TeMA

Journal of
Land Use, Mobility and Environment

There are a number of different future-city visions being developed around the world at the moment: one of them is Smart Cities: ICT and big data availability may contribute to better understand and plan the city, improving efficiency, equity and quality of life. But these visions of utopia need an urgent reality check: this is one of the future challenges that Smart Cities have to face.

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Cover image: The ZCB Zero Carbon Building, designed by Ronald Lu & Partners, conceived to promote a low carbon emission lifestyle and to be a showcase of technologies to initiate a cultural change.

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TeMA Journal of
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TeMA Journal of
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EDITORIAL PREFACE:

CITIES, ENERGY AND BUILT ENVIRONMENT

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The improvement of energy efficiency is one of the main challenges we need to address to reach the objectives set by the EU 20-20-20 Strategy. Cities are responsible for two-thirds of the global energy consumption and this proportion is expected to grow further. Cities represent complex systems in which physical assets, strategic and economic activities as well as most of the world population are concentrated. Hence, to achieve relevant and enduring results in addressing energy efficiency issues, it is necessary to broaden our vision from the building scale to the whole urban structure. Urban planning is increasingly considered a crucial element in the long-term energy efficiency strategies. Hence, relevant and enduring results in addressing energy efficiency issues can be achieved, broadening our vision from the building scale to the entire urban system, and considering the relationships between the different urban components and energy consumption.

This issue of TeMA focuses on the topic of Cities, Energy and Built Environment. The first article, titled "Urban Planning Dealing with Change and Infrastructure", by Sonja Deppisch and Daniel Dittmer (Hafencity University Hamburg), deals with urban planning and the transformation processes that potentially affect local infrastructure. The overarching theoretical social-ecological resilience-thinking frame and its potential application as well as implications for urban land-use development. The paper illustrates two explorative studies in Germany. One study gains its material from a scenario process with planning practitioners and urban stakeholders of a medium-sized city. The second explorative study presents research results on the readiness to apply the resilience concept to urban planning, dealing with change and local infrastructure in a small community. The simulation shows that applying social-ecological resilience thinking to urban planning helps to critically consider the paths taken so far in building local infrastructure. Nevertheless, such a process requires additional financial, as well as human, resources and implementation tools. Also, the given path dependency as well as financial constraints are impeding the perception of any leeway in infrastructure development at the political level. The second article titled "Smart City and Metropoletan Area: the Energy Component in the Case Studies of Genoa and Naples" presented by Rosaria Battarra, Chiara Lombardi e Marco Raimondo deals with the metropolitan levels and proposes a survey of the experimentations carried out in the two Italian cities of Naples and Genoa referring in particular to the energy component. In order to define the inclination towards "smartness" of these two metropolitan Italian cities a methodology is developed. This survey was structured in two macro-phases: the first one aimed at collecting information

studying documents, databases, projects, programmes and actions, the second one based on stakeholder interviews. Authors highlight that from the analysis of the experiences and policies initiated in the metropolitan areas of Genoa and Naples, among the many themes defining Smart City, the energy component emerges as a central subject. In both case studies, in fact, smart actions are primarily aimed at energy saving or, alternatively, at environmental protection. The need to mainstream, in the regular urban planning process, actions and tools aimed at implementing energy saving is highlighted by the authors as one of the necessary condition to action.

The section Land Use, Mobility and Environment collects four articles. The first one titled "Less Smart More City" focuses on the Smart City concept evolution and its relationship with urban planning. The paper presents the results of research aimed at analyzing and interpreting the different formulations that are made of the term smart city mainly, but not exclusively, through lexical analysis, applied to a textual corpus of 156 definitions of smart city formulated in the last 15 years. In particular, the study identified the main groups of stakeholders that have taken part in the debate, and investigated the differences and convergences that can be detected between the approaches of the: Academic, Institutional, and Business worlds. Beyond the differences that characterize these three groups, it demonstrates that the debate is increasingly in the hands of businesses, while institutions take a secondary role and the scientific community tries to carve out its own space with difficulty within the themes promoted by research funding. The second one, titled "Urban development in Tuscany. Land uptake and landscapes changes", written by a group of researchers from the Universities of Aquila and Florence, addresses the phenomenon of urban sprawl. It has been already recognized as one of the major anthropic threats to natural ecosystems and landscapes while the negative aspects of the phenomenon are still only marginally taken into consideration in the scientific and local government circles. The study regards the processing of data on urban land conversion over the past 50 years and the effects in the areas of high environmental vulnerability in Tuscany, one of the most important Italian regions. The historical data was compared from a qualitative and quantitative point of view with the present-day geography of settlements, which showing changes found in today's settlement-territorial structure. The conclusions focuses on collated environmental criticalities and the margins for recovery of the compromised territories that still today receive little attention from central institutions and local authorities and that are scarcely taken into account by land management tools. The third one, titled "Smart City, Metropolitan Areas and Competitiveness: the case study of Florence", like Giffinger et al., considers the Smart City articulated in six dimensions. One of these is the Smart Economy, which refers to the activation of development processes that increase the competitiveness of urban systems. Among the results of the research activities, it suggests that some metropolitan areas, such as Florence, have invested in policies and actions aimed at implementation of Smart City in order to increase their competitiveness in key sectors of their economy. Therefore, after the description of the relationships identified in the scientific literature between Smart City and territorial competitiveness, this paper describes the policies and the measures adopted in Florence, regarding the sector of cultural heritage and tourism, for the constitution of the Metropolitan City. The last one, titled "Sustainable Urban Mobility Towards Smart Mobility: the Case Study of Bari Area. Italy", discusses preliminary findings of a Research Project conducted at University of Naples, DICEA, funded by EU (PON REC 04A2_00120 Asse II), "Smart Energy Master – Toward Energy-based approaches for Regional Planning". The primary goal of the work is to review policies, programs, projects for sustainable urban mobility and smart mobility solutions in the Bari area. The second goal is assess the trends of urban mobility in order to evaluate its sustainability and smartness. A comparison, focused on matching the local strategies to European programs, is presented. Finally, a consideration on how the "smart" framework may improve urban mobility planning is proposed.

