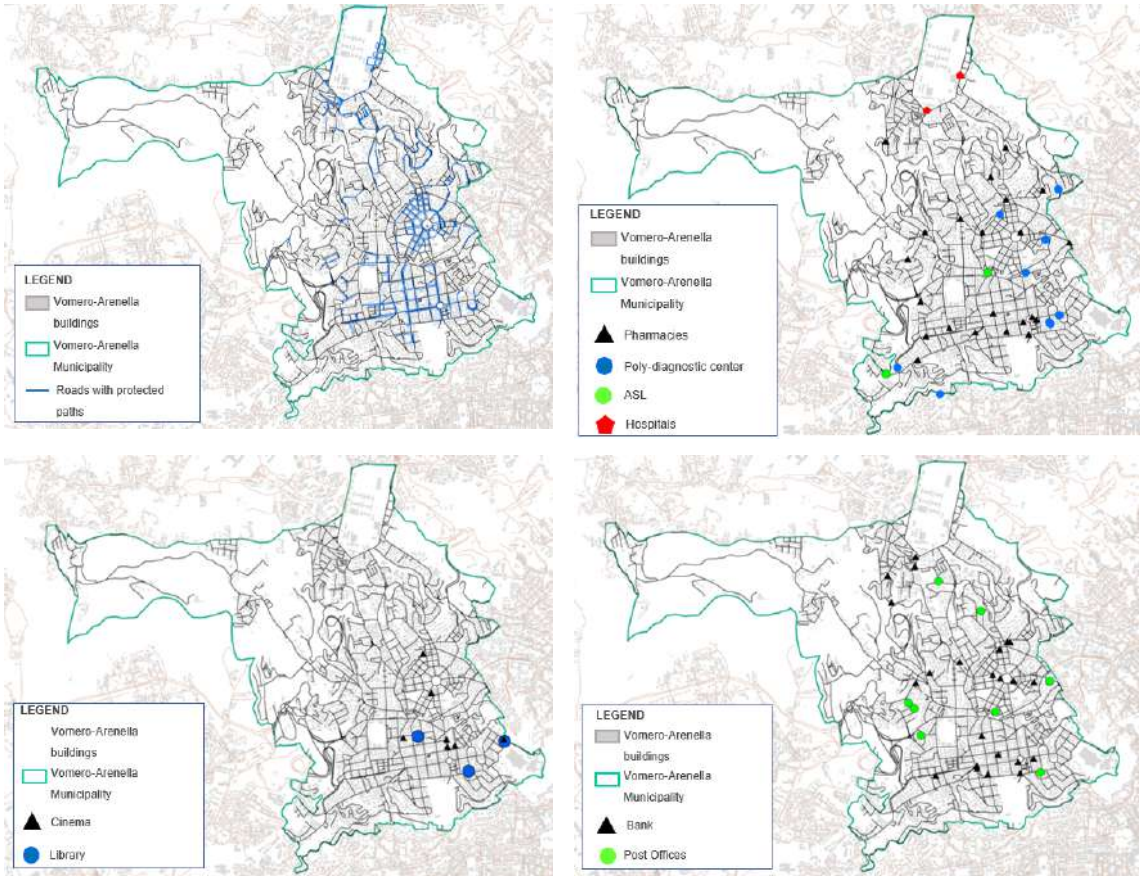


Fig. 1. The Municipality of Naples and the two districts studied

With the exception of the socio-economic subsystem - for which data are available only by consulting the databases of the National Institute of Statistics (ISTAT) - for the environmental, physical and functional subsystems quantitative data are obtained through spatial analysis in the GIS environment (Figure 2). Furthermore, all the data belong to the Open Data category, that are information collected in the form of databases by providing relevant opportunities to better design, interpret and manage the urban systems (Batty, 2012; Sui, 2014).



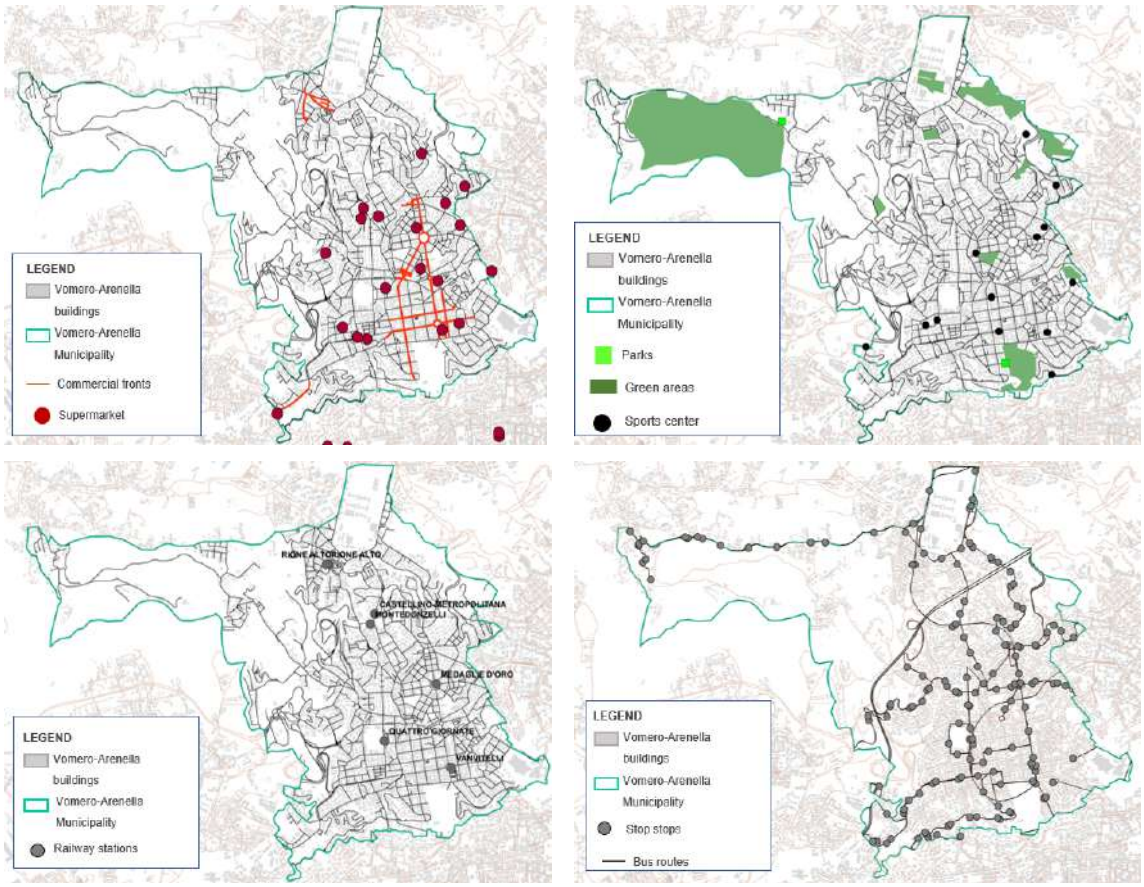


Fig. 2. Geolocalization of services of interest for the elderly and LPT supply

With regard to the physical subsystem, the variables related to the road and rail networks were geolocated by referring to the Open Data of the City of Naples, thus identifying 156 bus stops, 116 km of bus network, 6 railway stops and 1 railway line. The protected routes here are intended as the roads provided with wide sidewalks along which all the weak users can walk in safe conditions and without obstacles.

The geolocation phase of the variables of all 4 subsystems was followed by the definition of the local public transport (LPT) bus supply (Figure 2). The bus stops were classified on the basis of the service frequency of the lines which serve the study area, in order to consider the different mobility capital for the elderly.

The data of the LPT road lines were found by consulting the database of the Open Data of the City of Naples, with the respective departure and arrival times of the buses in the time slot 7:00 am - 2:00 pm. This time interval is supposedly the one in which most of the daily activities are carried out by the elderly; moreover, having a bus stop within easy walking distance favors their choice to use this mode of travel (e.g. Horgas et al., 1998; Morris et al., 2017).

The alphanumeric data collected were then associated with the related geometric elements in the GIS environment and the ones of interest were extrapolated through query operations. In particular, the following three frequency bands of the LPT bus service were determined: high frequency: < 15 minutes; medium frequency: 16-30 minutes; low frequency: > 30 minutes.

In the next step of the methodology, the service area (identifying the area where the users of that service actually reside) of each service has been defined according to the following elements: (i) the radius of influence derived from the scientific reference framework, that is the maximum pedestrian distance that a user is willing to walk to reach a specific service (Table 1), (ii) the slope of the road network determined by processing a Digital Elevation Model in the GIS environment, as this feature can contribute to reducing the distance that

elderly can walk; (iii) the walking speed that is an average value derived from the reference studies (e.g. Studenski et al., 2011; Weber, 2016) and equal to 0.7 m/s for the over 65 population.

The overlap of the "service areas" together with the concentration and distribution of each type of the services led to graduate the study area based on whether the physical and functional accessibility.

In fact, the systemization of the service areas of the LPT bus stops, classified according to the service frequency bands, and of the protected pedestrian paths led to define the following three classes of physical accessibility:

- high accessibility: when the service area of high frequency buses overlaps with the ones of the railway stations and protected routes are present in this overlay;
- medium accessibility: when the service area of medium frequency buses overlaps with the protected routes;
- low accessibility: when there are only medium/low frequency bus service areas.

An equivalent categorization led to the definition of the three classes of functional accessibility, according to the supply of each category of services considered:

- high accessibility: when at least two services are overlapped;
- medium accessibility: when there is only one service;
- low accessibility: when no service is present.

To achieve the second research objective, the research work was divided into three main phases.

In the first one, the "service areas" were deepened according to the maximum distances that the elderly can reach by walking (service distances), and to the different pedestrian speeds of the three main segments of the elderly population (65-69; 70-74; > 75) that have been identified according to studies such as Weber (2016). Thereby the functional component (services) is related to the behaviors related to each segment of the elderly population (Gargiulo et al., 2019). In the second one, the "service areas" have been redefined due to the presence of pedestrian paths with characteristics suitable for the elderly. In particular, the characteristics of pedestrian routes have been grouped into three main categories: physical characteristics, urban context characteristics and safety characteristics (Table 2).

ID	VARIABLE	MEASURE	SOURCE
	PHYSICAL CHARACTERISTICS		
1	Slope of the links of the road network	>5%=0 o <5%=1	GIS
2	Sidewalk width	<1,5 m=0 >1,5m=1	Google Maps
3	State of pavement of the sidewalk	0=poor good=1	Google Maps
	CHARACTERISTICS RELETED TO THE SENSE OF SECURITY		
4	Lighting density	<0,056=0 >0,056=1	GIS
5	Presence of escalators and elevators	No=0 Yes=1	Google Maps
6	Presence of parking areas	No=0 Yes =1	Google Maps
	URBAN CONTEXT CHARACTERISTICS		
7	Presence of green areas	No=0 Yes =1	Google Maps
8	Presence of panoramic points	No=0 Yes =1	Google Maps
9	No-main roads	No=0 Yes =1	Google Maps

Tab. 2. The three categories of characteristics used to define the optimal pedestrian network for elderly

In the third phase, we have identifies the areas that, due to the presence of useful services for the elderly, to the physical characteristics of the routes, and to the geomorphological characteristics, are compatible with lifestyles, needs and behavior of elderly people, according to their walking willingness. These areas, defined as FASZones, are, in other words, the urban partitions where the elderly are facilitated to reach the services of interest, based on their abilities (behavior) and the characteristics of usability and attractiveness of optimal pedestrian routes.

4 TESTING AND RESULTS

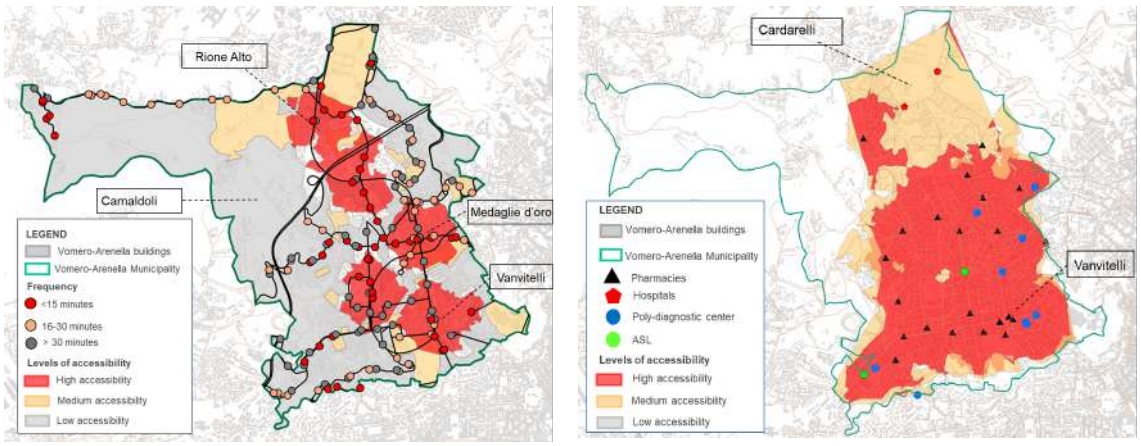
The description of the results is articulated according to the two main objectives of the work: identifying (i) the levels of urban accessibility and (ii) the Functional Accessibility Soft zones (FASzones).

With regard to the first goal, the overlay of the LPT supply and of the protected pedestrian paths (physical subsystem), on the one hand, the "service areas" and the concentration and distribution of each service of interest for the elderly (functional subsystem) on the other, led to classify the Fifth Municipality of Naples (Figure 3).

In Figure 3, it is possible to identify some macro-areas characterized by a high accessibility to LPT and protected path network in both the districts of the Fifth Municipality examined: the Arenella district, the eastern area of Camaldoli which includes the zone of Rione Alto and the contiguous areas, respectively, Domenico Fontana road and Medaglie d'Oro square, and the Vomero district, the area of Vanvitelli square and Francesco Gemito road. In all these zones, there are at least 5 high-frequency service bus stops and in particular the areas of Medaglie d'Oro and Vanvitelli squares facilitate elderly walkability thanks to the protected paths. This built environment convenience for walking is due to the urban fabric planned in the second half of the nineteenth century, with its regular road mesh and wide sidewalks.

The areas lying between Domenico Fontana and Bernardo Cavallino roads (Arenella district) and between Simone Martini and Francesco Cilea roads (Vomero district) is characterized by medium accessibility with a frequency of transport service between 16-30 minutes. In these two portions of the urban area, the improvement of the road LPT supply would allow for a more efficient connection with the nearby hospital, in the first case, and with a residential area (the one near Pigna road) located in the Vomero district, in the second case.

The remaining areas of the entire territory of the Fifth Municipality, which mostly concern the Camaldoli area near Rione Alto, the area located to the right of the hospital center and the southern area of Vomero bordering the Chiaia district, are neither served by bus frequency consistent with elderly needs, nor covered by protected paths.



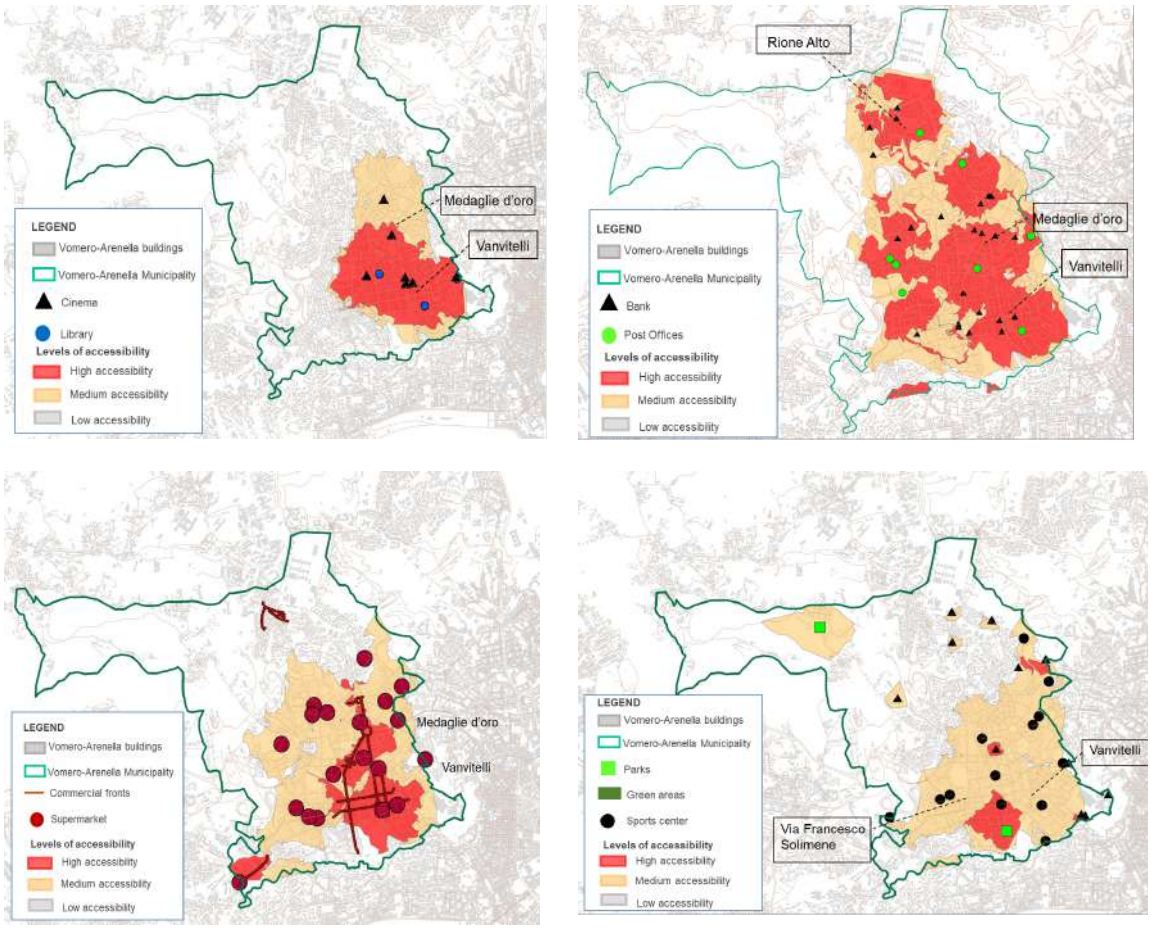


Fig. 3. Classification of the accessibility levels in Arenella and Vomero districts

With reference to the different types of services of interest for the elderly, the localization and distribution of health care services (hospitals, pharmacies, diagnostic centers and ASL) is homogeneous in those portions of urban fabric characterized by a unitary and planned design, as in the area close to the Pascale hospital center (Arenella district), the area bordering the Vomero district and almost all of the latter. Medium and low accessibility, instead, characterizes the service area of the contiguous area of the Cardarelli hospital center and the Camaldoli area.

Similar considerations apply also for financial services: their functional supply appears to satisfy the demand of most of the elderly who reside in the Fifth Municipality.

There results show that if the study area is generally characterized by a medium-high accessibility to the health and financial services, the accessibility is lacking in the commercial, cultural and recreational services. The service area of these three types of services is, in fact, almost exclusively concentrated in the area lying between Medaglie D'Oro and Vanvitelli squares, with the exception of the recreational facilities in the area between Aniello Falcone and Luca Giordano roads, where the urban park of Villa Floridiana is located. It is also worth noting that a medium accessibility also characterizes commercial and recreational services (urban park, green areas and sports facilities) in the Vomero district and in the area of the Arenella district lying between Pietro Castellino and Domenico Fontana roads, while the supply of commercial services (like supermarkets) is limited to the contiguous area between the two districts.

Taking an overall look at the six maps obtained, some "hotsposts" of physical and functional accessibility characterizing the study area seem to come up: the portion of consolidated urban fabric between Medaglie d'oro and Vanvitelli squares, and the more recent areas of Francesco Solimena road and Rione Alto. In order

to investigate the demand-supply ratio in these areas characterized by high accessibility, they were compared with the distribution of the elderly population density residing in the Fifth Municipality. In practical terms, we tried to investigate the main reasons why elderly chose these areas to live, according to urban accessibility levels. As this choice depends on numerous factors relating also the desired quality of life, the comparison of density population distribution (Figure 4) with urban accessibility maps (Figure 3) have been made by setting up demographical (population density distribution), settlement (different kinds of urban textures) and real estate value aspects, in order to provide an integrated interpretation of the overall structure, highlighting its characteristic relationships.

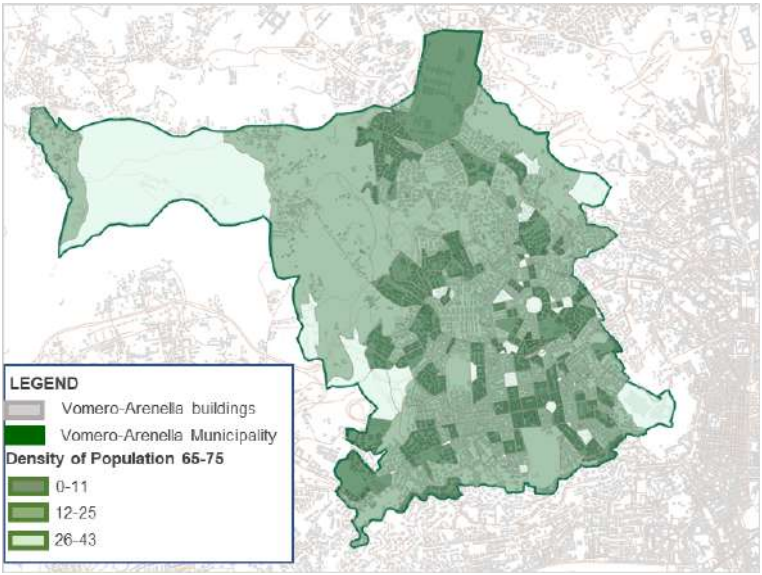


Fig. 4 Population density in Arenella and Vomero districts

The map shows that the highest population density values (about 25%) characterize the consolidated and planned portions of the urban fabric in both the Vomero and Arenella districts (Vanvitelli square, Medaglie d'Oro square, Scarlatti road). This concentration can be linked to aspects related to urban planning, as these areas are the result of an urban project aimed at improving urban quality also through the presence of services and functions compatible with residency. In fact, a diversified functional supply entails benefits in terms of accessibility (presence of several services accessible through footpaths) and also an increase in property values (as in the case of the two districts examined) because the more options there are for residents that share similar socio-economic characteristics, behaviours and lifestyles, the more they spend (Battarra et al., 2018a; Waldfogel, 2003).

The concentration of the elderly in the western part of the Arenella district (near Francesco Altamura road) can be attributed to the presence of gated communities (developed in the post-war period as unplanned building constructions) which would provide an increased sense of security and protection for this segment of the population to the detriment of low levels of accessibility both to local public transport and to cultural, recreational and commercial services.

Lastly, high density of the elderly population characterizes the area of Rione Alto, where the building process - started as a consequence of urban saturation of the "historical" areas of Vomero and Arenella - has led to a "non-uniform" improvement of the accessibility to road and railway public transport connected to the presence of the Cardarelli hospital center and also to good accessibility and financial services.