Finally, the Review Pages define the general framework of the theme of Smart City, Energy and Built Environment with an updated focus of websites, publications, laws, urban practices and news and events on this subject.

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URBAN PLANNING DEALING WITH CHANGE AND INFRASTRUCTURE

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ABSTRACT

This paper deals with urban planning and change processes potentially impacting local infrastructure. The overarching theoretical frame is social-ecological resilience thinking and its potential application to as well as implications for urban land-use development. The paper draws its main attention on if this concept can be of use for urban planners dealing with change and urban infrastructure and if a readiness towards its application can be identified. This endeavor is informed by two explorative studies in Germany. One study gains its material from a scenario process with planning practitioners and further urban stakeholders of a medium-sized city. Main topic was how to deal with the challenges of climate change impacts in urban planning and development. The second explorative study reflects research results on the readiness to apply the resilience concept to urban planning dealing with change and local infrastructure in a small community. The scenario process showed that applying social-ecological resilience thinking to urban planning helps to critically reflect so far taken paths in local built infrastructure, to take on an integrated perspective and to develop new and innovative strategies for further land-use development. Nevertheless, such a process requires additional financial as well as human resources and translation exercises. Also, the given path dependency as well as financial constraints are hindering to perceive any leeway in infrastructure development at the political level, so that concrete implementation at the moment seems to be out of sight, which is also caused by multi-level dependencies.

KEYWORDS:
urban resilience, urban planning, social-ecological resilience thinking, infrastructure

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应对变化和基础设施的城市规划

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摘要

本文论述 了城市规划 和变化过程 对当地基础可能造成的影响。总体理论框架是思考社会生态的恢复能力及其在城市土地利用和发展中的潜在应用及影响。本文重点关注此概念是否可以被城市规划者用来应对变化和建造城市基础设施，以及其应用是否可以就绪。此工作由德国的两项探索研究完成。一项研究从规划从业人员的方案和一座中等城市的利益相关者中获得材料。主题是如何在城市规划和发展中应对气候变化的影响。第二项探索性研究反映了恢复力的概念在小型社区应对挑战和当地基础设施时的准备成果。该方案过程表明，运用社会生态恢复力来思考城市规划有助于进行批判性反思，以及在基础社会的建设中获取捷径，采取综合角度为土地的利用与开发制定进一步创新战略。然而，这样的过程需要额外的资金、人力资源以及翻译操作。此外，对给定捷径的依赖以及金融制约也在政治层面阻碍着基础设施的开发，因此任何真正的实施要淡出人们的视线也是多层次的依赖所造成的。

关键词
城市规划，当地技术基础设施，
社会生态复原, 变化

1 URBAN RESILIENCE MEANDERING BETWEEN BUZZWORD AND COMPLEX CONCEPT

There is a growing discussion on the resilience concept and its relevance to different fields of science. Accordingly, there are seemingly almost as many resilience definitions as authors who write about the concept, even within the same discipline. This paper draws on the discussion of social-ecological resilience and discusses its potentials for being applied to urban planning and urban administration dealing with local technical infrastructure. The main question tackled here is if and how this complex and abstract concept can be of use for urban planners and related colleagues of urban administration dealing with local infrastructure, and if there can be detected a readiness to apply resilience thinking.

Especially with reference to cities and urban development resilience received a growing attention and use as catchword of importance not only within the scientific discussion (e.g. Galderisi and Ferrara, 2012, for an overview and grouping into "families" of bodies of literature see Colucci, 2012), but also in practice. The latter is for instance manifested in the 2013 Rockefeller's Foundation competition "100 Resilient Cities" (Rockefeller Foundation, 2014) with several hundreds of international applications from cities and also in the annual practice-oriented conference on Resilient Cities of the international cities association "Local Governments for Sustainability".

The growing use of the catchword resilience risks rendering the term to a fashionable buzzword loosing conceptual depth and meandering between very different definitions (Bahadur et al., 2010; Mazzeo, 2014; Papa et al., 2015). Also, as Papa et al. (2015) state, out there are not many concrete definitions of what is meant by urban resilience, but the ones provided share the common line of focusing on safety and the uphold of urban functions in case of crisis and further external forces. While as not that many explicit definitions exist, the term resilient city is often used. For further clarification, therefore, in this section, it will be explained what is meant by using resilience. It is referred to a specific body of literature, namely to the social-ecological resilience concept.

This conceptual understanding of resilience is considered as helpful looking at cities dealing with change, as it offers a perspective different to the common perspective used in practice. It highlights change as immanent component of a system instead of perceiving it as an external factor only. The interdependence of ecosystems and society is a crucial element of this concept, based on the understanding of inseparable social-ecological systems which develop dynamically and in a non-linear way. Their dynamics are described with so-called adaptive cycles and are illustrated with the figure of a "lying" number eight (Holling and Gunderson, 2002). This "lying eight" symbolizes the systems moving continually between four different phases. Walker and Salt (2006) highlight that the systems can also show different dynamics as these theoretically described ideal phases. Within this context, social-ecological resilience is understood as the capacity of social-ecological systems to persist continually and eventually to reorganise themselves. This happens through maintaining essential functions and structures of the whole system and further developing through incorporating change (Berkes et al., 2003; Walker et al., 2004). To reach resilience in this understanding, Berkes et al. (2003) propose as essential system abilities to learn to live with change and uncertainty, to support diversity, to combine different forms of knowledge and to provide for self-organization. An additional essential component of the social-ecological systems concept is the understanding of "panarchy" (Holling and Gunderson, 2002). Panarchy describes, that the considered system influences and is influenced mutually by systems on different levels which also go through adaptive cycles. In consequence, also dynamics on smaller or bigger scales can evoke disturbance or even shocks for the considered system.