With regard to the second objective, by taking into account the results of the previous phase, the urban portions classified on the basis of physical and functional accessibility levels were compared with the FASZones. As defined in the previous sections, the FASZones have been identified within the "service areas" and are also

equipped with pedestrian paths suitable for the elderly. For this reason, the latter first ones are to be considered the areas of greatest accessibility within the "service areas", thus providing first suggestions to the public administration about the improvements to implement in the various areas. As an example, FASzones of one of the segments of the elderly population, the over 75, and for commercial and economic financial services are described.

By comparing Fig. 3 and Fig. 5, it can be seen that the "service areas" of the commercial services with high functional accessibility (in red, Fig. 3) are lack in pedestrian paths suitable for elderly. In fact, the optimal footpaths characterize only some parts of the surrounding areas of Vanvitelli square. The disparity between the functional and the physical components of urban accessibility characterizes also the economic-financial services for the area between Vanvitelli square and San Martino. From the comparison between Fig. 3 and Fig. 6, it is clear that, despite the fact that the services supply for the elderly is satisfactory, the pedestrian accessibility is lacking in a large part of the area.

Instead, for the areas of Camaldoli and Rione Alto, the comparison between Fig. 5 and Fig. 6 shows the overall significant lack of accessibility both in terms of services and pedestrian routes.

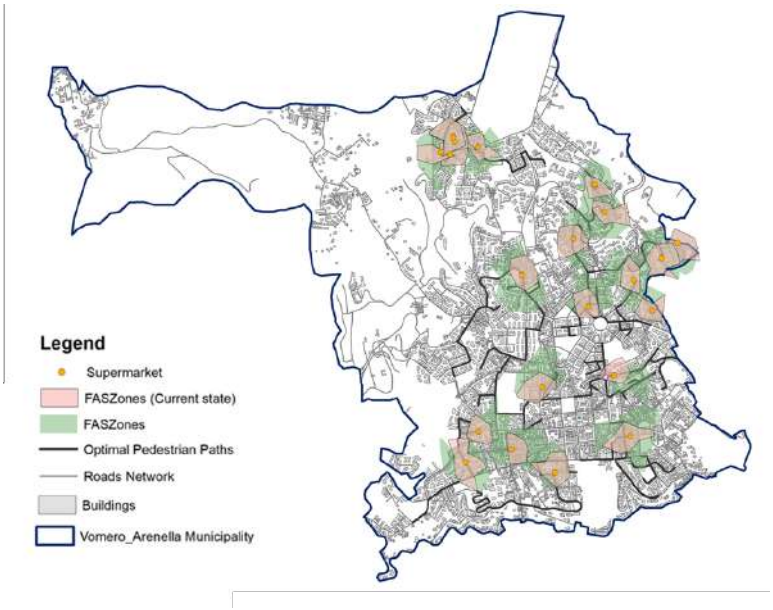


Fig. 5 FASZones of commercial services for over 75

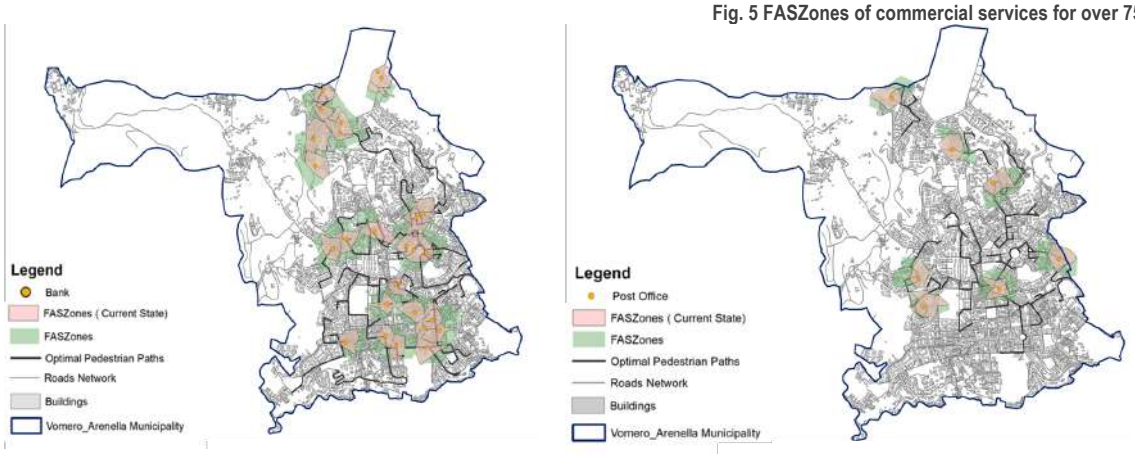


Fig. 6 FASZones of economic-financial services for over 75

5 CONCLUSIONS

This research work is a first result for the development of a decision support tool to improve urban accessibility to services of the elderly. The methodological results allowed to innovate the traditional urban planning "trade tools" by defining the "service areas" and the FASZones of services of interest for elderly. The FASzones relate the supply of main urban services to the behaviour of the older users through the suitable pedestrian network for them, according to the principles of Universal Design and the most recent theories on accessibility (Deboosere et al., 2018; Jansen et al., 2018).

The operating findings obtained show the urban portions with a supply-demand equilibrium, as well as those where it is necessary to intervene to fill this gap for elderly. For instance, the urban portions characterized by a high lack of accessibility to urban services require both areal and linear interventions, aimed respectively at increasing the supply services and improving the use of pedestrian network.

Therefore, integrated actions should be taken both on the functional and physical subsystems, in order to improve urban accessibility and guarantee social inclusion for the elderly by enabling them to actively participate in 'urban life' (Chun et al., 2018; Garin et al., 2014; Peacock-McLaughlin et al; 2018). According to Loo et al. (2017) and Wiles et al. (2009) the organization of urban spaces and services in the immediate surrounding areas near elderly's homes represent a significant element in "constituting their local activity space". In fact, a good connectivity and distribution among recreational services and 'necessary' services makes them more livable, also by promoting the sustainability of the related trips.

In this framework, if we systematize the physical and functional supply with the demand of the elderly, we can tackle the issue of urban accessibility with the systemic and performance-based approach that characterizes the governance of urban and territorial systems (Battarra et al., 2018b; Gargiulo et al., 2012).

The comparison between the urban accessibility obtained through the determination of the service areas in the GIS environment and the distribution of the elderly population density within the Fifth Municipality of the city of Naples, allows for identification of many ideas to be further investigated: (i) a more quantitative definition of accessibility levels by using indicators to be parameterized in the GIS environment; (ii) the definition of a set of punctual, linear and areal interventions to improve the distribution of urban places and services and the quality of pedestrian paths to get to them; (iii) a more detailed comparison between the real estates of the areas where the over 65 population density is high and the FASzones.

ACKNOWLEDGEMENTS

This work has been supported by Fondazione Cariplo (Grant n° 2017-0942). The authors acknowledge the financial support from the Fondazione Cariplo.

AUTHOR CONTRIBUTIONS

Although this paper should be considered a result of the common work of the authors, F. Gaglione took primary responsibility for the section 4, C. Gargiulo for the section 3, and. F. Zucaro for the sections 1, 2 and 5.

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IMAGE SOURCES

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Federica Gaglione is an engineer, Ph.D. in Civil Systems Engineering at University of Naples Federico II. Her research topic concerns the urban accessibility. The aim is to develop a decision support tool that, on an urban scale, allows to choose the most effective actions to improve urban accessibility for vulnerable users, by contributing to improve their quality of life.

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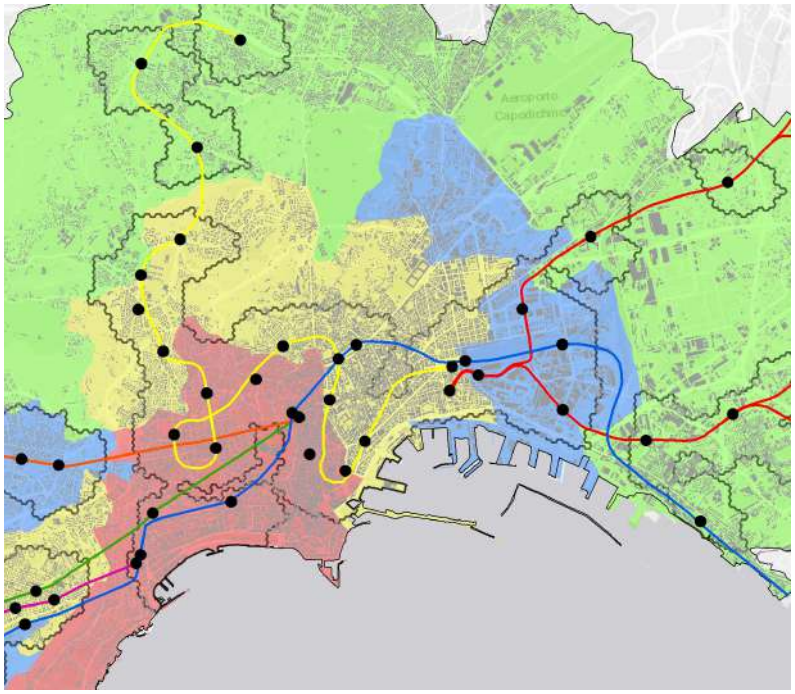
TeMA Journal of Land Use, Mobility and Environment

TeMA 3 (2019) 313-330
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6273

paper received 16th Septmeber 2019, accepted 19th December 2019

www.tema.unina.it

How to cite item in APA format:
Carpentieri, G., Guida, C. & Chorus, P. (2019). Land-Use and Transport integration polices and real estate values. *Tema. Journal of Land Use, Mobility and Environment*, *12* (3), 313-330. doi: http://dx.doi.org/10.6092/1970-9870/6273



LAND-USE AND TRANSPORT INTEGRATION POLICES AND REAL ESTATE VALUES

THE DEVELOPMENT OF A GIS METHODOLOGY AND THE APPLICATION TO NAPLES (ITALY)

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ABSTRACT

The interactions between the Transport and the Land-Use Systems are complex and not widely analysed, causing uncertainties in decision-making processes. New governance tools are needed to support territorial transformations oriented to more sustainable use of soil resources, the transition towards more environmentally friendly transport modes and to greater accessibility equity to transport services. Moreover, these tools have to consider the interactions of external phenomena on the urban system, such as economic crisis and political issues. In this perspective, the research aims at developing a GIS-based methodology able to assess the impacts of interventions on the railway network and nodes on the urban environments, in terms of real estate values, as a proxy of urban requalification. The methodology consists of an ex-post spatial analysis procedure, applied to the city of Naples (Italy), where local and regional planning strategies, during the last decades, have been oriented towards an integrated approach between Transport and Land-Use Systems. The results show that in some catchment areas and concerning some types of properties, the effects of the world economic crisis on the real estate had less effect in terms of fall in prices. Moreover, the results show that the methodology is useful to quantitatively assess ex-post the main impacts of actions aimed at the integration between the Transport and Land-Use Systems, but its application could be extended to support the implementation of these strategies in different territorial context, on the basis of well-known best practices and their economic impacts on urban environment.

KEYWORDS:
Catchment Areas; Real Estate; GIS

TeMA
有关土地使用、交通和环境的杂志

TeMA 3 (2019) 313-330
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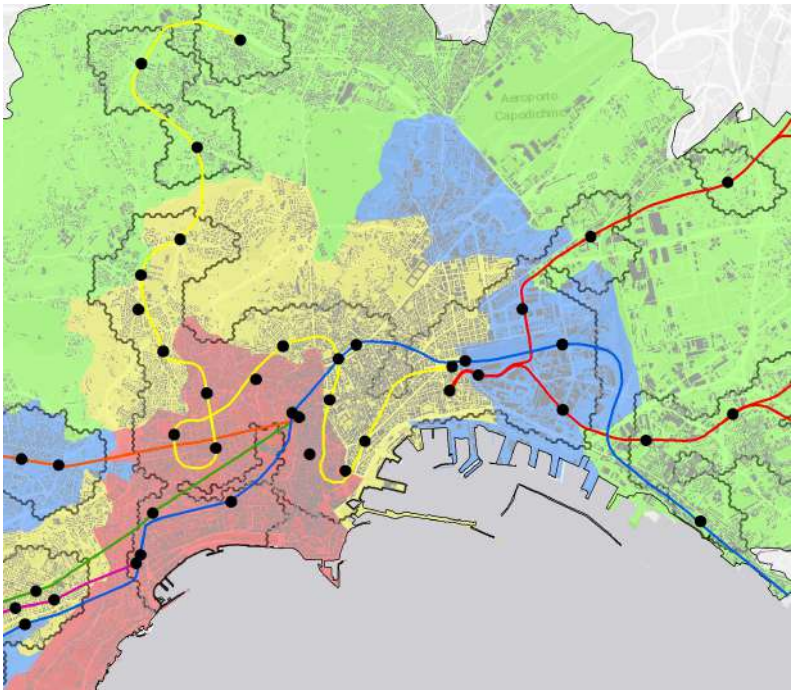

老年人生活质量与城市可达性：空间规划的方法建议

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摘要

人口逐渐老龄化是每个城市如今在满足相关的新承诺时必须应对的挑战。回应老年人的需求意味着要重新考虑城市空间的整治与规划，以确保老年人群对感兴趣的城市服务享有最佳的可达性和可用性。从这个角度来看，本文提供了一种根据 65 岁以上人口的流动性和城市服务水平对城市区域进行分类的方法。该方法学的目标代表了一项更广泛的研究工作的第一步，后者的目的在于确定策略、工具和行动，以便提高老年人在城市中获得服务和前往各种场所的机会。

关键词：
老年人；空间规划；市可达；城市可达性

1 INTRODUCTION

The research is part of the scientific panorama related to the Integration of Land-Use and Transport System in decision-making processes focused on the sustainability of urban areas. The relationships between spatial organization of urban systems and transport systems are complex and not widely analysed (Deboosere et al., 2018; E. Papa & Bertolini, 2015; van Wee, 2002; Wegener & Fürst, 2004). Considering the main influences between the two subsystems, many topics need further insights, such as the sustainable use of soil resource, the effects of the transition towards more environmentally friendly transport modes, the economic crisis and issues related to a greater accessibility equity to transport services (Beyazit, 2015; Coppola & Nuzzolo, 2011; Te Brömmelstroet & Bertolini, 2010).

Even though decision-makers are now aware of the imperative to implement polices able to integrate land-use and transport planning polices, in practice it is difficult to define roles and their individual contribution as well as their nonlinear interactions, considering urban planning, transport engineering, mobility planning, etc. In view of the above, it is clear how urgent the development of new approaches and tools is, in order to quantitatively analyse the interactions between mobility and land-use domains.

The aim of this study is to develop an ex-post spatial analysis procedure, GIS-based, able to quantify, in terms of real estate values, the impacts in station areas, at micro and macro level, that have been recorded as results of the redevelopment and opening of new urban railway lines and stations, as well as of the development of urban requalification and transformation actions. This result will provide decision-makers and technicians an appropriate knowledge of the evolutive dynamics, to facilitate the decision-processes about the choice of right localization for investments, according tor the interest of public authorities (improve the urban spaces and infrastructures) and to attract rivate investors. Moreover, a second objective is to apply the methodology to the Naples case study, in order to assess its effectiveness. The choice of this context has been prompted not only by its high urban and social complexity, but also by local and regional planning strategies (Piano delle 100 stazioni) which, during the last decades, have oriented their territorial polices towards an integrated approach between Transport and Land-Use (Cascetta et al., 2013; E. Papa, Carpentieri, & Angiello, 2018; E. Papa & Pagliara, 2006).

After this introduction, the rest of the paper is organised as follows. Section 2 outlines evidence from scientific literature of the land-use and economic impacts of urban rail investments. Section 3 describes Naples as a study case, with a focus on the GIS-based methodology that was implemented. Section 4 summarises the findings and highlights some further perspectives.

2 THE LITERATURE REVIEW

During the last decades, the growth of the number of people within urban areas resulted in an increased demand of new adapted spaces. In order to satisfy this increasing settlement request, areas characterized by a low residential density, marked mono-functionality and lack of services and infrastructures have been urbanized (Brueckner, 2000). The spread of this settlement has been promoted also by the wider use of private transport modes, that allowed a greater individual mobility freedom, causing several negative impacts on community and environment (Johnson, 2001; R. Papa & Mazzeo, 2014).

Demographic, economic and location dynamics have influenced the evolution of physical and morphological structures of urban areas, with negative impacts also for actors dwelling in this kind of contexts: (i) the unsustainable use of soil and of other unrenewable resources, the input of huge quantities of pollutants which generated negative consequences, locally and globally (Travisi et al., 2010); (ii) social exclusion phenomena linked to the lack of accessibility to services and opportunities, especially for more disadvantaged walks of life (Lucas, 2012).

In order to reduce these negative effects, decision-makers, researchers and technicians are working to guide future choices related to the urban and regional framework towards new solutions, capable to ensure a greater economic, social and environmental sustainability through practices which promote the integration of land use and transport. As highlighted by the scientific literature, practices focused on an integrated development appear to be key elements to guarantee a greater equity and sustainability to urban development actions (Duncan, 2010b; E. Papa & Pagliara, 2006; Ratner & Goetz, 2013). Examples of these actions are the realization of new urban transit lines and the physical and functional upgrading of existing ones, the improvement of accessibility levels and quality of the architectural environment and the implementation of measures to optimize the use of soil (Bonotti et al., 2015; Coppola & Nuzzolo, 2011; E. Papa & Coppola, 2012). The quantitative evaluation of socio-economic impacts related to the opening or improvement of the land-use and transport integrated projects was studied by several multidisciplinary researches (Dubé et al., 2011). These studies proposed different techniques, methods and tools to evaluate the direct and indirect impacts. Great interest was focused on the evaluation of impacts surrounding the transit and land-use integrated projects considering the different territorial contexts (urban, peri-urban, rural), the temporal evaluation time (ex-post and ex-ante) and typology of transport infrastructures (rail, metro, tram and bus).
In particular, the evaluation of economic impacts in terms of variation in real estate values was considered a fundamental issue to support the planning decision of the policymakers and investors. This issue has been deeply debated in the scientific panorama and numerous case studies were analysed, which confirmed theoretically and quantitatively these statements (Duncan, 2010a; E. Papa & Pagliara, 2006; Ryan, 1999). The main approaches are based on the assumption that saving money and time for movements influences the locational behaviour of landlords, investors, firms, and house-holds (Paul & Luca, 2011). From the quantitative point of view, it has been proved that there is a direct dependency between proximity to transport nodes and the increase of real estate values (Cervero & Kang, 2011). The preliminary research that started to study the relationships between accessibility and variation in real estate values are based on the studies developed by Alonso (1964); Mills (1972); Muth (1969). In order to define the extension of catchment area where we can evaluate the changes of real estate values related to the improvement of accessibility at a micro-scale, we did not use the simple measure of Euclidian distance from the node of transport that changes with the type of transport infrastructures (Gutiérrez & García-Palomares, 2008; E. Papa, Carpentieri, & Guida, 2018). For this study, we considered that the walking distance on the road is a more correct measure to define the catchment area extenction, as it is more in line with reality. According to with the indications of 100 Station Plan, we took into consideration a maximum walking distance covered in eight and half minutes.

3 METHODS AND APPLICATION

The aim of the research is to develop a GIS-based methodology that allows to quantify temporal and spatial variations due to the policy impacts within railway station (urban and metropolitan lines) catchment areas, in urban contexts.. In order to quantify the resulting impacts of integrated Land-Use and Transport strategies, in terms of real-estate values, accurate data sources were needed. Two important criteria were considered in order to ensure the replication and the accuracy of the methodology application. In particular, open access data sources were selected so that public administrations, technicians and scholars, interested in analysing these phenomena, can easily apply the methodology. This is an important point to the dissemination of the GIS-based methodology to other academic and practical contexts. Another considered criterion concerning data choice is the scale of detail: the methodology is based on a micro-scale that requires a data aggregation for small territorial units.
According to the above criteria and the scientific literature, four different indicators were selected with respect to real estate values. The selected indicators, also used in other studies, allow to carefully evaluate how

immovable property values changed in time and space, within station catchment areas, as consequences of integrated interventions (Duncan, 2010a; Pagliara & Papa, 2011; E. Papa & Bertolini, 2015; Singh et al., 2014; Soria-Lara et al., 2015). In this study four property categories were identified to assess changes in real estate values (Residential, Tertiary, Commercial and Manufacturing). Typically, in these types of analysis the alphanumeric and spatial data are selected from different sources and characterized by a different spatial aggregation scale. In order to solve these problems a hexagonal spatial unit was introduced whichallows to compare time series data (Carpentieri & Favo, 2017). The regular hexagonal shape has a 50 m side and 6,495 mq surface. The use of a regular grid is a very common technical and scientific solution in spatial phenomena studies (Yigitcanlar & Dur, 2010), since it helps comparing data computed and recorded for different spatial units and in different temporal moments. The use of the regular grid has allowed to compute variations in real estate rates linked to different territorial boundaries identified by Inland Revenue (Agenzia delle Entrate). The Inland Revenue is a national non-economic public agency that operates to collectg tax revenues, inspections aimed at avoiding tax evasion, provides cadastral and geo-cartographic services. The data used to compute the variation in real estate values for each hexagonal cell is provided in euros per square meter and they are the output of a methodology developed by the Italian Inland Revenue and they are shared on the Agency website every six months. Within the municipal territory, uniform territorial zones are identified (OMI zones), and for each of them and for each property category, changes in market and rental values are assessed.

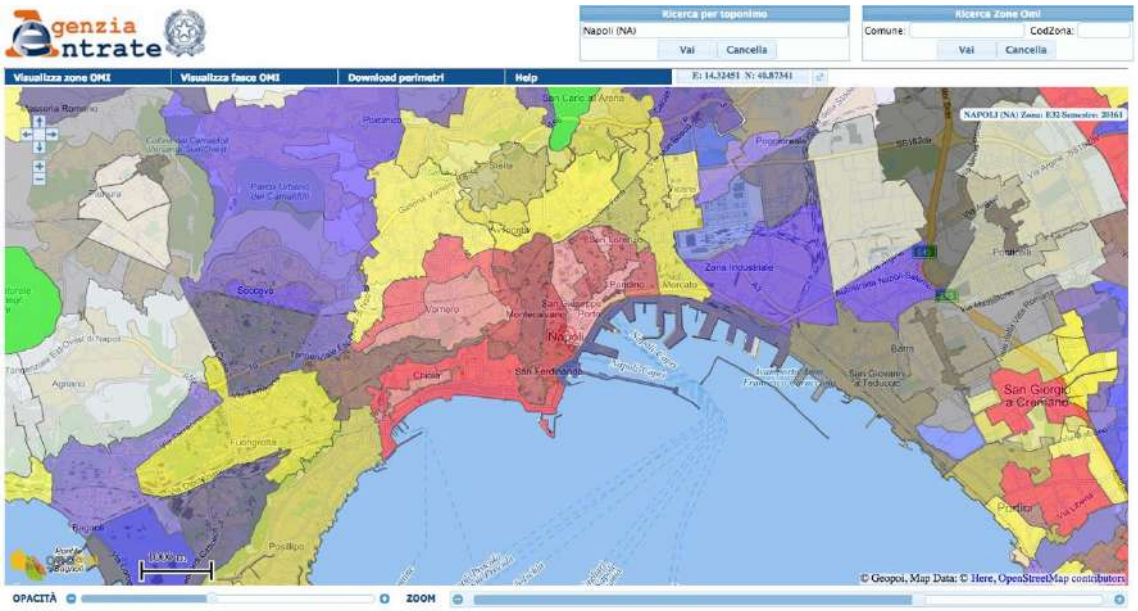

Fig. 1: Inland Revenue website page

Data provided by the Inland Revenue allowed to compute indicators for real estate values exclusively for the 2001-2011-time frame. However, in order to improve the analysis' accuracy, two other temporal moments were added i.e. 2004 and 2008. The introduction of these two additional moments permitted to better evaluate and interpret the impacts of the international economic crisis (2008), that has inevitably had an impact on real estate.