As this understanding of social-ecological systems and of resilience roots in systems ecology, it still undergoes strong discussions being applied to social dominated systems (see e.g. Swanstrom, 2008). Adger (2008) highlights as an answer to these critics that the concept is mainly to be understood as an analytical

tool and that it does not provide normative judgments. Nevertheless, even if it is understood as an analytical tool only, the highly abstract as well as multi-dimensional concept renders it difficult to bring it to further and concrete use in practice, especially in human dominated systems. While there is a multitude of very different approaches to operationalize the social-ecological resilience concept, these are mainly developed in non-urban research contexts or are very broad if it is dealt with urban complexes. But research and literature on urban resilience is fast growing, also within the social-ecological resilience concept it got increased attention during the last years. Especially the complexity of urban systems and the difficulty to define their confines due to the matter of fact that they are decoupled from the resources they use, render analyses of their system dynamics or their social-ecological interdependencies very demanding (Alberti, 2008; Colding, 2007).

With regard to the question we deal with here, the reference to social-ecological resilience is helpful, because it allows us to understand cities or, even broader, urban regions as complex adaptive systems. They are characterized by a variety and multitude of interactions and interdependencies between humans and the environment on different spatial and temporal scales. Additionally, they are undergoing uncertain or even surprising non-linear conditions of social, political, technological, economic or environmental change. Approaching urban planning and administration with this concept can mean to scrutinize dominant linear and complexity-reducing thinking in planning practice as well as the sectoral split within urban governance and administration (Deppisch et al., 2014). Referring to social-ecological resilience in practical spatial planning would mean in consequence to emphasize complexity and here especially non-linearity, emergence, uncertainty and potential states of not-knowing, relevant other temporal or spatial scales (panarchy) as well as social-ecological interdependencies.

In bringing these ideas and concepts closer to planning practice, the main attention is drawn on if and how this complex theoretical concept can be of use for urban planners dealing with change and local infrastructure and if there can be detected a readiness towards its application.

2 EXPLORATIVE RESEARCH SETTING AND CONTEXT

This endeavor is informed by two explorative studies in Northern Germany. One study gains its material from a transdisciplinary scenario planning process in a medium-sized Northern German city located at the Baltic Sea coast. This process used a translated resilience perspective as the conceptual point of reference. It was undertaken in a period within two years (2011 to 2012), prepared and conceptualized by a core-group consisting of practitioners from urban and regional planning and administration as well as of scientists with different disciplinary backgrounds. The idea to emphasize the characteristics of a translated resilience perspective was brought in by these scientists. The process consisted of three main scenario workshops with up to 40 participants from different fields relevant to urban development, ranging from planning practitioners to urban politicians, economic actors and further urban stakeholders. Main topic of this process was how climate change as well as other factors will impact future land-use development of the urban region and how urban and spatial planning can deal with the challenges of these change processes (for details see Hagemeier-Klose et al., 2013). For the intention of this paper, it will be looked especially at the interim as well as the final outcomes of this process with reference to the topic of the current state of the urban infrastructure and its further development. As empirical material it is referred to protocols of the scenario planning workshops (plan B:altic, 2011a-b, 2012) as well as the finally developed climate change adaptation concept adopted by the City Parliament (Hansestadt Rostock, 2013). For further contextualization of the urban planning and infrastructure situation, it is referred to the preparatory land-use plan (Hansestadt Rostock, 2009) and further documents of the city. With reference to infrastructure development, Rostock provides several characteristics. So it has an important sea harbor for cargo and for passenger handling, and further enlargement of the harbor is not only discussed but also foreseen within the preparatory land-use

plan (ibid.). Such an enlargement could also require additional traffic structures or improvements of given structures with a general municipal road system which can be considered as sufficient and in a good state as it was improved after German Reunification. Public transport is ascribed an important role by urban planning (ibid.) and next to the upgrading which already took place during the last decades, further upgradings and improvements are planned, especially to strengthen public transport against road traffic (ibid.).

Further information comes from a second explorative study. This study reflects research results on the applicability of the social-ecological resilience concept to urban administration and planning in dealing with change and local technical infrastructure in a small Northern German town, based more inland. The research material in this explorative study was gained through semi-structured interviews with practitioners from urban and regional planning, urban administration and from the service provider for energy. Additionally, documents of relevant local political committee meetings were analyzed (Gemeinde Seevetal, 2013a-c, 2014a-c). With identified key persons of urban planning the material gained was also re-discussed and it was analyzed if there is to be found a readiness to apply a resilience perspective in dealing with local infrastructure in preparatory land-use planning at the community level.

As can be judged already from the material, we here deal with two explorative studies and do not pretend to have performed an all-encompassing broad study. Nevertheless, we think that this material is worth to be published to give further – and practically tested – information and insights on the discussion on urban resilience.

3 RESULTS

3.1 OUTCOMES OF A TRANSDISCIPLINARY SCENARIO PLANNING PROCESS HIGHLIGHTING UNCERTAINTY AND COMPLEXITY

Starting with the first explorative case study, we look at Rostock, a medium-sized city at the German Baltic Sea coast with around 200 thousand inhabitants. It is an old hanseatic town and spreads basically from its old medieval center along the river which is mouthing in the Baltic Sea.