3.1 THE CASE STUDY OF NAPLES

The city of Naples was selected to apply and verify the reliability of the proposed methodology, in order to measure the real estate value impacts due to the implementation of polices aimed at integrating the Land-Use and the Transport Systems. Naples represents a significant case study to verify the GIS-based methodology's robustness, with almost 1 million inhabitants, population density of 8.273 inhab/kmq and about 500.000 of workers (ISTAT 2011). Naples is not a structured city: 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 (Punziano & Terracciano, 2017). Its characteristics, its shape and its history and its complexity and the clear coexistence of a variety of typical situations of degraded urban contexts, the city is a privileged laboratory in the study of urban development (Russo, 2012). The role of infrastructure is essential to manage these issues. Transport in particular, although requiring a system-wide and not a few investments, is a good basis for restarts (Gargiulo, 2008).

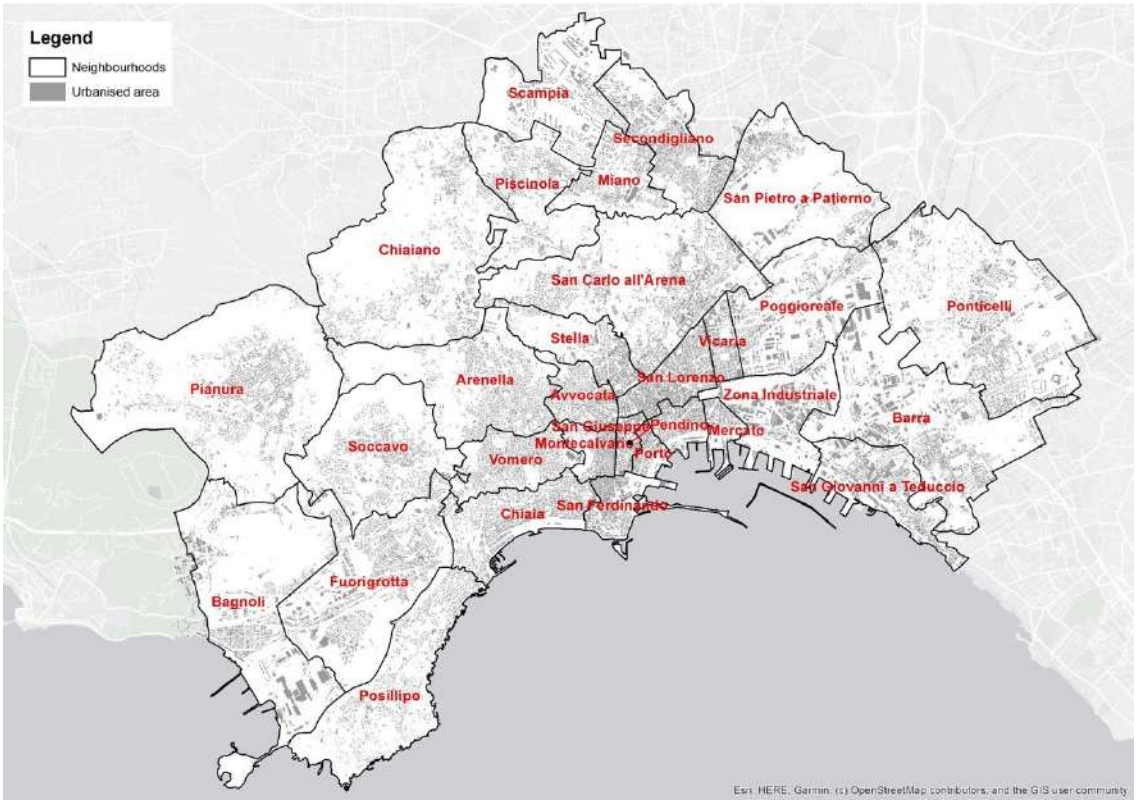

Fig. 2: The Municipal Territory of Naples, with the delimitation of each neighbourhood

A further element that influenced the choice of this case study is the knowledge of the socio-economic and settlement dynamics of the last decades (Fistola & Papa, 1998; R. Papa, 2010). This has proven extremely helpful in verifying the output of the application of the methodology. According to what is stated above, Naples is considered a good example for the implementation of integrated development polices, as demonstrated by the construction of new railway infrastructure (metro) accompanied by urban renewal interventions. The new offer of public transport services has prompted the regeneration of areas nearby transport nodes. The first programmatic document, developed by the city Municipality, was signed in 1994, and it explains the main reasons for orienting policy choices towards the integration between the Land-use and the Transport Systems. Following these general indications, in later years, the municipal administration developed further tools for the city government, such as the Municipal Transport Plan (1997), the Primary Road Network Plan (2000), the Railway Stations Plan (2003) and the Variant to the Municipal Master Plan (2004). At the same time, administrative authorities of Campania Region and Naples Metropolitan Area drafted and approved several legislative and programmatic documents, such as the Regional Law for the Mobility System Reform (2002) and the proposal of Provincial Territorial Coordination Plan (2007), that further favoured the implementation of Transport and Land-Use integration strategies. The *trait-d-union* of these documents was the will to link the transformations of urban fabric to the construction of new railway infrastructures. . One of the emerging and innovative elements is the role of the public transport network which has to promote the upgrading of urban and rural areas (Cascetta & Pagliara, 2008). The whole Naples Metropolitan area has attracted large

investments concerning the building of new railway lines and modal interchange stations, thanks to this new integrated approach. This has led to an increase in urban accessibility levels, notably within stations catchment areas, promoting transformation processes that concerned large parts of the city. In the Norme di Attuazione (Implementing Rules), the new City Master Plan identifies a specific urban framework (Ambito n. 30) that includes stations as interchange nodes. These rules govern the possibility of interventions in order to allow "the greatest accessibility to the areas served , building renewal, traffic conditions and the introduction of new functions and activities that could be the engine for new commercial activities, aimed at the exploitation of interconnection places" (Comune di Napoli, 2004).

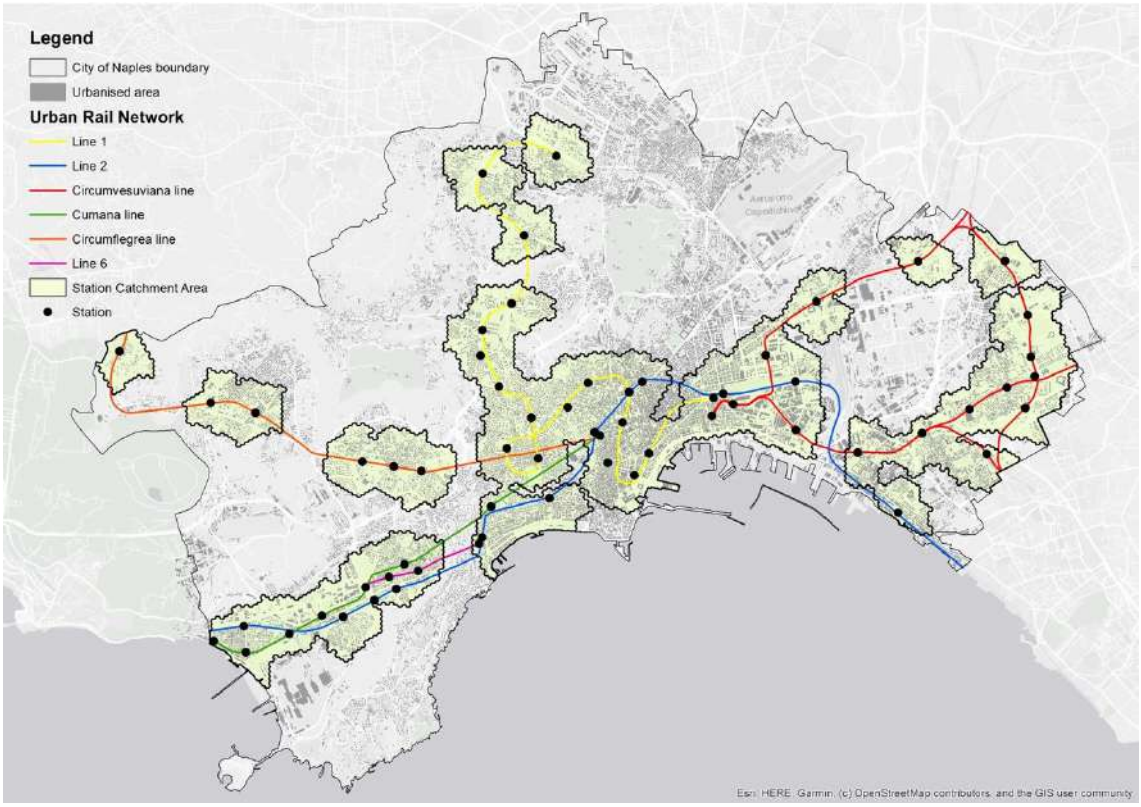

Fig. 3: Urban railway lines and stations in the city of Naples

RAILWAY LINE	NUMBER OF STATIONS	POPULATION	WORKERS	LOCAL UNITS
Line 1	18	464,594	251,487	55,823
Line 2	10	180,509	72,717	18,417
Circumvesuviana	16	162,676	71,614	13,673
Cumana	8	126,491	39,289	10,666
Circumflegrea	7	107,084	21,476	7,087
Line 6	4	70,477	24,889	7,298
Network	62	1,111,833	481,471	112,965

Tab. 1 Data referring to railway infrastructure and socio-economic characteristics, for each railway station catchment area within Naples. The data was computed from ISTAT census 2011

The main indications of the City Master Plan have been further worked out in the 100 Stations Plan, which identifies for each station its role in promoting urban redevelopment (Napoli, 2003). The principal innovation of this plan is that the renewal of urban environment is led by interventions in the railway transport network, concerning both the level of service and its building stock. The plan is focused on some significant aspects, such as the architectural and functional quality of railway stations buildings and nearby areas, that makes

these places more accessible and capable of taking new activities in. Moreover, the plan considers that not every station has the same accessibility level and that there are many contributing aspects making them distinctive from each other, such as the topography of the city, their location, the presence of infrastructure barriers, the distance to residences and, more in general, to places of interest from transport nodes (E. Papa & Trifiletti, 2010). These features mostly characterize those stations located in remote areas (architectures from 1950 and 1960, illegal (unauthorised) buildings from 1980 and 1990 or social housing), since they are distant from residences and urban facilities, and not easily accessible from the principal road network (ANCE, 2004). A key-element is the pedestrian accessibility, that is computed as the average time of access to stations, equal to eight and half minutes (Napoli, 2003). The plan describes catchment areas around railway stations and identifies several potential interventions, such as:

- Interventions on existing station buildings, in order to provide new entrances and to serve densely populated areas that suffer a steep topography, infrastructure barriers, a poor building refurbishment and renewal that should make existing constructions adequate to the mandatory removal of architectural barriers and fire safety;
- Interventions on traffic conditions around stations, through the reduction of crossings on high volume roads, the renewal of the pedestrian environment, the construction of new roads to reduce distances towards station entries;
- Third-party interventions, promoted by landlords and/or the managers of activities of public interest located in stations catchment areas, which aim at removing existing barriers to access points to the public transit network;
- Interventions to increase intramodality, through the realization of interchange parking, bus terminals for urban, rural and tourist routes.

The integrated and planned actions concern the whole municipal territory, which was divided in urban sections, as proposed by the Inland Revenue (Agenzia delle Entrate), in order to better analyse the impacts produced during last years. This territorial division was introduced by the Inland Revenue as part of studies concerning real estate values, through the detection of different areas, on the basis of their geographical location within municipal boundaries, their urban structure and the prevalent type of building (Central, Semi central, Inner Urban and Suburban zones). Figure 3(?) and table 2 show the data analysed for each urban section: the population was computed as the total number of served users, computed as the sum of the population for each cell within each station catchment area. Therefore, it is worth noting when analysing central areas there is an overlap of stations catchment areas, which are part of different railway lines. In other words, the residential population of a cell is counted twice if the cell is situated in more than one station catchment area.

URBAN ZONE	POPULATION	JOBS	WORKING UNITS
Central	204,038	84,800	26,604
Semi Central	272,387	115,458	24,186
Inner Urban	120,865	53,244	8,911
Suburban	359,570	61,488	12,444
City of Naples	956,919	314,995	72,145

Tab. 2 Data refers to 2011, for each urban section (Data processing from ISTAT 2011)

In order to verify the existence of different users' behaviours deriving from integrated actions, this study compares each indicator computed for a station catchment area with a similar type of areas outside the station catchment area.

The following paragraphs show the main results concerning indicators computed in four different temporal moments (2001, 2004, 2008, 2011), for residential, commercial, tertiary and manufacturing properties located in Naples. The first and last year correspond with the dates of the last Italian national census surveys. The

other two years are selected as intermediate time points but considering that in 2008 the global crisis of real estate started.

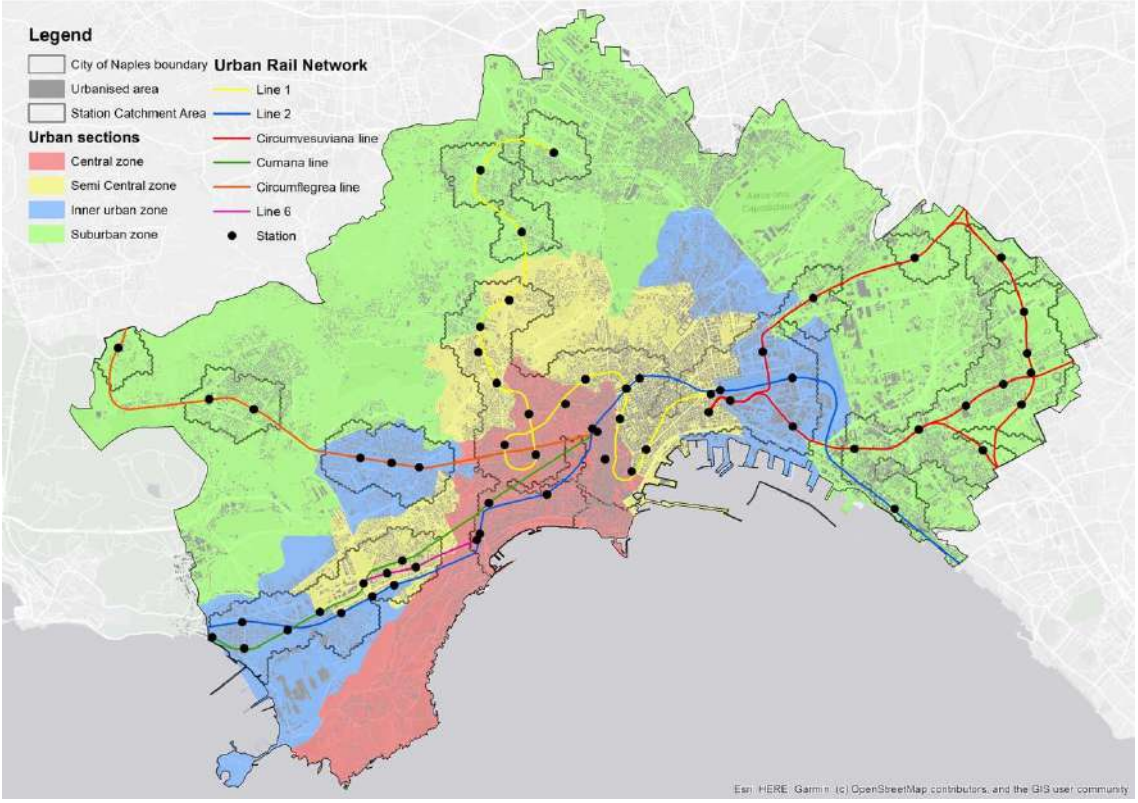

Fig. 4: Municipal division according to four urban sections identifies by the Inland Revenue

4 RESULTS AND ANALYSIS

In the following paragraphs, we present and discuss the results obtained through the application of the developed GIS-based methodology at the city of Naples for the four different category properties (Residential, Tertiary, Commercial and Manufacturing).

4.1 RESIDENTIAL PROPERTIES

This subparagraph shows the main results of the methodology applied for residential properties in Naples, with the support of tables and graphs that highlight the variation in prices of real estate, between 2001 and 2011. Analysing the values shown in Fig. 5 and Fig. 6, the trend of real estate values for each railway line is very similar to the trends recorded for the whole city. The only exceptions is the Circumvesuviana that had an upward between 2001 and 2011. Moreover, it is worth noting that values for residential properties located nearby line 1 stations recorded a greater decrease between 2008 and 2011, compared to other lines. This phenomenon is probably due to a poorer resilience to the 2008 economic crisis for these city areas. The Fig.6 shows the values for the Circumflegrea stations, and those located in General urban (Piave, Traiano and Soccavo) and Sub-urban (La Trencia, Pianura and Pisani) zones have the better performances compared to Montesanto station, which is in the central zone, according to Inland revenue classification. Tab. 3 shows that between 2008 and 2011 the only line that recorded an increase of real estate variation on prices is Circumvesuviana. For what concerns data related to the whole analysis period (2001 – 2011), it was observed that Circumflegrea shows in the residential real estate values, nineteen percentage points over the city mean. From the period 2008 to 2011 the general impact of the world economic crisis is evident, and it is related to the real estate market, whose consequences influences also this territorial context.

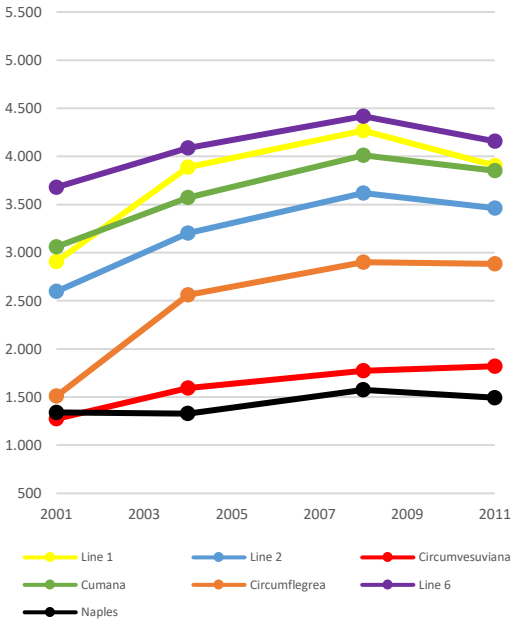

Fig. 5: Variation in Euro of residential average property values in the catchment areas for urban railway lines in the city of Naples.

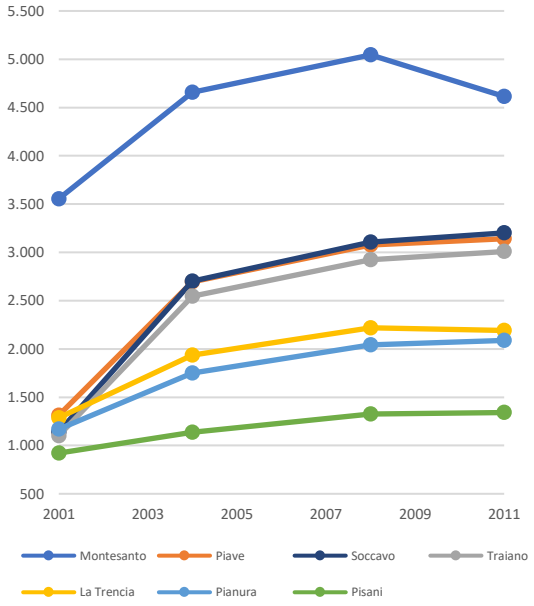

Fig. 6: Variation in Euro of residential average property values in the catchment areas for the Circumflegrea stations.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
LINE	2001	2004	2008	2011	2001-2004	2005-2008	2008-2011	2001-2011
Line 1	2,908	3,888	4,268	3,904	25%	9%	-9%	26%
Line 2	2,597	3,204	3,619	3,461	19%	11%	-5%	25%
Circumvesuviana	1,274	1,595	1,772	1,820	20%	10%	3%	30%
Cumana	3,061	3,573	4,011	3,851	14%	11%	-4%	21%
Circumflegrea	1,509	2,562	2,901	2,883	41%	12%	-1%	48%
Line 6	3,680	4,086	4,417	4,158	10%	7%	-6%	11%
City of Naples	1,768	2,299	2,563	2,473	23%	10%	-4%	29%

Tab. 3 Comparison between real estate variations in prices for each railway line, within Naples Municipalit

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
STATION	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Botteghelle	1,087	1,489	1,687	1,733	27%	12%	3%	37%
Madonnelle	987	1,352	1,532	1,574	27%	12%	3%	37%
Argine Palasport	750	1,025	1,160	1,193	27%	12%	3%	37%
Villa Visconti	927	1,179	1,343	1,447	21%	12%	7%	36%
Vesuvio De Meis	1,082	1,331	1,520	1,672	19%	12%	9%	35%
Bartolo Longo	1,043	1,313	1,497	1,623	21%	12%	8%	36%
Officine Ponticelli	1,118	1,508	1,710	1,775	26%	12%	4%	37%
Ponticelli	1,221	1,558	1,769	1,898	22%	12%	7%	36%
Ponticelli Neighbourhood	972	1,276	1,448	1,527	24%	12%	5%	36%
Suburban zone	949	1,201	1,376	1,436	21%	13%	4%	34%

Tab. 4 Comparison between real estate variations in price, for residential properties, for some Circumflegrea stations in Ponticelli neighbourhood

More, the best performances in terms of percentage change have been seen for railway stations located in the Ponticelli neighbourhood (Tab. 4): data show that some stations had nearly double increases of real estate

values compared to others in the same neighbourhood or urban zone, within their catchment areas. These results could be explained as a consequence of an increased number of heterogeneous activities within the neighbourhood (functional mix) and of workers. Based on ISTAT census data from 2001 and 2011, population and workers density were computed for each station catchment zone and both of them respectively average increase of almost 10% and 5%, during the analysis period (2001 – 2011). These positive variations of the real estate values depend to great extent of the investments to improve the urban accessibility and by localization of some new urban important services by public authorities (e.g. Del Mare Hospital, Sports and Instruction structures). Unresolved remains the effective participation of private investors should be encouraged in this neighbourhood.