Fig. 1 Rostock, the old hanseatic center and the river Warnow mouthing in the Baltic Sea

This city, which is not belonging to an administrative district due to its size, and its surrounding suburban area started together with a research team in 2011 a process on dealing with climate change impacts on future land-use development and here especially with related complexity and uncertainty. Before, it was not dealt purposely with climate change impacts with regard to the land-use development in the urban region, neither in the urban nor in the regional land-use plan. Potential climate change impacts to be expected within the city are storm floods with an increase in intensity as well as frequency, more and more severe

flooding events due to sea-level-rise and an increase in frequency and intensity of extreme events such as heavy precipitation events or droughts. Also the already existing urban heat island is expected to rise due to rising temperatures. Nonetheless there can be identified some strategies within the preparatory land-use plan of 2009, which can also serve as adaptation strategies. The intention to create a strcuture with multiple centers for energy production is such an example to distribute to diverse territorial parts of the town diferent functions of the grid (Hanstestadt Rostock, 2009, 62), which then can, due to this diversification, better react to extreme weather events. But at the same time there are also other strategies, which can run contrary to adaptation purposes, as climate change adaptation was not a topic during developing and adopting this preparatory land-use plan in 2009. Examples are planned new settlements as well as tourist infrastructure close to the river or the sea-side (ibid, 99ff.), which can be threathened due to extreme floodings or storm surges.

For the purpose of this paper, we focus here on aspects of energy and further local infrastructure and their discussion within the general land-use development as well as urban planning context. As method to deal with the potential future of land-use and influencing factors, a scenario-process was performed. This process showed that while dealing with climate change impacts and the related complexity and uncertainty issues in the land-use development of the core city and its hinterland, the most prominent infrastructure topics were energy and transport. But also, water drainage, further built infrastructure as well as drinking water supply were discussed.

Energy supply and related infrastructure was already a prominent topic within the city since a first framework concept on climate change mitigation was developed in 2005, long before the scenario process started. It was aimed at mitigating further climate change and at sustaining the future local and regional energy supply through renewable sources. Here, also an explicit reference to an energy optimized urban as well as infrastructural development was made (Energiebündnis Rostock, 2011). In consequence, it was also a very prominent topic within the scenario-process which had a focus on how to deal with climate change impacts (plan B:altic, 2011a-b, 2012). The participating stakeholders and practitioners from civil society, politics, economics as well as urban and regional planning and administration highlighted the importance of an energy transition with reference to both sides of the coin climate change.

What exactly was considered as important to be dealt with referring to the energy supply? The energy transition to a mainly renewables-based energy generation got a high attention throughout the whole scenario-process. It is seen as a potentially benefiting factor for the further economic development of the core city and the urban region through saving current high costs for fossil energy and replacing them with locally produced renewable energy. The boosting effect for the local economy is not only seen in the energy production and supply itself, but also in further related economic fields such as rendering the urban region to a focal point of related technology development and transfer. Still, it was also taken into account that an energy transition of this kind would depend on funding mechanisms supporting renewable energy as otherwise the so produced energy would be too expensive for the inhabitants in comparison to conventionally produced energy. Also it was critically judged if full support for such a transition by the inhabitants could be expected as they were not as familiar with potential changes, related complexity and uncertainty as the actors who were participating in the scenario planning process. Also, climate change was considered to be a negatively biased topic in the public sphere so that it cannot be expected to foster the willingness to transform the energy supply and to accept the consequences, such as higher prices for locally produced energy. The latter as well as the transition as such were also discussed in dependence from the global market, such as the price development for coal or oil. Not to forget, it was mentioned that there will be an increase in future energy demand due to needed cooling purposes which are expected to be necessary due to future climate change impacts such as extreme heat events or increased urban heat island effects.

Setting these points in relation to urban and regional planning as well as spatial development, it became obvious, that aiming at this energy transition, there are further areas as well as further infrastructure developments needed for implementation. Additionally, the risk was seen to focus on renewables only in a way of "mono-culture". With reference to land-use development, the need for additional areas to plant biomass for bio-energy purposes which are now used for other purposes such as crop production or the need for new solar or wind energy production sites was seen very critical. These needs also conflict with other measures developed within the process to deal with potential climate change impacts, such as the strategy to hold as many areas as possible free from use to mitigate the urban heat island and to still have options to deal with unforeseen events or to focus on urban and regional agricultural food production. Here it was also seen as necessary to develop further strategies to re-use already sealed areas or to think on multi-use strategies. Such a potential for a multi-use strategy was for instance seen within the harbor area of the town, where the potential for solar or wind energy production was identified (Albers and Davidse, 2011). Such a development would then require further infrastructure to distribute the generated energy. Potential disturbances for the – then already transitioned – energy supply were also seen by climate change impacts such as an increase in intensity and frequency of storms leading to damage of the related energy infrastructure like aerial lines.

During discussing potential unexpected events, off-shore wind energy sites were considered as potential reason for unexpected disturbances of the sea-based traffic. This traffic is important for the city as its harbor is an already established important economic factor for the urban as well as the regional scale. Looking at further transport infrastructure, an important measure of dealing with climate change impacts was discussed, namely to intentionally use specific roads as areas to be flooded, especially in case of future heavy precipitation events (Richter and Davidse, 2012). The use of these roads as flooding zones would in consequence require providing better connected and combined transport modes throughout the urban territory. While this was discussed during the workshops as a long-term implementable non-conventional measure of flood-protection, the participants also ended up with a completely opposite idea they prioritized finally. The proposed important as well as short-term implementable adaptation measure was to raise the main roads which then would also function as protective dykes in case of floods within the city (plan B:altic, Hagemeier-Klose et al., 2012).