4.2 COMMERCIAL PROPERTIES

This subparagraph refers to the changes in real estate values in prices, between 2001 and 2011, for commercial properties in Naples. As is shown by the graphs and tables, it is possible to note a common decreasing trend between 2004 and 2011, for each line and for the whole city. This trend is also found when analysing the three stations of line 1 presented in Fig. 8. The last period of analysis (2008 – 2011) presented a lower reduction in percentual variations of real estate values compared to the urban centre zone. Moreover, the same stations recorded for the whole period 2001 – 2011 a successful increase of real estate values, greater than other stations of Line 1.

Looking at Tab. 5 in more detail, a 21% decrease of commercial property values may be observed for line 2, while Circumvesuviana and Cumana lines recorded a minor reduction during the observation interval. The only railway line that shows a positive change in real estate values for this property category is line 6. This positive result is influenced exclusively to the catchment area of Mergellina station that in these years becomes a place very attractive for commercial activities.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
LINE	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Line 1	1,663	1,557	1,550	1,444	-7%	0%	-7%	-15%
Line 2	3,983	4,580	3,967	3,304	13%	-15%	-20%	-21%
Circumvesuviana	2,902	3,583	3,259	2,868	19%	-10%	-14%	-1%
Cumana	1,582	1,665	1,693	1,561	5%	2%	-8%	-1%
Circumflegrea	3,467	3,901	3,466	3,073	11%	-13%	-13%	-13%
Line 6	2,105	2,753	2,565	2,394	24%	-7%	-7%	12%
City of Naples	2,240	2,396	2,240	2,006	7%	-7%	-12%	-12%

Tab. 5 Comparison between commercial properties values within observation interval

The values reported in Tab. 6 shows that the commercial real estate values are negative within the line 2 station catchment areas, except for Gianturco, Piazza Amedeo and Mergellina. The results of Piazza Amedeo and Mergellina are significant since they are diametrically opposed to the performance of the urban zone where they are both located (Semi Central zone) but confirm (as the results of Line 6) that these two specific catchment areas are particularly targeted for the commercial sector.

They are characterized by a strong and high-level residential vocation and the reason for their performance in terms of commercial properties could be found in the increased number of local units, especially of luxury retail trade. For what concerns Gianturco, during the last decades, it attracted large investments to localization some large wholesale shops, since it is at the east edge of the city in the proximity of the port and highway exits. This may explain the increase of commercial properties' values around Gianturco railway station.

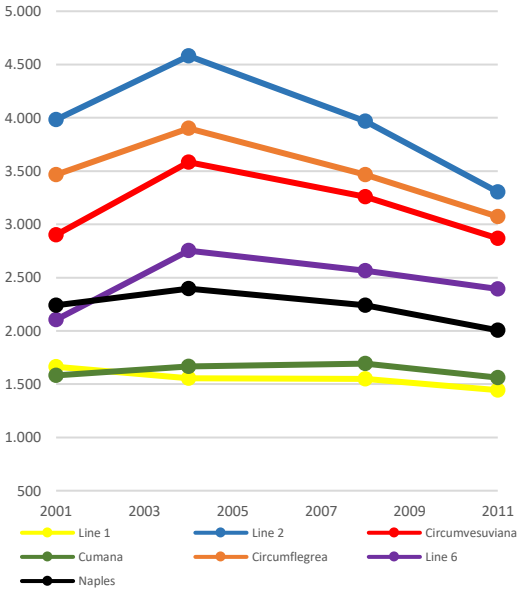

Fig. 7: Variation in Euro of commercial average property values in the catchment areas for urban railway lines in the city of Naples.

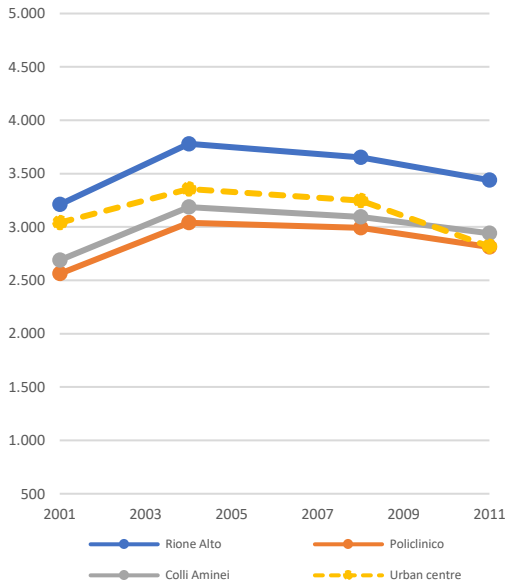

Fig. 8: Variation of commercial average property values in the catchment areas of Line 1 stations in Urban centre zone.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
STATIONS	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Napoli San Giovanni Barra	1,551	1,734	1,697	1,564	11%	-2%	-9%	1%
Gianturco	1,408	1,452	1,738	1,708	3%	16%	-2%	18%
Piazza Garibaldi +	2,673	2,522	2,694	2,430	-6%	6%	-11%	-10%
Piazza Cavour +	2,898	3,298	3,123	2,569	12%	-6%	-22%	-13%
Central zone	3,040	3,356	3,247	2,816	9%	-3%	-15%	-8%
Montesanto FS +	4,185	5,190	4,538	3,856	19%	-14%	-18%	-9%
Piazza Amedeo +	2,959	6,987	5,556	4,618	58%	-26%	-20%	36%
Napoli Mergellina +	4,169	6,613	5,576	4,693	37%	-19%	-19%	11%
Semi Central zone	5,308	5,430	4,611	3,924	2%	-18%	-17%	-35%
Piazza Leopardi	3,234	3,710	3,319	3,037	13%	-12%	-9%	-6%
Napoli Campi Flegrei +	3,230	3,600	3,229	2,998	10%	-11%	-8%	-8%
Urban Center zone	3,040	3,356	3,247	2,816	9%	-3%	-15%	-8%
Cavalleggeri Aosta	2,609	3,100	2,762	2,463	16%	-12%	-12%	-6%
Bagnoli-Agnano Terme	3,728	2,817	2,699	2,483	-32%	-4%	-9%	-50%
Inner Urban Zone	1,726	1,838	1,806	1,708	6%	-2%	-6%	-1%

Note: + Interchange Stations.

Tab. 6 Comparison between commercial properties values for some line 2 stations

4.3 TERTIARY PROPERTIES

This subparagraph is dedicated to the changes in real estate values, between 2001 and 2011, for tertiary real estate in Naples, properties used to service activities for businesses and people, such as professional offices and to private facilities such as clinics, schools and training centres (D.Lgs. 1150/1942 – Legge Urbanistica). Tab. 7 shows the results of the methodology highlighting a significant increase in prices of tertiary properties between 2001 and 2011, but, focusing on 2008-2011 period, the economic crisis had impacts on this category for nearly every line and within the whole city with a significant decrease. However, Circumvesuviana and Circumflegrea recorded a better presentation than the other lines because these peripheral areas became

more attractive for the tertiary activities considering the low real estate value compared to the central areas and the improvement of urban accessibility.

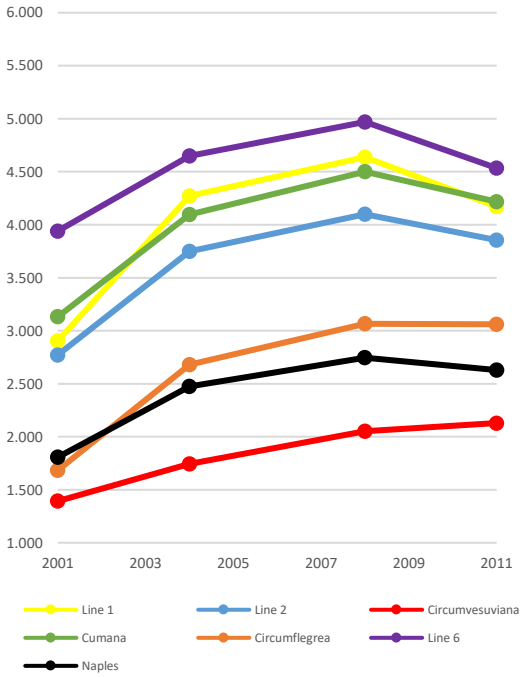

Fig. 9: Variation in Euro of tertiary average property values in the catchment areas for urban railway lines in the city of Naples.

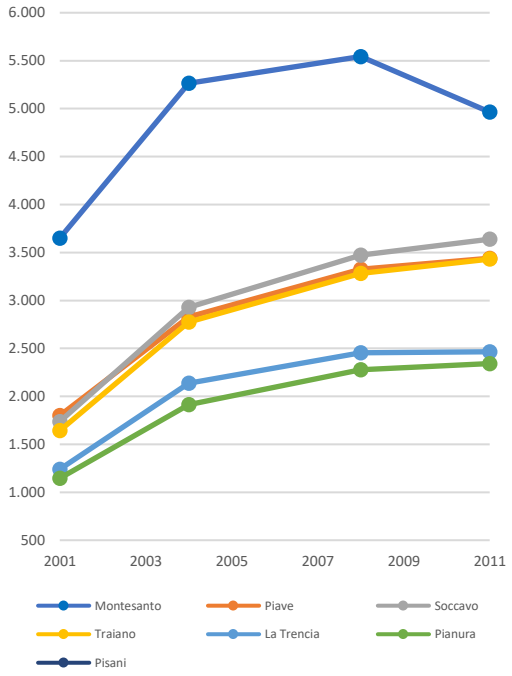

Fig. 10: Variation in Euro of tertiary average property values in the catchment areas of Circumflegrea line.

Tab. 7 shows in more detail the results of the methodology and it is worth noting that line 1 and line 6 recorded the greatest reduction in prices between 2008 and 2011. As stated above, Circumvesuviana is the only line whose stations catchment area have seen an increase between 2008 and 2011.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
LINE	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Line 1	2,905	4,272	4,637	4,171	32%	8%	-11%	30%
Line 2	2,772	3,749	4,099	3,856	26%	9%	-6%	28%
Circumvesuviana	1,393	1,745	2,051	2,129	20%	15%	4%	35%
Cumana	3,132	4,097	4,500	4,217	24%	9%	-7%	26%
Circumflegrea	1,684	2,682	3,066	3,062	37%	13%	0%	45%
Line 6	3,941	4,649	4,970	4,534	15%	6%	-10%	13%
City of Naples	1,807	2,474	2,745	2,628	27%	10%	-4%	31%

Tab. 7 Comparison between tertiary properties values within observation interval

Napoli Porta Nolana and Garibaldi EAV are the only Circumvesuviana stations that recorder a negative variation in tertiary properties' prices after the 2008 world economic crisis, and they are the only stations located in Semi-Central zone (Tab.8). This negative effect may be explained as a consequence of economic crisis and the consecutive bank close: the most widespread tertiary activities in Napoli Porta Nolana and Garibaldi EAV catchment areas are banking services. All the suburban stations, apart from Poggioreale, recorder higher values that the average for that urban section.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
STATION	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Napoli Porta Nolana	2,823	3,309	3,694	3,404	15%	10%	-9%	17%
Garibaldi EAV +	2,178	2,499	2,888	2,825	13%	13%	-2%	23%
Semi Central Zone	2,922	3,597	3,949	3,610	19%	9%	-9%	19%
Via Gianturco	1,618	1,683	1,992	2,190	4%	16%	9%	26%
Centro Direzionale	2,172	2,735	3,209	3,280	21%	15%	2%	34%
Inner Urban Zone	1,412	1,918	2,248	2,309	26%	15%	3%	39%
San Giovanni a Teduccio	1,266	1,739	2,117	2,233	27%	18%	5%	43%
Barra	1,210	1,663	1,996	2,069	27%	17%	4%	42%
Santa Maria del Pozzo	1,151	1,581	1,915	1,990	27%	17%	4%	42%
Poggioreale	1,816	1,867	1,824	2,010	3%	-2%	9%	10%
Botteghelle	1,127	1,547	1,888	1,966	27%	18%	4%	43%
Madonnelle	1,024	1,405	1,714	1,785	27%	18%	4%	43%
Argine Palasport	777	1,066	1,300	1,354	27%	18%	4%	43%
Villa Visconti	931	1,241	1,506	1,610	25%	18%	6%	42%
Vesuvio De Meis	1,072	1,409	1,706	1,845	24%	17%	8%	42%
Bartolo Longo	1,043	1,384	1,679	1,801	25%	18%	7%	42%
Officine Ponticelli	1,152	1,571	1,915	2,006	27%	18%	5%	43%
Ponticelli	1,227	1,638	1,987	2,117	25%	18%	6%	42%
Suburban Zone	924	1,215	1,434	1,500	24%	15%	4%	38%

Note: + Interchange stations.

Tab. 8 Comparison between tertiary properties values within observation interval, for Circumvesuviana stations

4.4 MANUFACTURING PROPERTIES

This paragraph analyses the main results of the methodology applied for manufacturing properties in Naples, within railway station catchment areas and their changes in prices between 2001 and 2011.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
LINE	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Line 1	2,563	2,670	3,084	2,745	4%	13%	-12%	7%
Line 2	1,610	2,003	2,412	2,168	20%	17%	-11%	26%
Circumvesuviana	800	813	1,088	1,095	2%	25%	1%	27%
Cumana	1,589	2,085	2,311	2,167	24%	10%	-7%	27%
Circumflegrea	1,176	1,382	1,630	1,686	15%	15%	3%	30%
Line 6	1,970	2,139	2,361	2,292	8%	9%	-3%	14%
City of Naples	1,340	1,328	1,575	1,492	-1%	16%	-6%	10%

Tab. 9 Comparison between manufacturing properties values within observation interval

The average values of Tab. 9 and Fig. 11 show that stations of Line 2, Circumvesuviana, Cumana and Circumflegrea recorded a high increase when compared to other stations. Analysing the values for each station showed significantly increased for the stations localized in the periphery areas (Inner urban zone and Suburban zone) that are become more adequate for this category of activities (more accessibility and transformable areas). In the last temporal interval, 2008-2011, Circumvesuviana confirmed as the line that is the least affected by the impacts of the economic crisis as in the other categories of properties.

According to Fig. 12, line 1 stations in semi central urban sections, in the last observation period, are characterized by an even higher increase compared to other stations in the same urban section. Analysing data from Tab. 9, manufacturing properties recorded significant increases for all lines, with the exception of

line 1 that only increase of 7%. This result is mainly influenced by the conformation of urban structure around the station nodes is not adequate for this type of activity. Looking at Tab.10 it is worth noting that those Circumvesuviana stations located in peripheral sections, for this real estate category, had better performances rather than central stations. Moreover, for almost all stations, the values of manufacturing properties are higher than the average value of each urban section.

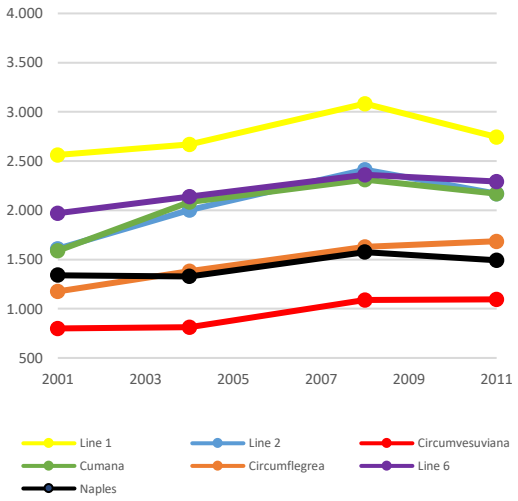

Fig. 11: Variation in Euro of manufacturing average property values in the catchment areas for urban railway lines in the city of Naples.

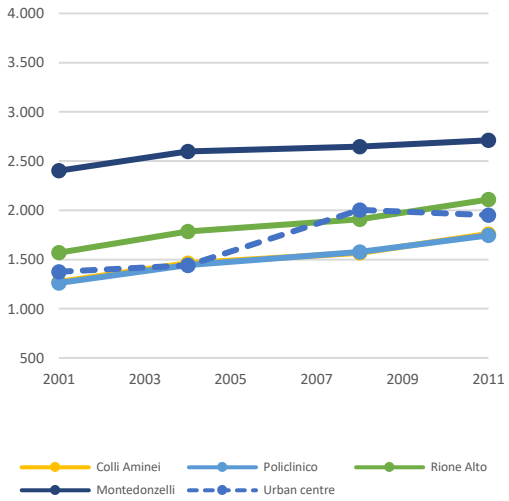

Fig. 12: Variation in Euro of manufacturing average property values in the catchment areas of Line 1 stations in Urban centre zone.

	PROPERTIES VALUES [€/mq]				VARIATION [%]			
STATION	2001	2004	2008	2011	2001-2004	2004-2008	2008-2011	2001-2011
Montesanto +	3,359	3,569	4,080	3,547	6%	13%	-15%	5%
Corso Vittorio Emanuele	3,289	5,755	6,151	4,819	43%	6%	-28%	32%
Central zone	4,399	3,888	4,175	3,514	-13%	7%	-19%	-25%
Fuorigrotta	1,683	1,723	1,919	2,052	2%	10%	6%	18%
Mostra +	1,522	1,526	1,672	1,844	0%	9%	9%	17%
Zoo-Edenlandia	986	1,376	1,518	1,552	28%	9%	2%	36%
Semi Central zone	1,376	1,441	2,004	1,952	5%	28%	-3%	30%
Agnano	582	1,163	1,300	1,302	50%	11%	0%	55%
Bagnoli	578	1,018	1,141	1,173	43%	11%	3%	51%
Dazio	641	1,193	1,403	1,432	46%	15%	2%	55%
Inner Urban zone	705	870	1,017	1,079	19%	14%	6%	35%

Note: + Interchange stations.

Tab. 10 Comparison between manufacturing properties values within observation interval, for Circumflegrea stations

5 CONCLUSIONS

This study concerns the development of an ex-post methodology useful to quantify the impacts of Transit-Oriented policies on the Land-Use System: the mutual interactions between the two systems make it difficult to quantify their social, economic and territorial effects in the government of territorial transformation process. The city of Naples represents an interesting case study considering the implementation of several tools developed by the local administrations (municipality, provincial and regional) in order to improve the quality of both the level of public transport service and the urban environment. The results presented in this paper further support the scientific assumption whereby the introduction of rail transit investment brings benefits to

the transportation system and to the accessibility of the population to employment, retail, and recreational activities (Pagliara & Papa, 2011). Similarly, the main results also confirm the policy strategy and objective: increase the accessibility to rail transit nodes, improving architectural and urbanistic quality of built environment within station buildings and their catchment areas. The municipal administration also aims at reducing the environmental damage of the rail infrastructure and its neighbourhoods (Napoli, 2003). This study is focused on the impacts on real estate values around transit nodes and within their catchment areas, but still points of reflection could be studied such as the impacts in social, generational and gender equity, safety and security perceptions. The results for the city of Naples showed that in some catchment areas and for some types of properties the effects of the world economic crisis of real estate had less effect in terms of reduction of the prices. Moreover, the results show that the methodology is useful to quantitatively assess ex-post the main impacts of actions aimed at the integration between the Transport and Land-Use Systems, but its application could be extended to support the implementation of these strategies in different territorial context, on the basis of well-known best practices and their economic impacts on urban environment.
This study could be further developed by extending the analysis period and including more recent data, in order to quantify the impacts of 2008 global crisis on real estate values over the years. Moreover, different indicators may be selected to assess and quantify the main impacts of integrated transport and land-use policies on the urban environment: increased accessibility and employment, as two examples of improvement of quality of life within transport node catchment areas.

AUTHOR CONTRIBUTIONS

Paragraph 1, 3 and 4, Gerardo Carpentieri; Paragraph 2, 3 and 5 Carmen Guida; Paul Chorus has made substantial contributions to the essay's improvement, design, and conclusions.

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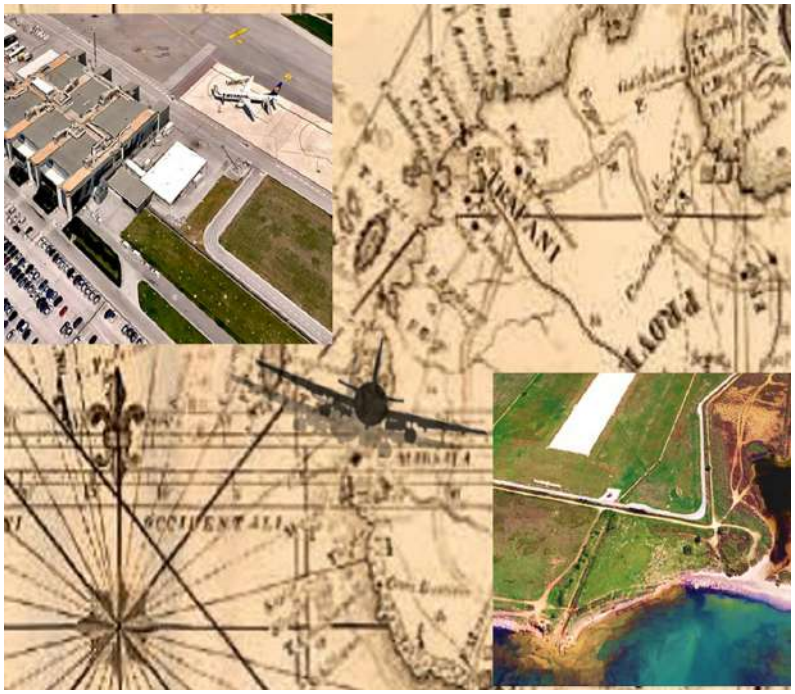
TeMA
Journal of
Land Use, Mobility and Environment

TeMA 3 (2019) 331-350
print ISSN 1970-9889, e- ISSN 1970-9870
DOI: 10.6092/1970-9870/6298

paper received 16th Septmeber 2019, accepted 19th December 2019

www.tema.unina.it

How to cite item in APA format:
Massaro, A., Ventura, P. & Calderon, E. (2019). Transport Implications in Tourist Destinations. *Tema. Journal of Land Use, Mobility and Environment*, *12*(3), 331-350. doi: http://dx.doi.org/10.6092/1970-9870/6298



TRANSPORT IMPLICATIONS IN TOURIST DESTINATIONS

TTHE TRAPANI AIRPORT IN WESTERN SICILY

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ABSTRACT

This search following the Sicily, the largest island in the Mediterranean Sea (25,460 sq km) and a self-governing Region, located in the southernmost part of Italy, has at least four tourist-related airports, sited between the eastern and western coast, separated from each other by a vast territory without efficient transport links and suffering from many diverse environmental problems. Utilizing a desk search methodology based on GIS software, this paper discusses the impact upon the regional development of the tourist traffic of the Trapani Airport situated in the westernmost part of Sicily. Ultimately it analyzes the critical role of connectivity and accessibility in the development of the area and tourism, seeking a maximum involvement of stakeholders. The recent growth of low-cost carriers have had a definite impact on the economic growth of the entire territory, where those choices could determine the life or the death of firms and, inevitably, their annual incomes. Tourism and connectivity are strictly related, thus showing deficiencies of the area in terms of accessibility, as well as the trade-offs between the different government (central and local) investment policies and the specific benefits emerging from the airport in the regional mobility.