With regard to surface water drainage it was highlighted as important to create new drainage axles on the surface within the city to prevent devastating flooding events. Also it was considered necessary to adapt the sewage system technically to potential water volumes of heavy precipitation events. But this was then denied as over-dimensioned sewage systems would cause severe problems in case of periods without increased precipitation or even with droughts. Further infrastructure-related potential adaptation strategies which were developed, were to apply amphibious infrastructure solutions in the spheres of transport (especially for the harbor area), tourism and housing as well as general infrastructure purposes. But their potential usability was only seen in a limited way as the participants also expected problems with this kind of innovative infrastructure if extreme events such as storm surges or major flooding events would occur.

As far as general infrastructure planning was discussed, it was seen as a short-term need to take potential climate change impacts into account in ongoing planning and land-use decisions about long-lasting infrastructure and to use a more generalistic approach within urban development looking at infrastructure development. It was emphasized to respect the need in further plans to think in different plausible futures which might also have very opposite consequences such as a drought or a heavy precipitation event as well as to try to create more flexibility and diversity. These points are also concretely reflected within the urban framework concept (Hansestadt Rostock, 2013, 13), where a future critical assessment of the urban infrastructure (transport, energy, etc.) is envisaged. As main criteria to be used for this assessment were laid down the functioning of all supplies even if some parts fail, to reduce vulnerability of the infrastructure against extreme events and to guarantee the main functions and infrastructure services. Also, a mid-term

reflection of the municipal urban planning and environmental department on the need to retreat from certain already built areas found its way in this framework concept on climate change adaptation (ibid., 21).
A difficult and therefore only cursory discussed point was the further population development of the core city as well as the sub-urban communities. Both, the further ongoing trend of re-urbanization but also a return of sub-urbanization processes were seen as possible, the latter for instance could be caused by increased urban heat islands effects or heat extremes. Especially the latter would have an effect on further infrastructure needs.
Overall, the participants highlighted as a very fruitful additional outcome of the process to have established a wide spanned network crossing sectors within urban administration as well as going beyond administrative actors and crossing the city boundaries, too. This crossing was seen as essential to get a comprehensive impression of social-ecological-technical interdependencies and to be able to discuss a wide array of potential future land-use developments and respective consequences in the urban region.

3.2 OUTCOMES OF A STUDY ON READINESS TO APPLY THE SOCIAL – ECOLOGICAL RESILIENCE THINKING IN URBAN PLANNING

The second study was performed between 2014 and 2015 on the main topic if at all and if yes how a comprehensive approach within urban planning dealing with local technical infrastructure can be fruitful, which is based on social-ecological resilience. The focus was on a holistic perspective including complexity and change as a system-immanent component of the local system. In contrast to the first case, here, a transdisciplinary process to implement a perspective of social ecological resilience within land-use development was not performed. Instead, it was focused on the current readiness of urban planning to implement social-ecological resilience from a pure scientific perspective. Also, barriers to practically implement such thinking were of concern. The case is based in a Northern German local community of around 40 000 inhabitants, located inland. In difference to the above mentioned case, this is a smaller local community which belongs to an administrative district. It does not have an old center but provides a polycentric structure as it originates in 19 different local communities being organized into one in 1972. It provides some central functions to its neighboring more rural communities. As a consequence of the former structure of 19 single and autonomous local communities, the now united community provides a quilt-like picture of a big energy and water supply as well as sewage network.
While there are only some smaller private energy production sites (solar, wind and water power), the very main part of the energy supply comes from external sources. As far as water supply and sewage is concerned, these are also externally steered at the administrative district level. But there can be found relevant productive infrastructure within our considered community, which serves for both, for itself as well as for the district. Especially the sewage plant is of relevance for the whole administrative district. Within the process of compiling a new preparatory land-use plan for the whole territory of the local community, this infrastructure was of special relevance as its state urgently needs to be renovated in some parts. It was emphasized to seek for synergy measures concerning the built infrastructure. Decentralizing infrastructure within the community with the aim of rendering it less dependent from upper administrative and political scales was not a topic at all. The main questions of supply and sewage are now strategically prepared at the district-level. This tributes to the fact that local single action is nearly possible given the already built infrastructure networks and related dependencies, at least at the community level.
Urban planning is having difficulties in dealing strategically on the land-use development of the whole local territory; also its position was weakened substantially in giving up the idea of establishing a new formal preparatory land-use plan. This plan was intended to revise strategically the so far ongoing land-use and the related future land-use development concepts. Instead, local politics decided upon an informal concept which is also to be respected in the binding land-use plans but which does not provide a coherent land-use strategy for the whole municipal territory. A formal preparatory land-use plan would have encompassed

decisions or at least contents regarding local infrastructure for the whole territory, which are now lacking in the informal concept. The latter mainly contains single areas for further development and related prioritized measures.

An astonishing result was that urban planning uses different (old) plans of local infrastructure, especially in the field of water supply and sewage, while as in the same building their colleagues from the local civil engineering department are using different and new plans. So urban planning in this case is not up to date as far as the state of the local technical infrastructure is concerned. Additionally, both departments are also working with different concrete data, not only with different plans. The supply and sewage structures are not an explicit topic within the established informal concept concerning land-use, a general strategy with reference to urban development is lacking.

These infrastructures are only discussed with reference to certain potential areas for further development and the current state of infrastructure and the link from these areas to the infrastructures are discussed. In case these considerations led to the potential need to change infrastructure networks, the respective areas were not considered for further development due to the then necessary high development costs. The dominant thinking is oriented on a stable state equilibrium and does not provide an overarching strategy. Questioning the future-fitness of the local infrastructure system would have been possible within a cross-cutting and all-encompassing preparatory land-use plan which was not pursued anymore, but instead an informal and punctual concept. Ideas on implementing local renewable energy were raised, but not implemented.