KEYWORDS:
Regional and Urban Planning; Network; Tourism; Connections; Economic Data; Accessibility; Environment

TeMA
有关土地使用、交通和环境的杂志

TeMA 3 (2019) 331-350
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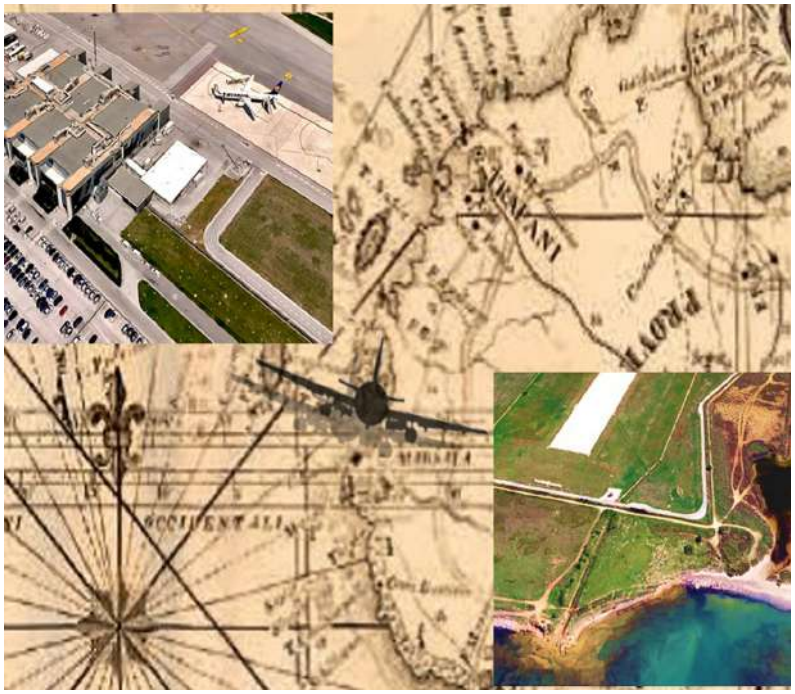

航空运输对旅游目的地的影响：西西里岛西部的特拉帕尼机场

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摘要

本研究针对地中海最大的岛屿（25.460 平方公里）— 西西里岛，这一位于意大利最南端的自治区在其东海岸和西海岸之间设有至少四个与旅游相关的机场，但彼此之间被辽阔的土地所分隔而缺少有效的交通枢纽，同时还受到各种各样环境问题的困扰。本文利用基于 GIS 软件的桌面研究方法，讨论了西西里岛最西端的特拉帕尼机场对地区游客流量发展的影响。最后，它分析了连通性和可达性对该地区及旅游业发展至关重要的作用，以寻求让各方利益相关者尽量参与其中。近期低成本航空公司的发展对整个地区的经济增长产生了一定的影响，这些选择可能会决定企业的生死存亡，并且不可避免地决定其年收入。旅游业与连通性息息相关，因此在可达性方面存在不足，并且不同的政府（中央和地方）投资政策与机场在区域流动性方面的具体效益之间存在权衡取舍。

关键词：
机场； 高铁； 集水区； 联运互补性； 方案

1 A SHORT HISTORIC OVERVIEW

A quick overview of the Sicily planning history shows the existence of three airports in the territory of Trapani since the '20s [1]. For military reasons, the first base was built in Milo (1920-1949), followed by Chinisia (1955-1961), and lastly, in the '60s, Birgi, which is the only one still in operation. Close to the Balata river, the mouth of the Birgi river was thoroughly altered in 1961 to build the Airport, in the northwest regional coast of the island. It is essential to highlight the use of the airport today, both for civil and military traffic. Runway maintenance is still carried out by the Military Government. Thus, it is essential to stress the close collaboration with both the Apulian airport of Galatina (Military Airport) and Brindisi Airport, as well as with the Grazzanise Airport of Campania (Military Airport), in the Military Programs of the Mediterranean Basin Defense. Moreover, it is not a little notice that in 1975 Italian Space Agency installed a "stratospheric hot-air balloons launching base" in the currently disused Chianisia Airport, an issue that underpins the crucial role of the transportation system for the area[2].

Trapani Birgi Airport stays at the same distance, 15 km, from Trapani, about 60,000 inhabitants, and Marsala, about 80,000. The Palermo Punta Raisi International Airport location, instead, is approximately 90 km from Birgi. Trapani's origins probably date back to a village founded[3] in the 5th century BC. Although a great deal of population passed through those lands and consequently through a port with a crucial importance in the middle of the Mediterranean Sea, the layout of the city, as well as of others alongside the entire west coast (Marsala, Mazara del Vallo, etc.), derive their form from the Medieval Age.

The urban distribution made by frequent migrations from and to the coast and the extensive urbanization carried out by Arabs and Normans is both related to the role of the sea and of local agricultural resources.

Today, it is possible to discover the transformed grid of ancient paths to the hinterland, as all along the coast. Some of those have become all-purpose roads, while others nowadays are new highways. Presently, the road network (1.781 km long) has a density index (km per 1,000 sq km of the territory) higher than the whole of Sicily and Italy, too[4], strictly related to the Metropolitan Area of Palermo. The two provinces of Trapani and Palermo connect a particular territory that has a geomorphologic shape sloping down gradually from the mountains to the sea. Likewise, the flat land of Trapani province stretches out to the south, becoming the Trapani Valley. Along the coast, history records the intense activity of the 21 existing ports, most of them with an inadequate structure. The port of Trapani displays a particular hooked shape. Fortified from the 5th century, it continues to receive today a vital load of cargo traffic (particularly with origin/destination in Africa). Only recently, it was opened to the most significant tourist ferries, thus attaining a leading role in the ports system of Sicily, above all in the relationship with the port of Palermo.

The port of Marsala, on the other hand, is a vital hub for links with other islands, as acknowledged in the recent Regional Transport Plan. The deficiency of the port system lies in the connections with the hinterland, due to the road and railway systems inefficiency. A closer look at the railway system would provide many explanations about the functioning of connectivity in the region. The birth of the Sicilian railway system can be traced back to the debate on the unification of the whole national railway system, the arrival of Garibaldi in Sicily, and the sulfur production activities on the island in the first half of 18th century. Nevertheless, the link with the peninsula system played a crucial role in the connection between Catania and Syracuse and the exclusion and abandonment of the western cities. The first railway line started from Trapani to the southern ports of Marsala and Mazara del Vallo. In the same years, the railway linked Mazara to Palermo. The entire

[1] (http://www.aerohabitat.eu, s.d.) (http://www.aeronautica.difesa.it, s.d.)
[2] (https://www.asi.it, s.d.)
[3] It was founded by the Elymians, a nation of not well-known origins that arrived in Sicily before 1000 BC.
[4] Road Density Index: 718 (Trapani), 663 (Sicily), 551 (Italy), (http://www.provincia.trapani.it, s.d.)

railway network has a length of only 120 km. The shortcut from Alcamo to Trapani started in the '30s, but underutilized.

Significantly, later on, the railway network neglected that first grid, stopping the necessary maintenance and modernization from guaranteeing the right development and the linkage with the rest of the island. These facts underpin the critical role of the ancient postal liaison, with its dense connection grid and the part of the firm, historic coastal navigation network, although with inadequate intermodal infrastructure. Therefore, if the connectivity in the Sicilian Region were to be enhanced, the primary role of roadway and navigation network should be highlighted, as well as the secondary, inefficient, the role played by the railway system.

Furthermore, the ports of Trapani and Marsala have not an efficient railway connection. This fact hinders trade and the tourism of the entire province concerning the Eastern coast of the Region. Moreover, in a zone dotted by small ancient communities and a dense network of minor roads, the airport is isolated, if only 1 kilometer away from the old single-track railway line (Fig. 1).

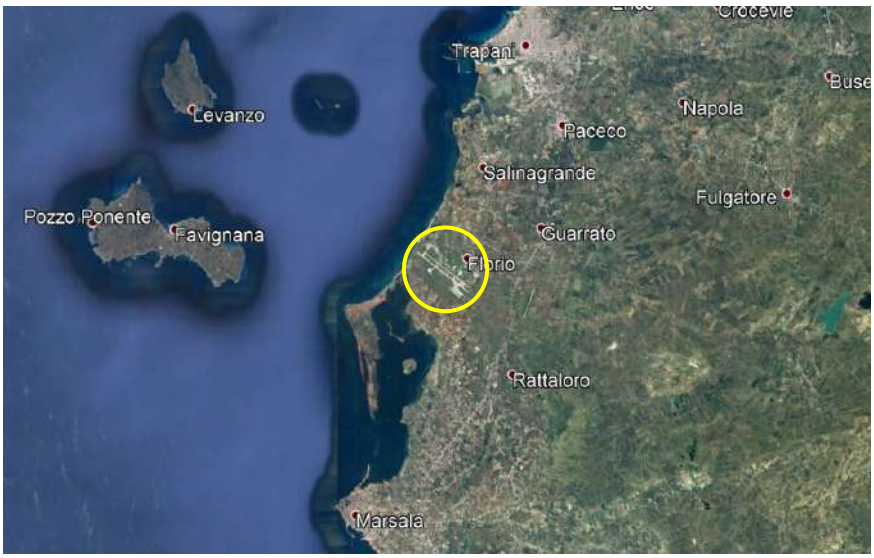


Fig. 1 Trapani Airport Location

2 THE TRAPANI BIRGI AIRPORT SITE AND ITS ACCESSIBILITY

Since the 14th century, the Municipalities of Birgi Nivaloro, Birgi Novi, and Birgi Vecchi occupy the territory around the Airport. The first rural settlements appeared in the early 19th century, and they are all now just south of the runway. Along the coast, near the Airport lie the Villaggio San Teodoro, an exclusive bathing resort to the south, and Posidonie with its little bath village of Tritoni, both of them part of the Marsala Municipality.

The ancient territories belonging to Vincenzo Florio[5] are today part of the Air Force base and the NATO Base in the Trapani Municipality. The entire aerodrome (almost four sq km), the immediate agricultural land, and the mouth of the Birgi River (Balata River) are enclosed by the coastline to the west and by the roadway SP21 to the east. Almost all the Aerodrome Area is part of the Trapani Municipality.

Thus, Birgi Airport is a new center in the disperse lands between Trapani and Marsala, each one with its specific planning documents, not always adequately coordinated

Birgi Airport has a strategic role in the Italian context, as a part of the final section of the TEN-T network (the Scandinavian - Mediterranean corridor). Notably, the National Airport Plan considers the Sicilian Airports as part of two different strictly connected systems: the East Pole (Catania - Comiso) and the West Pole (Palermo - Trapani).

[5] Vincenzo Florio (1799 –1868) was a wealthy Sicilian entrepreneur and politician.

Problems of connectivity and accessibility have soon arisen between the two poles and the hinterland. The National Airport Plan underlines the need to improve the connection between the nearest airports, stresses the two systems working model, and puts forward suggestions for the development of the roadway and railway links, which could boost up development opportunities for the south of the Island.

However, Birgi Airport accessibility enhancement requires significant infrastructure investments following the expected increase in passenger traffic. Thence, the Regional plan accepts the national hypotheses and consequent public works envisaged

At a sub-regional scale, the picture becomes more specific. The airport is connected to the main road via the A29 DIR motorway branch, linking the airport with the A29 Palermo - Mazara del Vallo motorway. Also significant is the SS 115, which connects it with the neighboring cities of Trapani and Marsala. From the Airport, it is possible to reach the cities of Trapani, Marsala, Palermo, Agrigento, as well as nearby locations. There is no direct access to the railway network, although the Alcamo, Castelvetrano, and Trapani railway line is less than 1 km away from the airport. The nearest station is Mozia-Birgi, 3 km from the airport, but there are no public transport connections between the two nodes. The Trapani and Marsala railway stations stay about 15 km from the airport. These connectivity issues should be improved with a new railway section between Trapani and Palermo, passing through Milo and Alcamo, as well as with a new road link between Mazara del Vallo and Trapani, consisting in one cat. C1 section with an overall width of 10.5 m. The road project has a total length of about 15.6 km plus a 900 m - the leg from the Marsala south junction to the Marsala Hospital roundabout. Furthermore, the new project boasts a viaduct of about 140 m, plus 5 m under - and 4 m overpasses. It presents some significant construction problems related to the numerous quarries and pits in the area. Moreover, the new link would not serve the population of the Southern territories of the island. The last version of the Regional Transport Plan details the maritime connections and accessibility links in the national Ports Plan. It confirms the Administrative reorganization of the Port Authorities in the new Port System Authority. The port of Trapani enjoys an excellent geographical position that allows it to be a reference point for traffic to and from the continent, Sardinia and North Africa. Furthermore, the presence of a large pool of consumers and the absence of production facilities give the node a potential logistic role. The location of the port and city center allows the independence of the commercial traffic from the urban road system. As in the previous Transport Plan of 2002, the New Regional Transport Plan highlights the synergy between the harbor and the airport of Trapani as relevant poles in the western transportation system. Specific programs for the port of Marsala, a critical connection with Egadi, Lampedusa, Pantelleria, and Africa, are, likewise, envisaged.

The New Regional Transport Plan notices that the airport lacks good road accessibility and that the single-track railway Palermo-Trapani line via Castelvetrano is underused, although it runs close to the airport. The port development seems aimed towards recreational uses. In May 2016 an agreement was signed between the MYR firm and the Sicilian Region to allocate the entire port basin to leisure uses. The highlighted planning applies choices of the National and Regional infrastructure to the Provincial and local planning.

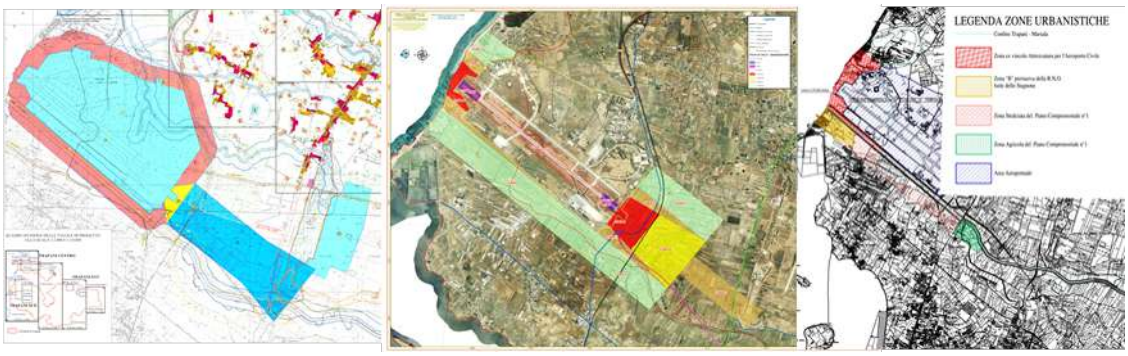


Fig.2 Airport, Marsala and Trapani constraints around the aerodrome

A closer look at Airport accessibility and connectivity points out some relevant necessary additional interventions. Among those, fixing the connection with the A29 motorway (1,5 km); the railway connection with the Palermo-Alcamo line branch Castelvetrano-Trapani (1 km); some Airport Terminal renovation works and the linkage of the airport water supply system to the Public Aqueduct[6]. These elements show only a minimal part of the issues and programs on the broader planning scale and highlight other essential problems of environmental impact assessment that the airport traffic growth would generate. Water demands and pollution growth link the planning issues to the nearest river and the sea alike.

Local planning underpins the leading role of Birgi Airport. Its development is shared in the planning policies of both central municipalities of Trapani and Marsala, and considered an urgent problem to solve (Fig. 2). Only 4 % of the Airport surface area falls within the district of Marsala, but most of the small communities close to the runways are part of Marsala. Indeed, the Airport Risk Plan (2014), managed by Marsala Municipality, imposes specific prescriptions on the areas around the aerodrome. The Plan does not consider the adjacent areas north of the runway, because they are under the control of the Trapani municipality. On the other side, the General City Plan of Trapani (2010) encloses the aerodrome in different specific zones of constraint. Both plans could work better, and the implementation of issues be more effective if considering various stakeholders and a single management board established.

Sicily Airport system has an essential role in the Scandinavian - Mediterranean corridor, the longest of the entire TEN-T network. Sicily is the furthest point in this corridor, a natural contact point with Africa[7]. The focus on maritime connections among the EU states gives more strength also to the hallway between the North Sea and the Mediterranean Sea. Due to the priorities of the European Policy, the transport sector in the southern regions has attracted financial support for infrastructure projects to improve air traffic and maritime control and logistics services in ports. The establishment of the Trans-Mediterranean-Network-Transport-TMN-T[8] has become a toolkit to develop the entire EU infrastructure system. This statement puts Sicily in the core of the investments, clearly as a strategic place in the south of Europe.

The location of the airport of Trapani-Birgi is 15 km from both city centers of Trapani and Marsala (TP), 115 km from Palermo center, and 168 km from Agrigento one. The airport has a strong tourist vocation due to the presence of low-cost carriers and the characteristics of a relevant catchment area of cultural, bathing, archaeological, and eno-gastronomic sites. Since 1992, the civil airport management is carried on by the stock company Airgest SpA, almost totally owned by the Regione Sicilia. The passenger terminal is sited southeast of the airport runway and covers 14,700 sq m, 66% open to passengers. The ground floor, of 9,500 sq2, houses the arrival and departure halls, boasting 15 check-in counters. The first floor provides eight boarding gates, covering an area of 5.200 sq2. There is a medium-long term parking area for cars consisting of 829 stalls. The runway for take-off and landing has a 13-R/3-L orientation, almost perpendicular to the coast, with a length of 2,695 m and a width of 44 m. The main taxiway of the same size, parallel to the runway, is used for take-off and landing, only by military aircraft, and is paved with bituminous conglomerate as the main runway. The other taxiways are partly in bituminous conglomerate and partly in concrete. The apron has an extension of approximately 64,900 sq2 and contains nine stalls for aircraft, four on flexible flooring, and five on the rigid pavement (concrete).

[6] (Territorial Provincial Plan, 2013)

[7] Scientific literature highlights the important role of the Mediterranean Region in the international coordination, specifically in the development of transports connectivity, in the approval of multilateral agreements, plus the multi-modal maritime, road and rail corridors for connections. A report by the Ministry of Foreign Affairs of the Italian Government (MAECI), officially presented at the 3rd edition of the Mediterranean Dialogues-MED 2017, held in Rome, 30 November, 2017 did state - "Italian strategy in the Mediterranean: stabilizing the crisis and building a positive agenda for the region" – defines the Mediterranean as "a geopolitical paradox" because it has become "an increasingly fragmented region and - at the same time - more interconnected." (Giampaolo Basoli, 2018). The involvement of the investors in the connectivity is a structural issue of the development and growing with the years; it has finally changed the TEN-T programs, focusing on maritime services improvement, stimulating the transfer of road traffic to short sea shipping connections, with economic and environmental benefits.

[8] (Bruxelles, 2013)

3 LEGAL REGULATIONS IN TURKEY AFTER GÖLCÜK EARTHQUAKE IN 1999

The Gölcük earthquake in 1999 caused a moral and economic collapse firstly but then caused an awakening in the overall country. As a result of this earthquake, 18,373 people lost their lives; 285,211 houses and 42,902 workplaces were damaged (Wikipedia, 2019).

These extreme damages have taught the reality which unplanned urbanization puts human life at risk, especially in disaster risk areas. The earthquake revealed that the country was not prepared at a sufficient level for many issues. For example, transportation and telecommunication nets were collapsed. Search and rescue works were inadequate. It was understood that there was no proper insurance system. Generally, emergency legal arrangements were always entered in the force in order to bind up wounds after every earthquake in the country (Şengün, 2007). In this regard, the Decree-Law no 574 was issued, immediately after the earthquake. However, this earthquake affecting the whole of Turkey expressed the necessity of some radical changes for this time. Renewal of urban areas which are collapsed and not resistant to earthquakes became the main topic. There were a few urban transformation projects in Turkey until that day and the projects could usually be applied by special laws. An example was the "Dikmen Valley Urban Transformation Project", which was adopted in 1990 in the capital city, Ankara (Demirci, 2004).

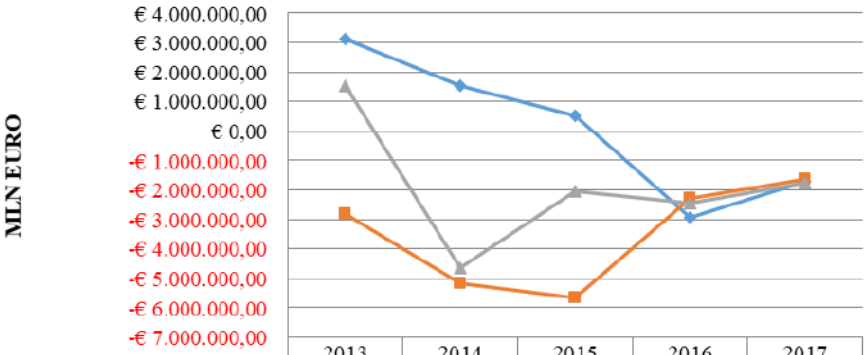
Another example was the "Northern Ankara Entrance Urban Transformation Project" implemented with the special law no 5,104 in 2004 (Resmi Gazete, 2004). Especially, it can be said that the purpose of the "Northern Ankara Entrance Urban Transformation Project" was a physical transformation. Until that date, there was still no clear legal regulation which defines urban transformation's purposes and control mechanisms. Article 73 with entitled "Urban Transformation and Development Area" of the "Municipal Law" No. 5393, which entered into force in 2005, provided a major expansion.

This article authorized municipalities to implement urban transformation in order to rebuild older parts of the city, to create housing, commercial, industrial and social areas, to take precautions against earthquake risk, to preserve the historical and cultural structure of the city. Unfortunately, many projects based on this article have received negative criticisms that urban transformation has diverged from its renewal and conservation purposes. Following the Van earthquake where 644 people lost their lives in 2011 according to Disaster and Emergency Management Presidency (AFAD)(AFAD, 2014), the necessity of regulating a specific law to reduce the losses before the disaster has become the main topic again. Finally, Law No. 6306 on "Transformation of Areas under Disaster Risk" was published on 16 May 2012.

This law sets out the principles of improvement, re-settlement, and renewal in order to create healthy and safe living spaces in disaster risk zones (Resmi Gazete, 2012a). Unfortunately, this law has caused many discussions and many of its articles have been rescinded or rewritten.

Besides legal regulations related to urban transformation, some other important regulations have been entered into force after the earthquakes in 1999. "Building Inspection Law" No. 4708 which came into force in 2001 can be given as an example (Resmi Gazete, 2001).

The purpose of this law is to ensure the construction of structures conforming to standards for safety of life and property. Also, one of the important regulations is the "Regulation on Buildings to be Constructed in Seismic Zone" which were arranged in 2006 but entered into force one year later (Resmi Gazete, 2006). This regulation includes many crucial changes to build resistant-constructions against earthquake. Unfortunately, this regulation was started to be implemented in some provinces, and it was decided to implement it all over the country after the Van earthquake in 2011. Another regulation is the decree-law no 587 named as "Compulsory Earthquake Insurance" was entered into force in 1999 (Resmi Gazete, 1999). This regulation was rearranged as "Disaster Insurances Law" No. 6305 in 2012 (Resmi Gazete, 2012b).



	2013	2014	2015	2016	2017
EBITDA	€ 3.104.139	€ 1.533.655	€ 508.078,0	-€ 2.953.00	-€ 1.719.00
EBIT	-€ 2.805.44	-€ 5.172.38	-€ 5.646.96	-€ 2.304.00	-€ 1.631.00
OPERATING PROFIT	€ 1.547.839	-€ 4.649.43	-€ 2.029.70	-€ 2.439.00	-€ 1.753.00

Fig.3 Comparing EBITDA, EBIT, O.P. of Airgest SpA

3.1 THE TRAPANI PROVINCE TOURISM GROWTH

The Regional Transport Plan (2017) stresses the relationship between the population and the job market in terms of GDP. Data show the evidence highlighted by ISTAT[9] and MEF[10] conclusions about the low employment rate of Trapani and Palermo provinces in the Sicily Region. Building construction leads the Trapani and Marsala's active population employment, followed by the agricultural sector, with a concentration in the Trapani district. Employment in tourism plays today a marginal role but it is expected to attain a leading position in the future. The income per capita calculated for the inhabitants shows a deflection in the Trapani curve over the years. Still, on the other hand, the same indicator for the occupied population shows a positive trend in recent years. This fact underlines the growth of different market types. The population decline explains the fall of the personal GDP and highlights the marginal role of Trapani Province in the Sicily Region. The income per capita in the Province of Trapani is significantly higher on the coast, due to building construction and the pervasive presence of tourist activities.

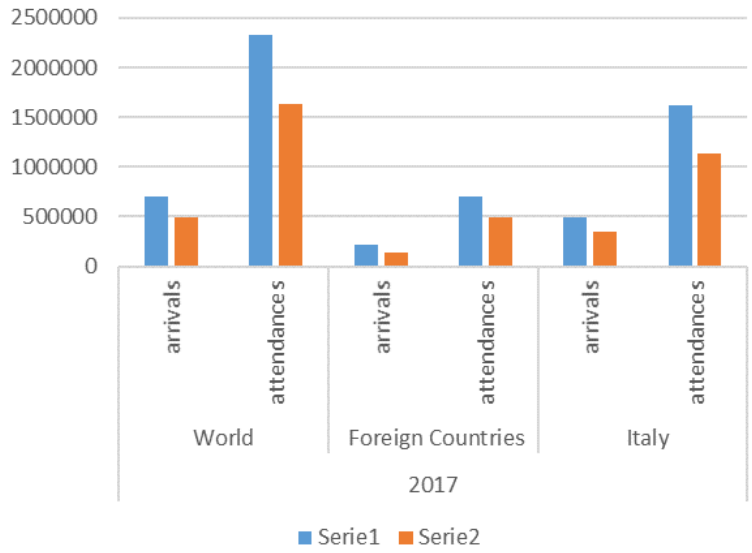


Fig.4 Tourism Facilities Use

[9] (http://www.istat.it, s.d.) Italian National Statistic Institute
[10] (http://www.mef.gov.it/, s.d.) Italian Ministry Economic and Finance

Arguably, all those issues related to planning, as discussed earlier, but also to the Airport's management joint-stock company and its specific point of view (Fig. 3). The balance sheet of Airgest SpA[11] shows continuous growth with a peak in 2012 (Fig. 4).

The growth of air traffic over the years, associated with low-cost carriers, as argued further ahead, has had an initial direct effect on the tourist facilities, increasing the number of beds made available to match the arrivals. Especially the percentage of international tourists from 2007 has rated high concerning all other airports (13%). This growth matches the territorial expansion of tourist facilities, industry, and commerce, enough to generate a noticeable escalation of the GDP in the entire Province[12]. The Chamber of Commerce data show the relevant growth of the employment levels in the same period in the tourist and restaurant companies and in the building trade. The Chamber of Commerce provides monthly updates allowing to verify the direct correspondence with the tourist traffic, with its peaks in the warmer seasons.

3.2 THE COMPETITION OF PALERMO PUNTA RAISI INTERNATIONAL AIRPORT

The annual growth of Trapani Airport has to deserve the steady growth of Palermo Airport. The linkage and the cooperation with Palermo in the western part of Sicily undergo some overriding levels of planning, as argued before.

However, in the specific airport planning, it is challenging to introduce cooperation as a principal element. The airport management, in the hands of a stock company, creates competitiveness in the specific market sector. The complicated factors related to the proximity between airports are a further matter of research. The different types of influences play a leading role in defining a framework allowing a comprehensive assessment of the impact of various institutional market programs[13]. The time distance by road between Trapani and Palermo Airports is of about two hours. That time stresses the need for cooperation and a comprehensive, integrated approach, but also the need to consider the infrastructure problems throughout the territory. The accessibility to the airport of Palermo implements the links with the east regional area, especially with the provinces of Messina and Catania, applying a significant amount of the investments to facilitate that relationship. On the other hand, Trapani could catch the southern populations. These issues influence the use, modernization, and maintenance of the airport infrastructure. Punta Raisi Airport has faster connections to the east and to the peninsula, which is an advantage for carrier's attractiveness. So, the traffic flows of Palermo prove the positive effect of the presence of different air carriers. On the other hand, Birgi Airport has had a consistent growth between 2008 and 2015, paired with the presence of Ryanair. Still, now its withdrawal reveals the difficulties to match new carriers and new routes and to gain a steady growth similar to Palermo's.

3.3 THE ROLE OF LOW-COST CARRIERS: BENEFITS AND DRAMA OF THE AIRPORT COMPETITION FOR TOURISM

Arguably, in the last years, tourist traffic has slumped, and this has had profound consequences in airport management. The main factor in this story is the presence of Ryanair. The report of Airgest in 2012 emphasizes the neat link between the GDP generated by the Airport and the entire province.

[11] The Airgest SpA is a limited company made up by 99% of Public Bodies, which manages the Trapani-Birgi Airport since 1992. Airgest SpA, in June 27, 2012, has stipulated with ENAC (Italian National Civil Aviation Authority) a 30-year Concession for Managing the Trapani Birgi Civil Airport Infrastructures, which has recognized its role as Directing Manager of the airport infrastructures. Furthermore, Airgest is also a handling company– currently the only one at the Trapani airport – in charge of passenger, baggage, aircraft and goods services. (http://www.airgest.it/, s.d.)

[12] Results from 2004 to 2010: Trapani + 2.2%, Sicily +2.0%, Italy +1.1% (http://www.airgest.it/, s.d.)

[13] The literature shows us, that airport costs are driven by external factors, such as traffic structure (percentage of international passengers, percentage of business passengers, LCC share and share of cargo traffic), delays or the degree of competition between airports. The type of ownership and the level of outsourcing also matter. (…) For small airports with inadequate passenger throughput, subsidies play a very important role for their financial survival (AA.VV., 2014)

The analysis of passenger flows reveals the essential role of low-cost traffic, primarily due to the number of Ryanair routes. In 2012, the Trapani province revenue amounted to 290 M euros, a sum that encompasses the GDP of all municipalities and all other market benefits. All Municipalities subsidize the cost of Ryanair base in the Birgi Airport for a total amount of 2,150,000 euro per year. This subsidy, even if the benefits are more than proportional to the paid amount, recognizes the monopoly of Ryanair and its specific costs. Moreover, yet if the territorial benefits balance the relative amount, it increases the uneven interrelations between Airport and Municipalities. The reason could probably lie in the dispersion of revenues and the consequent spillover effect, giving advantages to some zones as opposed to others. The specific market of the low-cost airlines in the years, the reduction of prices, the unrest of the workers and, last but not least, the difficulties on the specific territory of Trapani, the long-term measures to improve connectivity and to enlarge catchment areas, are all reasons that determine the reduction of routes from Birgi in 2017 only to four airports in Italy, slashing the number of international passengers. The agreement with Ryanair and the obstacles[14] for other airlines evidence the marketing attempts to regain the traffic routes. This is perhaps the last step of a bad chronicle. Other companies were excluded following complaints from airliners interested in the low-cost traffic (Alitalia in this case). All those experiences affected the Airport management. The decline in passenger numbers and a parallel slump in the Airgest revenues led to a shrinking GDP and subsequent economic risks. In this framework, the Chamber of Commerce database is reassuring anyway. In fact, the benefits of the previous years have slightly lifted up the definite curve of GDP, demonstrating again the importance to look in perspective. Trapani commercial firms committed to significant investments are becoming scared by the fall of tourism-related revenues. The significant number of press articles collected in recent years bear witness to this situation. The cash flow and the Gross Operating Surplus (GOS) derived from the last Airgest balance sheet are negative. In the first half of 2018, passenger numbers fell by a hefty 67%, back to the figures of 2008. The reports about the future try to regain the past growth rate, but the solutions are just a part of the specific possibilities of the Airport. The overall corporate planning remains the same and does not provide a quick solution to this problem. The path to follow could be in the strategic marketing plans, and it should pledge for the return to positive balance levels. Probably now, the need to merge the two Airports in a single corporation as in Bari-Brindisi in Apulia or Milan is emerging.

4 TRAPAN AND PALERMO AIRPORTS: IMPACTS ON TOURISM DEVELOPMENT

The role of low-cost traffic in Birgi Airport is determinant, and closely related to the Ryanair vector, as disclosed in the Airgest SpA analysis of traffic[15]. Sicily complies with EU recommendations, and the Birgi Airport growth has been strictly proportional to the Ryanair decisions about routes. After 2009 the relative growth of traffic was higher than in other airports, and it continued so in the years till the recent downfall. The passenger traffic growth of Catania and Palermo airports is ranked among the first ten airports in Italy. Trapani, on the other hand, has experienced the most significant reduction of its traffic in the last years. This fact reflects the different load factors for vectors too. It depends not only on the tourism effect but on the possibility of extending the tourist passengers over to the winter season. Concerning tourist facilities, the difficulties of Trapani to extend its tourist catchment area towards the south and to attract other airliners depend on the overlapping with the Punta Raisi catchment area. The connectivity to the broader southern Region should be a pivotal issue to transform the competition between the two neighboring airports to enhance their cooperation. However, this brings about the problem between the plans for airport accessibility. The specific location of the Birgi

[14] The Regional Administrative Court for Sicily has ruled against the restricted procedure issued by Airgest SpA for allocation of promotion and communication services for the creation of an advertising campaign aimed at favoring the increase of tourist presences in the territorial area related to the Trapani Birgi Airport, infringing free competition, as it contains conditions which are tailor-made to Ryanair, thus excluding other firms, especially Alitalia which has appealed (Palermo, 23.01.2018).
[15] (http://www.airgest.it/, s.d.)

Airport could be a reason to extend its shape, to promote the airlines' attraction, and to meet the need for ground facilities: all costs should be jointly considered. The airliners have to comply with PSO programs and to bear their costs[16]. The distance between the two airports must be analyzed at a broader scale, where the current size of the catchment area may be extended [17]. Moreover, pollution and the mandatory environmental impact assessment are the elements on which the ideal development should be analyzed. Public service obligations, both for airports and vectors, depending on the possibilities to evaluate the increase the air traffic and the different benefits to be accrued by the affected territory. The impact of tourist traffic growth is well described in the Airgest SpA documents. At the same time, the local plans should put the Airport in its specific context: the benefits on the province GDP growth do not offset the problems of the urban settlements in the vicinity of the Airport and the territorial location. The Airport and the region, indeed, are strictly linked, as witnessed in the transformation of the mouth on Birgi River, carried out for the construction of the Airport (1961). The infrastructure is sited in a highly protected area between the Salt Flat of Trapani and the Stagnone of Marsala, home to different types of fauna and flora.[18] Moreover, the lack of water resources affects the entire area, both an important territorial issue for agricultural development and one of the tourist assets of the whole Province. Again, regarding tourism development, the beaches close to the airport lack public lighting. A little bit more to South (less than 10 km) one of the most prominent examples of the archeological industrial heritage of entire Italy, the structures of the old seaplane base of Marsala, built by Pierluigi Nervi, a real point of tourist attraction, show a remarkable state of neglect. Sicily Region has now invested 17 M Euro to promote the development of the Province, trying to solve the problems of Birgi Airport following the Ryanair defection. Therefore, notwithstanding action about the problem of coexistence between aircraft and the birds, there are no other programs in terms of pollution or general territorial risks. The particular features of the Largest SpA management underpin this character in terms of regional adaptation. Still, in the recent past, the underassessment of risk determined the congestion of the airport. Therefore, from the perspective of new routes and touristic traffic growth, the analysis of risks acquires the central importance. All the highlighted problems have a distinct impact on the territory in terms of accessibility and connectivity, in terms of future costs to manage for the Airgest SpA and the tourist companies in general.

4.1 TOURIST SITES CATCHMENT AREAS

The Regional Transport Plan[19] highlights the relationship between urban sprawl and the environmental problem in a system of analysis that starts with data acquired by phone calls (CATI). The following formula supports the results of the CUBE software model adopted:

$$Sij = (Ei \cdot Aj \cdot f(Tij))/(\Sigma Aj \cdot f(Tij))^{20}$$

$j=1,\ldots,n$

The OD matrix obtained through the application of the Friction Factor based on extensive phone calls (CATI model), was split between the different transport modes, the choice of one certain alternative being based on utility (Multinomial Logit). Crossing this evaluation with the matrix OD derived from home-based return trips,

[16] Public Service Obligation (PSO) which involves the concept of Level of Service (LOS)

[17] "From this finding, it can be concluded that an optimal long-term strategy for small-sized airports should be not to increase the capacity unless a certain threshold for the utilization of current capacity is reached." (AA.VV., 2014)

[18] The archipelago of the Stagnone Islands covers an area of 2,000 hectares and extends between Punta San Teodoro and Capo Lilibeo. The Reserve, established in 1984, includes the entire lagoon bounded by the open sea from the island Grande or Longa, with three small islands in its interior, Mozia, Santa Maria and Schola. The lagoon has a very relevant naturalistic interest and great scenic beauty.

[19] (http://pti.regione.sicilia.it/, s.d.)

[20] Formula deduct from the methodology applied by the Regional Transport Plan (Technical Report, Regional Transport Plan), which determines the distribution of occasional travels through a gravitational model, where: Ei is the number of total trips with origin in zone i; Aj is the number of total displacements attracted by the zone j; f (Tij) is the impedance factor between zones i and j.

which provides a measure of the result of the mobility demand, confirms the metropolitan city of Palermo as the most important regional attractor of mobility, with a share of about 17% of the total movements, including home-based return trips. In the Region, Trapani generates the largest number of movements to Palermo with 21,100 daily trips. The CUBE software, using time as the deterrence factor: TC = T0 [1+a(V/C)b][21]. The CUBE software explains that the metropolitan areas and the coasts are mostly affected by the transport system. Likewise, it shows the importance of the railway system and the difficulty of reaching the coastal zone of Trapani from the metropolitan area of Palermo. The investment requirements emerging from this analysis focus on the road and railway systems to improve connections between Trapani and Palermo and on to the nearest south zones. The weakness of this approach is to be found in the multiple management plans, in deregulation, but also in the absence of environmental considerations, the absence of bonds with risk analysis, above all related to the different time scheduling of the investments.

The current analysis places the Airport System of Sicily Region and, consequently, the Airport of Trapani as the key nodes of the network.

The network is built around the principal roads of Sicily Region, subdivided into different sections by typology, length, and maximum speed. The primary maritime routes which connect the Province of Trapani with its Islands are included too, converting average rate from knots to kilometers per hour. On the other side, railway lines and railway stations, always subdivided into sections with maximum speed and typology, complete the network. Sicily Region is mapped by Provinces and by Municipalities, and they are all subdivided by population from 2011 to 2018 and by GDP from 2011 to 2016. Thus, it has been possible to describe the variations in percentage both in terms of population density per year and GDP per year. The work about the Municipalities has been completed by the georeferenced districts subdivided by population with 2011 as the base year.

About the Province of Trapani, the tourism facilities have been georeferenced, classed by Municipality, Address, Typology, Bed Places, and Category (2016 values).

In the same way, Health facilities have been located and classed by Address, Name, Typology, Phone Number, Bed Places, Ward typology, Day Hospital, and Use (2016 values).

The connectivity measurement has been performed by Network Analysis tools, building the following matrixes:

- Origin - Destination Matrix between Municipalities and Airports (TP and PA Provinces);
- Origin - Destination Matrix between Tourist Facilities and Municipalities with small tourist villages (TP province);
- Origin - Destination Matrix between Health Facilities and Municipalities with small tourist villages (TP province);
- Origin - Destination Matrix between Trapani and Palermo Airport and Touristic Facilities (TP province);
- Location - Allocation Matrix between Airport of Trapani, Health facilities and Tourism Facilities.

Looking for the areas which have the best GDPpc variation and the highest lack of connections in terms of travel time, so the lowest accessibility, the structure of the work done, can be displayed as in the following scheme (Graph 3). The OD Matrix bases its development on the Dijkstra's algorithm on a graph with edges V and vertices A, expressed as a function of the number of edges, denoted |V|, and the number of vertices, denoted |A|, using big-O notation (a mathematical notation that describes the limiting behavior of a function when the argument tends towards a particular value or infinity):

$$O((|A|+|V|)\log_2|A|)$$

It is useful to determine the distribution of journeys by minimum time and minimum cost, to build a classification of time-journey and time-cost between the different vertices and the demand points of the diverse using models.

[21] Formula deduct from the methodology applied by the Regional Transport Plan (Technical Report, Regional Transport Plan, (http://pti.regione.sicilia.it/, s.d.))

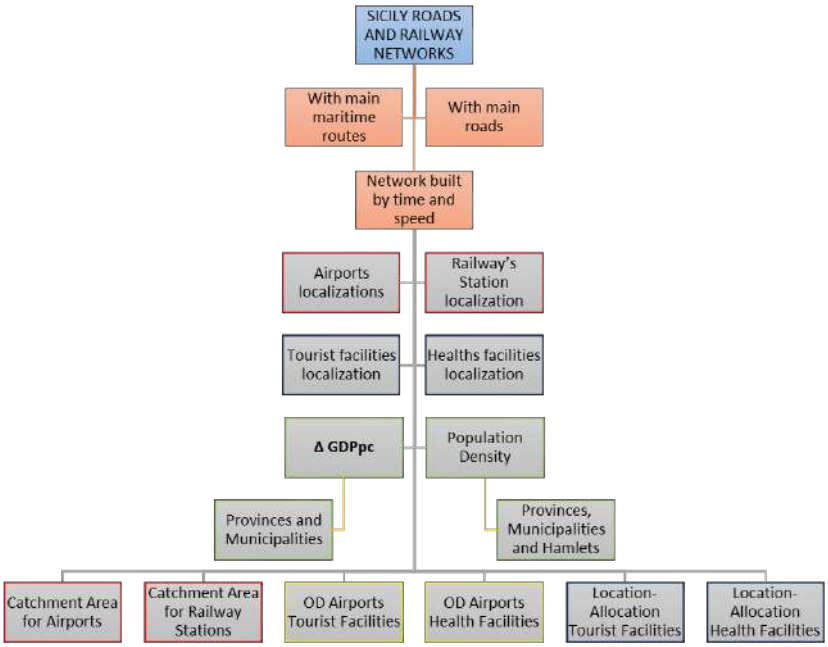


Fig.5 GIS Model

A direct survey of the catchment area for both airports (Fig.6), served by fast routes and railways, shows the difficulty for the Southern regions (especially the Province of Agrigento), to reach Birgi Airport. The consequent GDP reduction could be relevant for the Airport management. This means that in 2017 for 102 Municipalities in that area, the time-lapse to reach any of the four airports are more than 90 minutes and the corresponding sum of the same municipalities' GDP is almost of 900,000 euro, affecting nearly 700,000 inhabitants, 25% of the entire population of Sicily. For nearly 130,000 inhabitants, the travel time from the airports of the West coast is of 1.5 hours, involving GDP losses of almost 250,000 euros. Those data point out the possibility to extend the catchment area of the West Airport Node to the West part of the Provinces of Agrigento, Enna, Caltanissetta and Messina and towards the easternmost part of the Provinces of Palermo and Trapani.

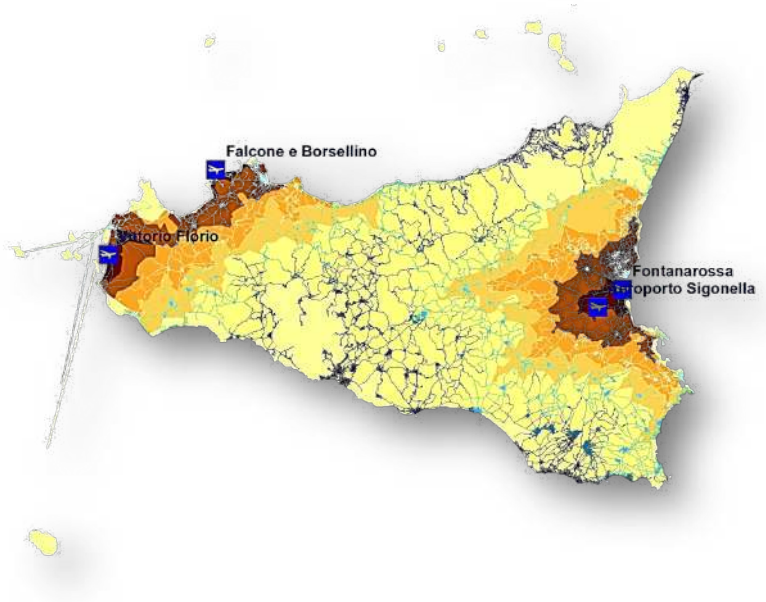


Fig.6 Sicily' Airports Catchment Area

In the same way, the analysis of the tourist and health facilities time distances, always made by travel time on road and railways, could be essential to appraise the possibility to improve the railway connections in the province of Trapani and to the others, provinces, to strengthen the railway capacity and to speed up the introduction of new technologies.