Generally, questions of change, uncertainty and resilience are not at all discussed at the local level, neither in general urban planning nor in urban planning dealing with infrastructure related questions. Instead, the term of sustainable development is of relevance to German urban planning, so also in this case, as it is part in the German national land-use and building law. But this is only of a theoretical nature as it does not play any prominent role in concrete urban planning of our case. The interviewees were mentioning that a general strategic concept on sustainable development of their community is lacking to guide land-use planning. Additionally the dominant priority in financial spending of the community is focused on efficiency. The application of this principle does not allow for leeway or to develop buffering capacities as they are considered as financially inefficient.

A good example for this way of thinking is the already occurred problem with surface water running over the run-off sites and leading to flooding and potentially also threatening buildings. Even if this problem occurs from time to time and can be expected to increase due to climate change, it was politically decided not to act upon this to prevent further surface water runoff problems but to prevent financial investments. This decision was taken in spite of several problem analyses of different administration departments. A general discussion on resilience thinking and related aspects with the planning department had as an outcome that urban planning in this case is dominated by single projects and by higher-level planning. A critical reflection of eventually implicitly applied planning strategies is nearly undertaken, but would be essential to identify capacities or willingness to implement resilience.

4 DISCUSSION

Both studies show that resilience can more be understood as a process (Folke, 2006) than a property of cities or local communities. Nevertheless, it does not provide for a concrete end or aim of the process, but it indicates so far blind spots not considered within practical urban planning. Dealing with change is explicitly challenging looking at built or yet to be built technical infrastructure. Roggema et al. (2012) distinguish three different types of dealing with change in land-use planning and refer to them as incremental change (the weakest version of changing the existing), transition as a further version of change and transformation as the strongest version changing fundamentally the existing (Roggema et al., 2012, 2525). Even if the first

case started explicitly with a complexity and uncertainty perspective, it did not end with a transformative notion in this understanding. But it already provided a very comprehensive discussion of manifold interdependencies and led to in this sense transition-oriented strategies and measures. Also, the participants of the process found many new interdependencies or cascades of interrelations and consequences of new strategies they considered beforehand more in a one-way perspective in thier daily working routine. During the process, the willingness to deal with these issues and to adopt such a resilience-based perspective was growing as it showed advantages. Also, a certain share of these ideas and strategies already found its way in the politically adopted municipal framework concept on climate change adaptation (Hansestadt Rostock, 2013). The second study, however, showed the barriers towards such a readiness within the daily practice of urban planning, especially in smaller local communities.

In practice it is nearly possible to analyze all interdependencies or complex states of the urban system and its non-linear dynamics. This was not only shown by the very sectoral planning approach even the so-called cross-cutting urban planning in the second case showed. Also the first case could just get a superficial impression in many interdependencies and cascades of consequences of socio-technical decisions, even if there was applied a complexity perspective. One has also to consider that this process was externally funded and supported by a research team. The practitioners were convinced that a repetition of a process like that would not be possible without this extra funding and support due to lacking additional man power to cover new tasks next to the regular duties. Additionally, it is difficult to gather all available and current information as well as knowledge needed due to the sectoral divide within urban administration and the different responsibilities. This serves as a barrier to apply the resilience concept and its holistic approach, too. This became also obvious in the second case, where urban planning behaved more than a single sectoral task instead than a cross-cutting one, which would encompass everything relevant to further land-use development. Here, local infrastructure seems to be not of a business of urban planning. But also the first case shows that the integrative and all-encompassing approach of social-ecological resilience is very challenging as it meets a practice which is segmented in sectors. And as the second case demonstrated, these sectors are not forceably using the same updated plans even if they are working on the same municipal territory.

With regard to the panarchy concept, the cities are dependent on developments on other levels or outside of politics and administration, especially in the field of water or energy leading networks. The smaller city shows this dependence even more, as some responsibilities of public administration are decided upon at the administrative district level. And if we look especially at local technical infrastructure, main decisions are taken at other relevant levels than the one of the city or local community. One aspect illustrating this is the essential legal basis for financing renewable energy infrastructure which is taken at the national level. This law regulates who is allowed to supply with current at which charges. Also it is decided on upper levels which form of energy production is supported by financial funds and further supporting schemes.

Even if these dependencies as well as interdependencies are given, it is possible to reflect them critically and discuss opportunities of self-organization, as the first study showed. Here it was discussed already before the resilience-oriented scenario process started to change the given path of the mainly external fossil-energy supply. Was this at the beginning mainly triggered by financial incentives, it was discussed comprehensively within the scenario process, reflecting also potential land-use conflicts. The second study, in contrast, showed the opposite as here even the opportunity of looking strategically at taken paths within infrastructure development of the whole territory was not seized through following up with a new preparatory land-use plan. Instead, this endeavor was given up and in consequence, the strategic decisions were left open and delegated to the district level.

In both cases – in the first above all at the beginning of the process, in the second during the first contacts with practitioners – there were lacking boundary points to identify potential contacts between the theoretical concept of social-ecological resilience and the daily planning practice and concepts it uses. Here, within the

small second study, it was only possible to talk about these ideas and their potential use in planning through using a reference to sustainability. If a reference to resilience is made, then it is – if we follow here the differentiation of Folke (2006) – the engineering type of understanding resilience which emphasizes a stable and constant equilibrium and the time of reaction as well as the efficiency of returning to this equilibrium. This is in close connection to the reductive perspective on infrastructure on its technical functioning; measures related to infrastructure are then maintaining the status-quo technically. The idea of other possible states outside of the path taken so far is hard to be found. The first case shows thinking which goes beyond the current state, but doubts its practical transition-oriented implementation at the end. This is also related to the high costs related to infrastructure development and the difficulty to change the paths taken so far. The latter would require huge changes correlated with huge financial investments. The bounce back oriented thinking ("engineering resilience", Folke, 2006) is even more prominent in the second case as the example of surface water shows as well as the decision to waive a new general land-use strategy. The latter might have offered also a future-oriented strategy in dealing with local technical infrastructure. This is a clear identified barrier to implement resilience, which depends on local politics and not on urban planning alone. And it supports the point of Papa et al. (2015, 29), who emphasize that it is important to consider both, the so-called hard as well as soft components of an urban system to built up or improve its resilience. This was reflected in the first case more comprehensively.

A relevant point to add and emphasize is the path dependency of the so far existing infrastructure which does not surprise while dealing with built infrastructure. This path is oriented on a stable state equilibrium and in case it works it does re-strengthen itself through many different feed-backs (Gößling-Reisemann, 2008). But if we look at discussed changes such as the change of the energy supply system to foster energy transition, also the transport of energy is of relevance. Such a transition would not only require a change in main energy sources, but also a change of the centralized supply network.

A decentralized system with many polycentric networks allowing a diversity of current injections would be necessary requiring an additional change in infrastructure (Gößling-Reisemann, 2008). The local communities in Germany have the autonomous power to take the necessary decisions by themselves. But a real change not only in the energy generation infrastructure but also in the supply networks and related feedbacks would require too many financial resources, especially for local communities with tight financial backgrounds or already problematic financial states, which are leading already to weakened investments and shortages even within municipal compulsory tasks (Deutscher Städtetag, 2014). This renders the path dependency even higher, due to the long-lasting permanence of built infrastructure as well as their high building-investment costs and also necessary destruction works and consecutive costs. But nevertheless, as the scenario process in case one showed, it is possible also within tight municipal financial constrains to think on diverse, redundant as well as multiple-use strategies and to leave given paths of infrastructure location as well as abilities.

5 CONCLUSION

Returning to the main question we raised at the beginning we can sum up the following answers. First, it was shown that the concept of social-ecological resilience thinking can be of use for urban planning and related administration to deal with change and local infrastructure. Introducing social-ecological resilience and the related thinking to urban and regional land-use development initialized new discussions and catalyzed the confronted practitioners to reflect certain topics within land-use development and local infrastructure development in a different way. Also new strategies such us multiple uses of transport infrastructure or local polycentric infrastructure networks were identified. Also the application of this thinking can be of use if it is brought to a concrete territory and applied there as this can reveal: (a) so far blind spots not considered within practical urban planning as it highlights socio-technological and ecological

interdependencies, related complexity, uncertainty and change as ever-present system-immanent features cities have to deal with; and (b) severe conflicts between different land-uses, even if they appear per se as general positive contribution to a sustainable urban land-use and infrastructure development.

Considering the established technical infrastructure, it appears more as an outcome or interplay of contingencies leading to current path dependencies, and less as a planned strategy. This does not contradict resilience thinking but it puts into question if a comprehensive and strategic approach at community level on applying and especially implementing social-ecological resilience thinking is realistic, even in a mid- or long-term perspective. This is especially questionable if local financial constraints are tight and if urban planning does not have a strategic role or even a role of importance attributed by local politics to generate innovative strategies with reference to land-use and immanent change, over spanning spatial as well as temporal scales.

At least and refering with that to the second part of the initial question how the concept can be of use, reflecting critically so far taken paths is possible and supported by an integrated resilience perspective which also brings to the light further interdependencies and consequences, also in relation to future change processes and their spatial consequences. Also it is helpful to develop manifold options for further actions as well as integrated strategies, which can also deal with potential surprises and further uncertain or unexpected not yet known change processes and events. This would be an alternative to the predominant bounce-back understanding of resilience.

Finally with reference to the third aspect of our question, if there can be detected a readiness towards applying social-ecological resilience thinking in urban planning already now, it still remains questionnable, if these developped diverse options or multi-use strategies will also be implemented. This depends on the political will, which seems to be dominated by the (financial) efficiency paradigm, while as implementing social-ecological resilience thinking would require sumptuous strategies and measures leading to many different as well as decentralized ways of maintaining energy as well as water supply and sewage. Such a readiness to apply this thinking on the whole urban territory and all its socio-technical-ecologocial interdependencies is also depending on available personal as well as financial resources to start all-encompassing analyses and the identification of cross-sectoral strategies and measures. It is easier for well equipped bigger cities or, as the first case showed, additionally supported cities, to test an application of this thinking than for smaller communities staffed with less human and financial resources. For the latter, also upper administrative levels can be attributed the role of initiating resilience-oriented processes. Additionally the actors available as well as filling the relevant positions within a place and their respective cross-scale networks and openness play a role, so that within the explorative cases shown, this can play an additive role next to the available resources and size of the city (see also Pike et al., 2010). Still, tackling urban complexity as well as a holistic social-ecological resilience approach are the most challenging aspects, especially in an administration divided by sectors, even within cross-cutting land-use planning.

In these respects it does not suffice to discuss the social-ecological resilience concept with experts of urban planning and infrastructure, but to bring it up to broader political discussions. Here one could also raise the further research question on the usefulness of respectively changed laws to force local communities as well as administrative districts to deal explicitly with the characteristics of social-ecological resilience and the meaning for their current as well as further land-use and infrastructure development.