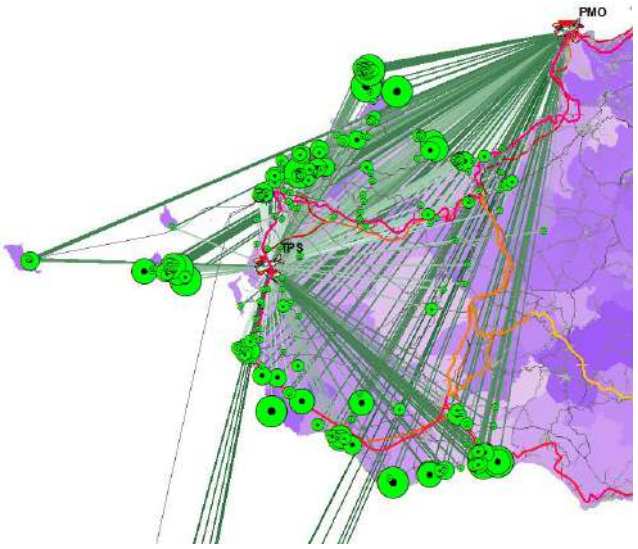


Fig.7 OD Cost-Matrix Facilities of Trapani' Province and the Airports of the West Pole

The OD Matrix between the two airports connects the 322 tourist facilities in the Province of Trapani (Fig. 7) with the two Airports of the West Node; results highlight the possibility to arrive faster from Palermo to a lot of facilities in the Province of Trapani, especially those located in the South of the Province.

Concerning health facilities, the network shows the most used hospitals of Castelvetrano and Alcamo with a deep connection to the tourist facilities of the territory, and this underlines the role of the two neighboring provinces, but also the risks of increasing demands of coastal tourism development. This simple consideration highlights the possibility to consider the links between the Airport and the towns: in the OD matrix between the two Airports and Towns (including their sections the Province of Trapani, the lack of the road and transport network towards the East and the South area of the province of Trapani appears obvious again. The analysis of the buffers (creating polygons around input features to a specific distance) shows the lack of linkages The polygons are managed crossing data between the two new roads, built to connect the Airport of Trapani and both the Tourism Facilities and Towns (with hamlets, and villages) of the Province of Trapani (considering the main Island) in the highway network. The result shows a critical unserved area in the middle of the province and low service connections in the South-east. The gap follows the variation of the percentage of GDPpc, underlining the active link between the transport network, tourism, and GDPpc. But also the contrast with the significant number of overserved zones highlights redundancies in the network system. Likewise, the same GIS analysis shows in the maps, the edge of the GDPpc polygon emerging from the appraisal of the other polygons in the research area, also built around the railway stations. The GDPpc variation is underlined by the evaluation of the different regions, elaborated crossing data from the area's polygons built around the railway stations, too (the zone regards the 15 minutes to achieve the stations).

The development of the railway network can be beneficial for the Province and connections with the South and the central part of the Sicily. Still, it must be considered in the development of the roadway network in the central zone of the Province. Thence, the accessibility becomes a more significant problem, in regard not only to the specific Airport and Railway but also to the different possibilities to reach those. Railway and other systems of mobility could guarantee the growth of the central zone (Fig. 8), also addressing there the tourist growth, linked to an expected boom of passenger flows in Birgi Airport.

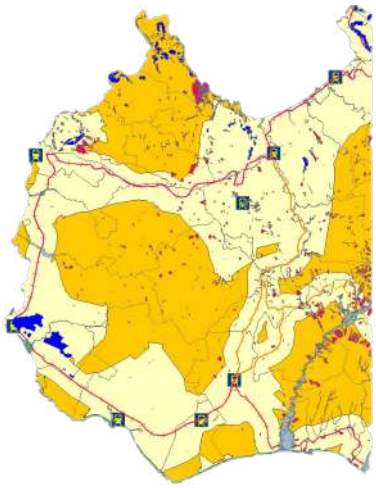


Fig. 8: Unserved Area

This should be for certain advantages in terms of time, costs, and connectivity, but also a way to reduce environmental pollution and to grant the public direct access to the airport's terminal. The links between the airport and surrounding areas should be considered in terms of quality and environmental assessment but a multi-scale coordinated growth plan. As in the Regional Transport Plan, the connections between the maritime routes acquire a crucial dimension in terms of capacity. Therefore, it all implies re-thinking the entire design of the coastal development in one organic and structured plan for accessibility, the centrality of the Airport, and the protection of its specific neighborhoods.

4.2 PLANNING COORDINATION AND MARKETING ALTERNATIVES

The dialogue between the infrastructure and its surrounding areas should be approached in terms of capacity and designed with a particular perspective of integration and preservation of the areas from the impact of pollution. This means to grant particular importance to the integration among the different structures of the landscape. Preservation of the different functions involves the development of the entire system: neighborhoods, coastal and other protected areas (water pollution, green preservation, bird's diversity, etc.); likewise, the development of the airport functions (civil, military, parking slots, etc.) should take care of the impact on anthropic growth.

Fig. 9 Idea for a design planning of the node. 1) Connection to the railway; 2) Adequate, new terminal; 3) Green road to protect the exixtent canal to the sea (Font: Authors)

Thence, at least, the different air carriers could find in the specific airport the possibility to develop their traffic and to guarantee the presence of more vectors. Even if in support of the Palermo traffic growth, that type of development should ensure the independence of Trapani growth. In the overall consideration made about the companies of the Trapani Airport, design plays a crucial role in terms of different types of tourist traffic too. This feature could take advantage of the contraction of revenues from aeronautical and airport fees from the perspective of growth, playing on the differentiation of tourist traffic. Moreover, a complex design re-thinking of the aerodrome and its specific surroundings should guarantee the benchmark development of the non-aviation components (Fig. 9). In the GIS model described, the problems of impact assessment derived from the growth of tourism traffic related to the Airport go on unsolved.

The infrastructural development approached through a single perspective of control where the different interests live together, the distribution of revenue, and the military functions are the main topics upon which to build up the dialogue.

Both the regional infrastructure plans and the airports' marketing strategies may be considered a practical approach to increase tourist flows and the involvement of residents at a broader scale, which is the least served area at a greater distance from the airports.

In September 2018, after the first summer season without Ryanair, in the heart of the touristic crisis, newspapers and the media at large were focused on the visit to Trapani of the US ambassador, to promote tourism and the cargo operations with the US. This recent visit strengthens the importance of the other continents, and it underlines the freight traffic improvement too, as shown in the actual data furnished by the Chamber of Commerce, which highlights the primary role of Trapani's exports.

The importance of a comprehensive design plan finds its justification in the tourist hub and the single infrastructure design with the involvement of railways, roadways, and ports, there included the dialogue among municipal and provincial plans.

The simple SWOT analysis shown below can summarize the development perspectives to be implemented for the Trapani Airport (Tab. 1).

STRENGTHS	
The Traffic PAX growth	The increase of passenger traffic using Low-Cost Carriers is an asset for the business of the entire Province
The History of Trapani and the cultural tourism	History and the cultural framework highlight the main role of the city in the Sicilian heritage, by way of growth and business development. A key issue is that of contemporary engineering, architecture and artistic presence in the Province. The scenic reserve of Stagnone Island and its archipelago is another important attraction point.
Export Statement	The positive value of the export business gives both Trapani and Marsala a relevant role in the Siciliy Region
Capacity Building	With its location in the middle of the West Coast transport system development, the Airport can be improved: there is some derelict land around it and runways could seemingly be improved. The possibility of using undeveloped areas to cater for growth adapted to the needs and in which to plan the desired expansion of the take-off and landing runways
Stock Company Balance Sheet	The reduction of debts in the last year, in the dramatic situation of the collapse of tourist flows, allows hope to reach a Pax growth.
WEAKNESSES	
Accessibility	The airfield suffers from limited accessibility, but also in the entire Province the transportation infrastructure is in a dangerous state of decay.

Setting up network connections	The disproportional surge in tourist traffic as well as a shortage of transport infrastructure in Sicily, make up a barrier to keeping part of the transit tourist flows in the area
Location	The management of the area in which the airport is situated, between the two cities of Trapani and Palermo has to be sorted out
Low-Cost Companies	The low-cost market increases the multimodal system while boosting tourist traffic growth and economic benefits
OPPORTUNITIES	
Comprehensive Airport near *Core* Airport	Trapani is a part of the Core Palermo Airport and a part of Scan Med in the Trans-European Transport Network
Terminal Building	Despite the last adjustment, the Terminal needs some upgrade to cater for the expected growth
Network attractiveness	Joint management for both airports may satisfy more effectively the urge of the area for the airlines business, thus triggering a key role for Trapani
Public Transport Linkage	To link the railway station to Trapani Airport could change the habits, but it should be accompanied by a better service, which could be easily assured by bus.
Harbor Linkage	The link between Ports (Palermo and Marsala) and Airport can be an asset for the whole city
NATO Base	NATO activities can bring in additional traffic demands to the Airport
West coast tourism growth	The Trapani tourist attraction affects Trapani Airport and its forecast growth plan
Environmental development	The Airport is situated close to the Tirrenic Sea and the urban centers of two historical cities, in a Protected Area of the Region. Further resources could be mobilized integrating economic development with the valuable landscape, under a comprehensive policy of tourist resource development
THREATS	
Empiric attitude and short period interventions	The business catchment area strategy finds its basis in new tourist routes. A problem-solving strategy apparently depends on economic reasons only.
Predominance of private sectoral interests	The Trapani airport system is strictly dependent on single management, in turn, reliant on the public decision-maker, who in turn is dependent on government decisions about fund allocations
Underestimate of environmental risks	The current absence of links with the Public Aqueduct, casts some doubts regarding the choices on the system Military – Civil of the Airport to guarantee protection for the sensitive areas.
Further urban development in dangerous areas closed to the runways	There is no Development Plan for the areas close to the Airport and this stresses the dangerous impact, an obstacle for those areas to become integrated in the city the problem affects the development of Airport fringe areas
Technocratic attitude ignoring stakeholders	Insufficient administrative capacity to prepare and manage EU-funded projects
Potential Impact	The prospect of an additional income of the area, the underestimation of entry barriers and the environmental risk
NATO Base	The military functions could hinder the normal airport activities

Tab. 1 SWOT Analysis

5 CONCLUSION

In the Airport of Trapani, different planning systems coexist, and the constraints increase the specific characters of the surroundings. Investment perspectives focus on overcoming constraints, but the absence of a comprehensive design plan stresses the overlapping effects, above all, on the airports' fringe areas. The impact of the Airport on the surroundings underlines the disruption of the areas prospicient the sea, anyway on the

canal that starts from there, on the south of the Airport. A perspective of growth should be considerate as the possibility to link the railway line to the terminal. This one has to be enlarged, acquiring different new functions. Moreover, it must find a way to protect the fringe area and to improve accessibility, so a greenway along the canal seems to be the first step to protect the environment in proximity to the existing transport infrastructure[22]. Solving problems for an airport and a city must press the collaboration among the two airports, giving positive effects to the airline competition. The analysis conduct on the Sicily Airport System underlines the importance of the underserved areas and the economic evaluation of the most distant clusters of the catchment area. Therefore, it seems that the strengthening of the relationships between the two airports can give more possibilities to equilibrate growth. The cooperation can be an effort to discover and transform in resource the historical heritage of the hinterland. Despite the considerable difference of traffic between the two airports, the Airport of Trapani, in this sense, can play a leading role, helped by the key part of Marsala city on the South Coast. These considerations follow the idea of the European Agenda 2020, try to find a way to dialogue between the different transport systems in the network, improving the existent infrastructures to gain the most collaborative planning growth. The tourist traffic is only a part of the air traffic managed by the two airports, and the studies of the network are ongoing to give an effort to the impact assessment regarding the improvement of domestic transportation, their frequencies, over the new international routes' search. A more equilibrate system of the internal traffic flows can be assured by the involvement of Trapani Airport, so to underline its specific role in support to Palermo Airport, as depicted in the National Transport Plan.

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https://www.asi.it

IMAGE SOURCES

Figg. 1, 2, 3, 4,5, 6: Generated by authors
Graph 1: airgest; Graph 2, 3: Generated by authors
Fig. 3: Image is obtained from Google Earth.
Fig. 4: Images are obtained from Google Earth.
Fig. 5: Generated by authors using ArcMap 10.1.
Fig. 6: Generated by authors using ArcMap 10.1.
Fig. 7: Generated by authors using Microsoft Office Excel.

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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 3 (2019) 351-371
print ISSN 1970-9889, e-ISSN 1970-9870
doi: http://dx.doi.org/10.6092/1970-9870/6528

www.tema.unina.it

REVIEWS PAGES

THE TIMES THEY ARE A-CHANGIN' 3(2019)

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.

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

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

author: Federica Gaglione
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04_UBAN PRACTICES
Urban practices describes the most innovative application in practice of the journal theme.

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

author: Andrea Tulisi
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TeMA
Journal of
Land Use, Mobility and Environment

TeMA 3 (2019) 351-371
print ISSN 1970-9889, e-ISSN 1970-9870
doi: http://dx.doi.org/10.6092/1970-9870/6528

www.tema.unina.it

评述页：

提高城市系统对自然及人为变化顺应能力的方法、工具和最佳实践

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

01_WEB RESOURCES
网站报告为读者提供与主题直接相关的网页。

author: Rosa Morosini
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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: Carmen Guida
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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: Federica Gaglione
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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。

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

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01

THE TIMES THEY ARE A – CHANGIN' 3(2019)

REVIEW PAGES: WEB RESOURCES

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In this number

SOIL: A RESOURCE TO PROTECT ONLY FROM WATERPROOFING? THE EFFECTS OF POLLUTANTS

The urgency to concretely adopt new patterns of development, promoting the reduction of soil consumption and of natural resources, in particular the ones that are not capable of regeneration in a foreseeable future, has led the attention of researchers and decision-makers on soil and land resources (Mazzeo & Russo, 2016; Zucaro & Morosini, 2018). As soil formation is an extremely slow process, soil can be considered essentially as a non-renewable resource; in order to ensure several functions, it is necessary to monitor and protect the functionality and the state of health of that system.

These needs have arisen in an increasingly way from the Earth Summit in Rio de Janeiro (1992), the first global conference of Heads of State concerning environmental issues and from the sixth action program of European Commission (EU, 2011), actualized in the Soil Thematic Strategy COM (EU, 2006). In this document, it is recognized that soil degradation is driven or exacerbated by human activities such as urban and industrial sprawl, but also by inappropriate farming and forestry practices.

If on one hand it is necessary to stop waterproofing phenomena, on the other hand it is essential to focus on farming and forestry activities that, due to the use of contaminants, can result in lack of fertility, of carbon, biodiversity, of water reservoir capacity, even alternating nutrients cycles.

In this perspective, it is possible to claim that contaminant have an extremely negative impact on soil, preventing the system to perform functions and services to men and the ecosystem. Moreover, contaminants tend to accumulate in soil for long period; this causes that damages are often detected in a very advanced state and sometimes they are irreversible. As a consequence, the quality of a good soil is different according to functions' priorities and its uses.

Moreover, it is not easy to link people health to environmental conditions; it gets even harder if soil is taken into account, because of long term effects and of multiple sources of exposure to contaminants.

A solution could be to monitor pollutants whose harmful effects on human beings have been proved by scientific literature. According to this perspective, it seems appropriate that, during decision-making processes concerning territorial transformation, technicians and administrators have to consider for each soil also past, present and in-coming contamination phenomenon, of every genre and nature, since it will have a limited destination and intensity of use. The contamination history has definitely effects on soil characteristics and its resilience fails both in terms of mechanical and functional features.

EPC
https://www.environmentalpollutioncenters.org/soil/

The Environmental pollution centers (EPC) is a website designed with the objective to raise awareness on environmental issues and on their impacts on people daily activities. The website contains wealth of information related to natural resources pollution. There are several detailed sections concerning these topics. In particular, on the top right of the homepage, there are links that lead to specific pages with one simple click; they are seven: about; latest news; soil; air; food; radiation. At the end of sections' links, it is possible to make a keyword search, directly from the Search box. Each section is organized in subsections, in particular, clicking on the one dedicated to soil, it is possible to access to the introductive page where the phenomenon of soil contamination is presented. Its subsections are five:

- causes;
- types;
- contaminants;
- diseases;
- facts.

In the subsections titled "causes", a lot of information is given concerning the causes of soil pollution classifying them in those naturally present and others produced by human action. In the first case, the attention is paid to contaminants that are generated from the microbial activity and from decaying organisms; while, for the second case the contaminants are produced by men, usually linked to improper disposal of industrial or urban refuse or from farming activities (pesticide). In the following section, "types", many kinds of contaminants are reported.
The third subsection "contaminants" gives a list of examples which are very harmful contaminants for people health and there are some boxes through which it is possible to deep the knowledge referred to each element. The following and last sections, "deseases" and "facts", are mostly dedicated to illnesses and consequences of a high presence of contaminants in soils.
The section "latest news" is very interesting and it is organized in two parts: on the right, there are different boxes, including the archive, arranged per month and per year; with one simple click you can access to a huge catalogue of articles. On the left, instead, there are articles and texts' previews, organized by topic.
At the bottom of each principal section, there are some links to articles that could be helpful to deepen the topic of this specific session.
In the homepage, above the search bar tool, there are the main social media links, Facebook, Twitter and LinkedIn.

ESDAC
https://esdac.jrc.ec.europa.eu/themes/soil-contamination

European soil data centre (ESDAC) has the aim to manage relevant information concerning soil and the European polices. Through the collection of data, the project includes the drafting of future scenarios thanks to advanced modelling techniques and analyses based on the main threats identified by the Soil Thematic Strategy (erosion, decomposition of organic matter, compaction, salinization, landslides, waterproofing,

contamination and lack of soil biodiversity). A strong scientific and technical support to the United Nations Convention to Combat Desertification (UNCCD) will be provided by promoting the reform of the Committee of Science and Technology (CST) of the UNCCD and by the development of an operational Global Soil Information System (GLOSIS) for the regular assessment of global soil degradation processes. ESDAC provides a coherent approach to soil data collection and distribution for all different policy areas and initiatives relevant to the EU, while assuring high scientific quality, policy relevance and technical support as needed.

The **European Soil Data Centre (ESDAC)** is the thematic centre for soil related data in Europe. Its ambition is to be the single reference point for and to host all relevant soil data and information at European level. It contains a number of resources that are organized and presented in various ways: datasets, services/applications, maps, documents, events, projects and external links. In fact, the website is well organized in three main sections: home, about ESDAC and Atlases. In the Home section there are three further subsections: dataset highlights; applications and services; scientific-technical reports. In these subsections there are several links that allow the user not only to easily consult the available scientific materials but also other websites. On the left, there is a box with useful links. Starting from the top, in the box there is the bar tool to make the keyword search and just below there are newsletter and events.

Another interesting section is Atlases where there are covers from Atlas such as "soil Atlas of Africa"; "soil Atlas of Europe"; "global soil biodiversity Atlas" and so on. For each Atlas, in addition to the cover, there is a short description of the contents and with one simple click on the link (above the description), it is possible to connect to the informative section of each atlas.

ECOREMED
http://www.ecoremed.it

ECOREMED is a project aimed at the reclamation of contaminated sites in Campania Region where, the storage of compounds derived from oil, steel industry, steelworks and from the production of concrete-asbestos is one of the main sources of pollution. In addition, the principal cause of pollution of the Vesuvian coast is the careless management of solid waste. It is a very innovative project that could be studied to promote its dissemination in other counties, since the during the last century a relevant increase of global pollution has been recorded, because of the excessive production and use of chemical compounds deriving prof oil, recklessly released into the environment. The main objective is to promote a high-quality environment where levels of pollutants from human activities have no significant impacts or do not represent a risk for human health. In this regard, the action is planned to protect nature and biodiversity, following the specific indications on EU laws, 92/43/CEE – "Conservation of natural habitats and wild fauna and flora" (21.05.92); Decision 93/626/CEE of the Council – "Conclusion of the Convention on Biological Diversity" (25.10.93); COM (98) 42 def. – "The Communication on a Community Biodiversity Strategy" (05.02.98); COM (2001) 162 def. – "Biodiversity Action Plan for the Conservation of Natural Resources". Furthermore, the project is sustained by several partners such as Campania Region and in particular the Agricultural Department, Risorsa, which is a research society that deals with agriculture, and Arpac, the regional agency of environmental protection.

The website is organized in eight sections:

- home;
- the project;
- partners;
- download;
- dissemination;

- events;
- links;
- contacts.

Among these sections, the more interesting and user-friendly are download, dissemination, event and links. Referring to these sections, it is possible to consult and download several materials related to soil contamination issue. The download section, in particular, is made of three subsections: publications, where all works made in contaminated sites are listed, such as proceedings and Ph.D. thesis. The other two subsections are ECORMED paper and ECORMED results, where products and results obtained from the project activities can be consulted. Also, the section dissemination is made of three parts, where all the dissemination actions are presented as well as the interviews made during the project. The section "events", instead, is rich of events organized by partners: from conferences to workshops. Finally, the section links show the logos of different national and international projects. With one simple click on the logo it is possible to access quickly to the website.

Links to social network such as Facebook, Twitter, and YouTube are shown on the right side of the homepage.

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IMAGE SOURCES

The images are from: www.environmentalpollutioncenters.org/soil/; esdac.jrc.ec.europa.eu/themes/soil-contamination; www.ecoremed.it.

02

THE TIMES THEY ARE A – CHANGIN 3(2019)

REVIEW PAGES: BOOKS AND JOURNALS

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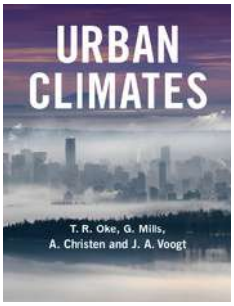
In this number

CLIMATE CHANGE: TOWARDS ENGINEERING SOLUTIONS

The DICEA, Department of Civil, Building and Environmental Engineering of University Federico II of Naples, hosted, between the 7th and the 11st October, the first edition of the Short Mediterranean Ph.D. School on Impacts of Climate Change and Sustainable Engineering Responses. It was a great opportunity to highlight how climate change and the growth of urban population are widely recognized as the major drivers of change in the 21st century (Galderisi, 2014) and that engineering responses are useful both to mitigate the impacts of these phenomena and to adapt human environments, limiting their vulnerability.

The word *climate* derives from the Greek word *klima*, which means *inclination* and does not refer to weather forecasts but to the average status of the ocean-earth-atmosphere system in a long period, at least thirty years. According to IPCC (Intergovernmental Panel on Climate Change), climate change represents one of the most challenging issues of our time, and it refers to any change in climate over time caused both by natural variability and human activities. The exponential increase of GHG (Greenhouse gases) emissions during the last century is considered the main responsible of extreme weather events (Icaza, Van der Hoeven, & Van den Dobbelsteen, 2016). Urban environments play a double role in this scenario: on one hand urban lifestyle and economy are responsible for the 70% of GHG emissions (Gargiulo & Lombardi, 2016) and for the consumption of natural resources (Zullo et al., 2015); on the other, cities are both vulnerable and exposed to the impacts of climate change, so that they require serious and effective strategies in order to prevent the potential damage to urban population. Up to few years ago, major efforts have been payed to mitigation strategies, aimed at reducing GHG emissions, while less attention has been devoted to adaptation strategies, capable of improving cities' responses to phenomena related to climate change. The focus on adaptation strategies is due to the awareness that climate change will inevitably occur, and its impacts will be particularly severe in urban areas. Moreover, scientific models predict that by the end of the century the average temperature of global surface would increase of 2°C, that would produce irreparable damages to nature, human beings and animals: the XXI century could be remembered as the century during which people would have limited climate change, preserving resources to future generations. This awareness should further encourage policy makers to invest both in mitigation and adaptation strategies, starting from urban environments. The section "Books and Journals" is focused on engineering solutions, starting with the classification of urban climates and then defining strategies to make cities more resilient, both from the planning and the architectural point of view.



Title: **Urban Climates**
Author/Editor: T. R. Oke, G. Mills, A. Christen, J. A. Voogt
Publisher: Cambridge University Press
Publication year: 2017
ISBN code: 9781139016476 (ebk)

Urban Climates is the first full synthesis of modern scientific and applied research on urban climates. The book begins with an outline of what constitutes an urban ecosystem. It develops a comprehensive terminology for the subject using scale and surface classification as key constructs. It explains the physical principles governing the creation of distinct urban climates, such as airflow around buildings, the heat island, precipitation modification and air pollution, and it then illustrates how this knowledge can be applied to moderate the undesirable consequences of urban development and help create more sustainable and resilient cities. With urban climate science now a fully-fledged field, this timely book fulfills the need to bring together the disparate parts of climate research on cities into a coherent framework. It is an ideal resource for students and researchers in fields such as climatology, urban hydrology, air quality, environmental engineering and urban design.

Urban climatology is concerned with interactions between a city and the overlying atmosphere. While interactions are two-way, this book is mainly focused on the impact of the city on the atmosphere. Urban development so fundamentally transforms the preexisting biophysical landscape that a city creates its own climate. The book also considers the effects of weather and climate on the city. As an object of study, a city initially presents a climatologist with a gloriously elaborate set of knotty challenges. They include questions of how to handle a dauntingly wide array of surface elements of very different sizes and compositions, along with the fact that the vast majority of them are alien to the natural landscape and include pulses of energy, water, gases and particles controlled by people rather than geophysical activity. Given these challenges and the desire of the rapidly growing world to live in cities, the book begins with an outline of the idea of urban ecosystems and suggests ways to approach the study of urban climates. Chapter 2 sets out a central theme of the book: to understand and effectively communicate about urban climate systems, a set of common terms, symbols, units, and descriptions of the urban surface is required. Here the authors adopted the Oke (1984) classification of urban climate systems that is built on scales of surface organization set by the roughness elements (mainly built structures) and scales of atmospheric motion and vertical stratification to systematize discussion. Chapter 3 is an overview of techniques used to obtain valid field observations and model results. The main exchange processes governing the budgets of momentum and radiation and the balances of heat, water, and carbon in cities are outlined. This permits description and analysis of the spatial distribution and dynamics of airflow, temperature, humidity, greenhouse gases, and air pollutants in urban areas in Chapters 4 through 11. These and other cloud processes are relevant to the potential effects of cities on cloud development, precipitation, and severe weather.

Urban air pollution has been a bane of urban living for centuries, but the mix of emissions keeps changing over history, as does the urban atmosphere into which it must be dispersed. It is useful and necessary to view things through the prism of scale. The text to this point deals with cases where micro and local effects are the prime controls on climate. On the other hand, Chapter 12 considers the role of orographic and coastal controls on urban climate, and the significance of the synoptic and macroclimatic context of a city.

In Chapter 13, the scale expands further to consider the increasing impacts of cities on global climate and how the altered state of that system in turn imposes impacts on city life. Chapter 14 introduces the fundamental climatic requirements of humans, our need for shelter and a comfortable environment to live and work, and how they set the context for the construction of appropriate buildings and urban infrastructure. In Chapter 15 we appeal to the principles outlined in the rest of the book to discuss ideas about intelligent and effective use of design elements such as construction materials, shade, shelter, water, and vegetation to create or modify urban climates at all scales. Urban Climates is thought to be a 'first' because it is a text designed to elucidate the general principles of the subject. There was an early attempt to do this in Chinese (Shuzhen and Chao, 1985), but this is the first in English.

Title: **The Urban Fix: Resilient Cities in the War Against Climate Change, Heat Islands and Overpopulation**
Author/Editor: Douglas Kelbaugh
Publisher: Taylor & Francis
Publication year: 2019
ISBN code: 9780429614453

Cities are one of the most significant contributors to global climate change. The rapid speed at which urban centers use large amounts of resources adds to the global crisis and can lead to extreme local heat. *The Urban Fix* addresses how urban design, planning and policies can counter the threats of climate change, urban heat islands and overpopulation, helping cities take full advantage of their inherent advantages and new technologies to catalyze social, cultural and physical solutions to combat the epic, unprecedented challenges humanity faces. The book fills a conspicuous void in the international dialogue on climate change and heat islands by examining both the environmental benefits in developed countries and the population benefit in developing countries. Urban heat islands can be addressed in incremental, manageable steps, such as planting trees and painting roofs white, which provide a more concrete and proactive sense of progress for policymakers and practitioners. This book is invaluable to anyone searching for a better understanding of the impact of resilient cities in the monumental and urgent fight against climate change and provides the tools to do so. The book is a collection of several studies, researches, professional and teaching practices.

Title: **Domus Ecoworld**
Editor-in-chief: Michele De Lucchi.
Print ISSN: 0012-5377

EcoWorld 2019 is the annex of Domus, an architecture and design journal, founded in 1928. Domus is listed as a Class A journal, according to the Italian Agency of Evaluation of University and research. EcoWorld 2019 tries to answer many questions related to the way architects and designers have to follow the 17 Global Goals, with the advice of Arup.
EcoWorld 2019 presents the main designing practices of current days and identifies potential policy areas, in order to meet the objectives defined by major world powers in 2015, as the evolution of those Millennium Development Goals signed in 2000, which were more focused on the poverty and needs of developing countries. Agenda 2030 has a wider range of action that previous agenda. Its 17 goals are very close to

designing practices, even thought the difficulty in defining the sustainability language makes complex its translation into practical procedures.

EcoWorld is made of four essays that explore topics related to cities and complex systems, through the identification of best practices made by Piero Pelizzaro – chief resilience officer at the Municipality of Milan – and a discussion concerning how powerful the architecture could be in "saving the world" by Richard Ingersoll – who highlights that territorial planning strategies are the more effective tools in order to provide concrete answers to climate change. Paolo Cresci and Jo Da Silva's works are on building practices and the main principles to design for man and nature, as also stated by four other international experts, interviewed by Domus. The journal also collects several architectural and design projects, selected worldwide, whose main topic is water saving and conservation.

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IMAGE SOURCES

The images are from: https://www.ilpost.it/2016/11/12/venezia-acqua-alta-foto/

03

THE TIMES THEY ARE A – CHANGIN 3 (2019)

REVIEW PAGES: LAWS

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In this number

"IMPROVE THE SUSTAINABILITY OF CITIES THROUGH SOFT MOBILITY"

The World Health Organization report estimates that the population in urban areas will continue to expand by over 1.5% per year until 2030 (WHO, 2010). Rapid urbanization implies, on the one hand, the need to satisfy a greater demand for travel in terms of access to urban places and services, but, on the other, it entails negative consequences for the urban system, such as increased traffic congestion, atmospheric and acoustic pollution This phenomenon requires the implementation of measures within cities aimed at spreading alternative modes of transport to the motorized one, which is still the most used transport mode, also for short distance trips. Encouraging pedestrian and cycle travels is a priority action to minimize urban air and noise pollution.

One of the possible solutions to discourage the use of private vehicles, without compromising the economic growth of cities and the possibility of accessing the services offered, is the creation of pedestrian and cycling networks, provided that their realization is effectively supported by road users (Masoumi & Shaygan, 2016).

The benefits of shifting from car use to cycling for urban trips would include saving 150 g of CO_2 per kilometre. For example, cycling 7 km would save 1 kg of CO_2 emission – compared to the same distance travelled by car – and could be a means to contribute to the pursuit of the goals of global sustainability set by the European Union in the context of international agreements for the transport sector. In favour of sustainable urban mobility, the European Union has promoted initiatives aimed at encouraging journeys on foot and by bicycle. In particular, the European Commission Work Programme for 2018 calls for the inclusion of an EU Roadmap for Cycling to take advantage of the environmental, health and economic cycling benefits. This document recommends a paradigm shift in transport policies to the European Commission, requiring a new sustainable hierarchy that gives priority to active modes of travel (walking or cycling). It highlights the need to promote, within the planning instruments, the improvement of pedestrian and cycling access to public transport stops and the realization, at the interchange points, of safe, attractive and easily accessible parking areas for the bicycles (available to all) and possible bike-sharing services, with the aim of increasing cycling mobility in the EU Member States over the next 10 years. It also underlines the active participation of local and regional authorities in compliance with the principles of subsidiarity, given that mobility and urban transport are the responsibility of local and regional authorities. Furthermore, cycling must become a distinct funding priority in the EU Research and Innovation programme called Horizon 2020 (Mobility for Growth).

In this perspective, it is recommended that the EC (Eurostat), on the one hand, draws up national documents as well as a database of good practices and an exchange of knowledge for the provision of cycling infrastructure, in order to obtain reliable and comparable data, on the other hand, that it develops a common methodology for collecting data and adopting harmonized definitions for national and urban data on bicycle use. It also proposes to include EuroVelo (the long-distance cycle route network) in the trans-European transport network (TEN-T), thus improving cross-border connections, developing tourism opportunities and increasing urban accessibility.

Cycling mobility

To achieve the set objectives, Law n. 2 of January 11, 2018 concerning the development of bicycle mobility provides for the creation of a national cycling route network aimed at developing the use of the bicycle as a means of transport to meet both daily and leisure needs and boost the tourist activity. The Member States, together with regions, local authorities and other interested parties, must pursue these objectives in order to make cycling a fundamental component of their mobility policies (Art. 1). In addition, the law introduces the regulatory definitions of cycle route, cycle route network, greenway, cycle path and their classification (Art. 2). Art. 3, in line with the objectives and aims of Article 1, provides for the adoption of a general three-year cycling mobility plan, which must be an integral part of the general plan for transport and logistics. The Plan will be adopted by decree of the Minister of Infrastructure and Transport, after consulting the Minister of the Environment and the Protection of the Territory and the Sea and the Minister of Cultural Heritage and Tourism, having subscribed to the agreement during the State-Regions and Autonomous Provinces Conference, and will be addressed to two specific areas of intervention:

- the development of cycling mobility in urban and metropolitan areas;
- the development of cycling mobility on routes defined at regional, national and European level.

The general plan for cycling mobility can be revised annually to take into account and incorporate future updates and amendments. Art. 4 regulates the identification of cycle paths of national interest that will constitute the national cycle network called "Bicitalia", the national-level infrastructure network that must be integrated into the "EuroVelo" trans-European network system within the plan for cycling mobility. This article defines some of the features of the Bicitalia network, such as:

- total development of no less than 20,000 km, articulated on routes throughout the national territory;
- integration and interconnection with the infrastructural networks supporting the other modes of transport, as well as with the other cycle networks in the area;
- continuity and interconnection with urban cycle networks, also through the construction of pedestrian areas and limited traffic zones, as well as through the adoption of traffic mitigation measures.

The financial, public and private resources allocated to cycling mobility and the identification of the methods of financing interventions are outlined in the Plans for cycling of municipalities and metropolitan cities. In order to achieve the aims of the provision, Art. 5 also requires that the regions prepare and approve, consistently with the regional plan of transport and logistics, a regional cycling mobility plan, lasting three years, to regulate the entire regional cycling system. The regional plan must be drawn up in accordance with the urban plans for sustainable mobility and the related programmes and projects presented by the municipalities and metropolitan cities; it must also define, among other things, the regional cycle network and the cycle routes included in the network called "Bicitalia". Metropolitan cities and non-metropolitan municipalities must define

the urban plans for cycling mobility (as regulated in Art. 6), called "Biciplan", which constitutes the sector-specific plan of the Sustainable Urban Mobility Plan (SUMP). Within this document, the municipalities should also outline the objectives, strategies and actions needed to promote the bicycle use. More in detail, Art. 6 includes the contents of the urban plans for cycling mobility, which define:

- the network of priority cycling routes or cycle paths in the municipal area that connects and crosses parts of the city along the main traffic routes, with efficient and safe infrastructures;
- the secondary network of cycle paths in neighbourhoods and inhabited centres;
- the network of green cycle paths that connects the green areas and the city parks to the rural areas of the municipal area;
- interventions that aim at the realization of networks, in coherence with the previsions of the superordinate sector-specific plans;
- the connection between the networks and the interventions defined in the previous points and the identification of areas of the city where priority must be given to cycle paths, roads 30 and pedestrian areas, and limited traffic zones;
- interventions that can be carried out on the main intersections with vehicular traffic, on the most dangerous points of the road network for pedestrians and cyclists and on the crossing points of large railway or motorway infrastructures;
- the objectives to be achieved in the territory of the municipality or the metropolitan city, in the three-year period of reference, in relation to the use of the bicycle as a means of transport, to the safety of cycling mobility and the modal split;
- any actions to encourage the use of bicycles for the daily commute to school or to work;
- interventions aimed at favouring the integration of cycling mobility with urban, regional and national public transport services;
- actions aimed at improving cyclist safety;
- actions aimed at combating bicycle theft;
- any useful actions to extend the spaces reserved for bicycle parking, primarily in proximity to school buildings, and those used for public functions or located near the main modal interchange nodes; actions to spread the use of bicycle sharing services (bike sharing);
- types of freight or people transport services that can be carried out by bicycles;
- the three-year financial program for the implementation of the interventions defined by the plan within a financial framework.

The Directorate-General for Climate and Energy, with the Ministerial Decree no. 417 of December 21, 2018, "Sustainable Urban Mobility Incentive Program", finances sustainable mobility projects in the municipalities with a population of not less than 50,000 inhabitants. In particular, it encourages the realization of projects involving the construction of new cycle paths capable of responding to the demand of daily commuter flows and the development of sharing mobility in urban areas.

City of Biella
BICIPLAN 2019-2021

In Italy, for example, the Municipality of Biella approved the Urban Plan for Cycling Mobility called "BICIPLAN" with a resolution of the City Council no. 18 of March 13, 2019. Within this Plan, the Municipality of Biella has set itself the objective of improving the safety of existing road connections through planned and widespread routine

maintenance to facilitate inflows and outflows and viability of vehicles, bicycles, pedestrians/sportsmen (improving the efficiency of public infrastructure), and to reduce traffic flows with interventions on the path direction and on critical pedestrian crossings, in order to improve cycling and pedestrian safety.

The provisions of the National Road Safety Plan (aimed at reducing the social costs deriving from road accidents and at improving air quality), regulate the creation of protected and reserved routes to: connect the pedestrian and bicycle tracks on urban and extra-urban stretches (through a reduction of the width of the roadway to slow down the speed of vehicles, a widening of pavements, the insertion of barriers to save pedestrians, the construction of raised pedestrian crossings with luminous signals, the removal of architectural barriers, a reorganization of vertical and horizontal signs to secure bus stops); strengthen the cycle network, in compliance with the technical standards required by the regulations, for sustainable mobility to support and enhance the usability of urban sites, starting from the busy main roads to encourage the use of bicycle as an alternative means of transport. These documents outline the need for a significant cultural change of the part of users who live in the city, depending on their will to change habits and behaviour.

The implementation of pedestrian and cycle networks, therefore, becomes a fundamental component to make cities more accessible to all, but also a new support able to enhance the historical and cultural heritage of the cities. In fact, the positive environmental impacts of the reduction of polluting emissions and the consequent overall improvement of air quality facilitates policies of re-appropriation of historical places of aggregation that can really make a cultural and social difference only without traffic congestion.

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IMAGE SOURCES

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03

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REVIEW PAGES: LAWS

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BICIPLAN 2019-2021

In Italy, for example, the Municipality of Biella approved the Urban Plan for Cycling Mobility called "BICIPLAN" with a resolution of the City Council no. 18 of March 13, 2019. Within this Plan, the Municipality of Biella has set itself the objective of improving the safety of existing road connections through planned and widespread routine

maintenance to facilitate inflows and outflows and viability of vehicles, bicycles, pedestrians/sportsmen (improving the efficiency of public infrastructure), and to reduce traffic flows with interventions on the path direction and on critical pedestrian crossings, in order to improve cycling and pedestrian safety.

The provisions of the National Road Safety Plan (aimed at reducing the social costs deriving from road accidents and at improving air quality), regulate the creation of protected and reserved routes to: connect the pedestrian and bicycle tracks on urban and extra-urban stretches (through a reduction of the width of the roadway to slow down the speed of vehicles, a widening of pavements, the insertion of barriers to save pedestrians, the construction of raised pedestrian crossings with luminous signals, the removal of architectural barriers, a reorganization of vertical and horizontal signs to secure bus stops); strengthen the cycle network, in compliance with the technical standards required by the regulations, for sustainable mobility to support and enhance the usability of urban sites, starting from the busy main roads to encourage the use of bicycle as an alternative means of transport. These documents outline the need for a significant cultural change of the part of users who live in the city, depending on their will to change habits and behaviour.

The implementation of pedestrian and cycle networks, therefore, becomes a fundamental component to make cities more accessible to all, but also a new support able to enhance the historical and cultural heritage of the cities. In fact, the positive environmental impacts of the reduction of polluting emissions and the consequent overall improvement of air quality facilitates policies of re-appropriation of historical places of aggregation that can really make a cultural and social difference only without traffic congestion.

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05

THE TIMES THEY ARE A – CHANGIN 3(2019)

REVIEW PAGES: NEWS AND EVENTS

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In this number

THE *CLOUD VOLUME* OF THE SMART CITY

In the twelfth edition of *Manifesta*, the biennial of contemporary art held in Palermo last year, there was an interesting installation by John Gerrard at Palazzo Ajutamicristo: the American artist has produced a detailed photographic survey of one of the main physical sites of Internet, the Google data center in Oklahoma; it is a huge structure composed of buildings of thousands of square meters that receive and distribute "immaterial" data produced every day in different parts of the world.

The interesting aspect of this operation lies in the ability to give body and volume to those that in the collective imagination are perceived as completely abstract and ephemeral networks that pervade our cities, providing them with a lot of services at "zero volume".

According to IDC, an international IT consultancy agency, the global data sphere is expected to grow to 163 billion zettabytes by 2025 (one ZB equals one trillion gigabytes), which is ten times more than the 16.1 ZB of data that existed just two years ago. More than a quarter of this data will be real-time and, of the latter, the real time IoT data will be more than 95%. Unthinkable numbers in 1986, when, according to Gartner, the volume of data in circulation amounted to only 281 petabytes (a petabyte is a millionth of a zettabyte).

Nonetheless, this constantly growing flow of data requires enormous collection centres to archive and process it; furthermore, due to the great success of the cloud this huge amount of data is not distributed in millions of devices in the world but increasingly preserved in large structures, which occupy huge areas, consume a huge amount of energy (Rong et al., 2016) and affect the economic strategies of territories and city.

In Norway, for example, the government is focusing heavily on the data center asset as strategy to repopulate the internal areas as well as an important growth sector for the entire country; it is expected that the construction in a small village in the north of the polar circle of one of the largest data centers in the world, will bring a significant increase of about 10/15000 employees in the entire area, thus enhancing the job opportunity of the two hundred students that each year graduate in technology at universities nearby.

Therefore, the data, considered by most as the black gold of the twenty-first century, will take on increasingly more substance and volume, becoming places, defining spaces and thus establishing a tangible dialogue with territories and cities. In the current academic context, the issue raised has not received particular interest from researchers, more focused on the potential of smart cities in terms of city services improvement (Angelidou, 2017); the conferences selected are therefore mainly focused on the theme of the smart city;

however, it would be interesting to contribute to enrich the debate on the topics proposed in the conferences with the suggestions created in this article.

THE SMART CITY EVENT

Where: Fort Lauderdale, Florida, USA
When: 11-14 February, 2020
https://www.thesmartcityevent.com/

One of the main events of this conference is the IoT Evolution's Smart City Event, focused on showing attendees how smart city innovations are changing the face of the today's modern city, improving quality of life for citizens and driving enterprise opportunity. In particular, the specific topics proposed are the following:

- 5G and smart city rollouts
- Regulatory issues and smart city rollouts
- Smart Transport and telematics
- Heterogenous networks - enabling smart city applications

THE MEETING OF THE MINDS 2020 ANNUAL SUMMIT

Where: Phoenix, USA
When: 19-21 February, 2020
https://events.meetingoftheminds.org/motm2020

Each year, more than 500 urban practitioners convene at the Meeting of the Minds Annual Summit to showcase recent successes and to discuss the ongoing challenges facing the future of smart and sustainable cities. The main idea is that a city really smart can make the living conditions of the population much more pleasant and can reduce budgetary costs by deploying smart services; therefore, the solution in today's conditions is to manage cities using information technology and communication, where millions of citizens may enjoy the maximum benefit of a project of this kind.

NORDIC SMART CITIES 2020

Where: Copenhagen, Denmark
When: 19th March, 2020
https://www.nordicsmartcities.com/

The underlying concept of this conference is that nowadays the technology offers an opportunity to change our cities for the better, but it is just an enabler, not the solution, the people must come first.
For this reason bringing citizens, politicians & city halls together to co-create outside of the box solutions to some of our biggest challenges City leaders need new ways of thinking about planning, designing & building our cities - putting the citizen & liveability at the heart of all future projects, developments & transformations. Every city or municipality is different, with different challenges and a different culture - for cities to become really smart they must embrace their unique context.

SMART CITIES CONNECT

Where: Denver, USA
When: 6-9 April, 2020
https://spring.smartcitiesconnect.org/

Smart Cities Connect Conference and Expo offers a comprehensive conference, exposition and accelerator of smart city innovation in North America. It aims to deliver premium networking and educational opportunities with a keen focus on city leaders and their priorities.

In particular the main issues of the conference will be the followings:

- Community Engagement (Policy, Funding, Commerce, Inclusion, Governance);
- Digital Transformation (Data, AI, Sensors, IoT, Cyber Security, Privacy, Blockchain);
- Smart Mobility (Transportation, Autonomous, Public Transit, Ride Share);
- Urban Infrastructure (Networks, 5G, Utilities, Energy, Grid, Lighting, Water/Waste);
- Urban Operations (Public Safety, Planning, Emergency Response, Sustainability).

REAL CORP 2020
Where: Aachen, Germany
When: 15-18 April, 2020
https://conference.corp.at/

The conference is the result of a reflection on the main trends that the cities of the world have in common in this historical moment, thus trying to stimulate a discussion on strategies and concepts for quality change management in the light of the main challenges which arise in neighborhoods, cities, urban regions and metropolitan areas. This also raises the question of who the actual actors of current urban, regional and metropolitan regional development are and what role planners can play in the corresponding scenarios. One of the raised argument is the role that the new technologies and digitization play in the development of cities, urban regions and metropolises; it will discussed in the session called "Cities and Technologies, Real Smart Cities, Intelligent Cities – High Tech and High Quality of Life: Best Practices and Concepts for the Future".

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