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IMAGE SOURCES

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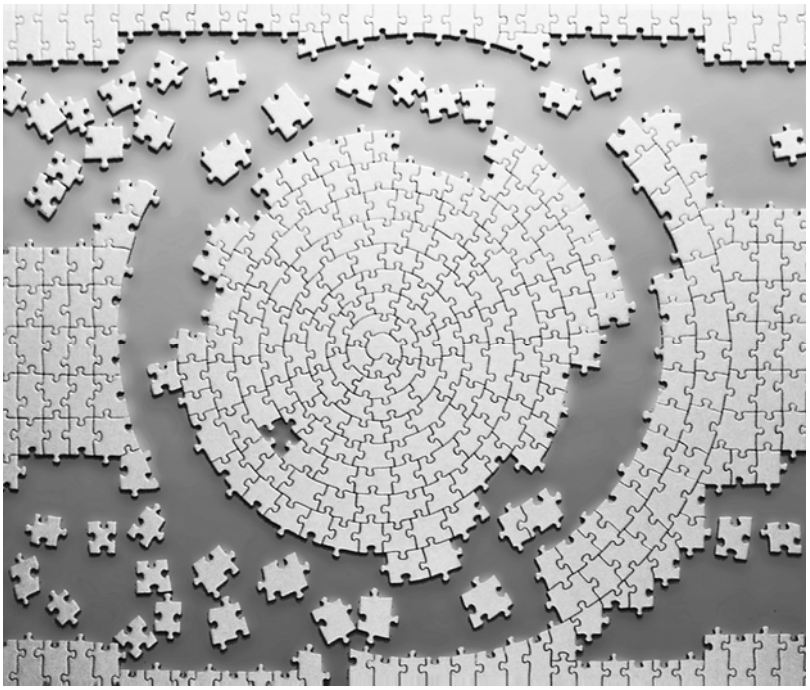

SMART CITY AND METROPOLITAN AREA

THE ENERGY COMPONENT IN THE CASE STUDIES OF GENOA AND NAPLES

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ABSTRACT

The Smart City model is now considered one of the opportunities to rethink cities and, in general, the development of urban communities. One of the most relevant themes in the application of the Smart City paradigm is the city/energy relationship and Italian cities are fielding several actions to effectively cope with the energy issues. Nevertheless, actions and projects are often uncritically promoted as 'smart', but actually lack innovative contents and methods. Therefore, the aim of this research, of which we present the first findings, is the drafting of a survey, tested through field analysis, of the experimentations of Italian metropolitan areas on the Smart City topic. The in-depth analysis of two case studies, Genoa and Naples, allowed us to compare the actual state of the two cities. We have that they have undertaken a common path in the implementation of strategies to try to transform themselves into Smart Cities, focusing especially on the energy aspects.

KEYWORDS:
Energy Efficiency; Smart City; Smartness Indicators; Genoa; Naples.

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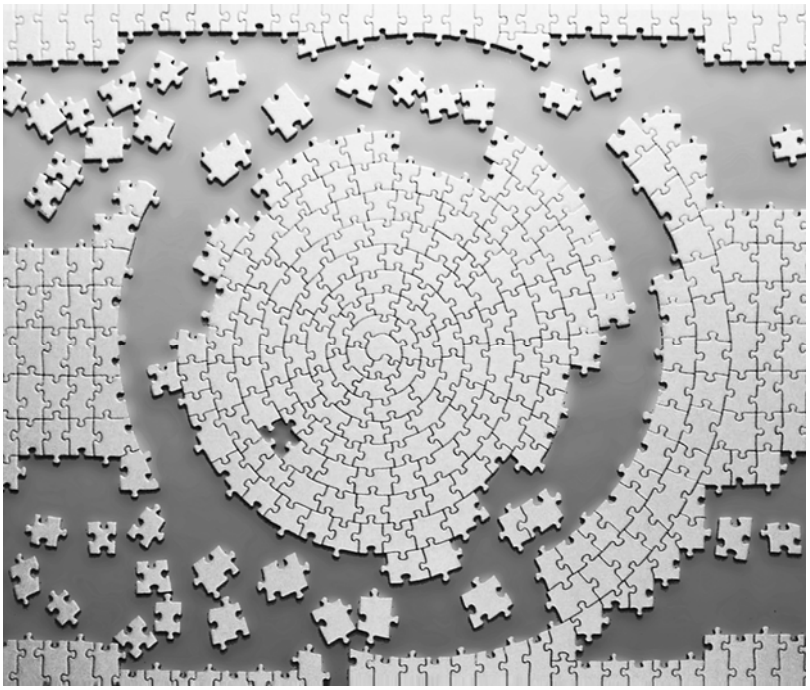

智能城市和都市圈

热那亚和那不勒斯能源个案研究

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摘要

智能城市目前被认为是重新思考城市和城市社区发展的机会之一。在智能城市模式的应用中最相关的主题之一就是城市/能源和意大利城市的关系为有效应对能源问题提出了若干举措。尽管如此，举措和项目还是常常不加批判地被作为“智能”来推广，但实际上却缺乏创新的内容和方法。从这个意义上说，第一项发现的目的就在于起草一份概述，通过智能城市这一主题，对意大利都市圈进行实地探测分析。热那亚和那不勒斯的两项深度个案分析让我们可以对这两座城市的实际状况进行比较，从而表明两座城市在建设智能城市的战略实施中采取了共同的道路，特别关注了能源方面。

关键词

能源效率，智能城市，智能指数，热那亚，那不勒斯

1 SMART AND METROPOLITAN CITIES: AN OPPORTUNITY TO RETHINK URBAN DEVELOPMENT

The topic of Smart Cities has gained, in the last few years, an increasing relevance in the scientific debate and in the national and international operative practises, becoming one of the opportunities to rethink cities and, in general, the development of urban communities.

The first considerations, studies and projects on the subject seem to agree that a "smart" sustainable development combines physical components – infrastructures and material networks – and social components – actors and city users to pursue sustainable purposes, efficiency and urban quality. Adopting this approach, the Smart City takes shape as a system providing services and infrastructures that derive from stakeholders and city users' needs, focusing on the aspects of sustainability and environmental protection. In this sense, what makes the Smart City different from other "city models" is the use of new information technologies at the service of an urban community inclined to revise its own lifestyle to pursue a model of sustainable development (Gargiulo, Pinto and Zucaro, 2012).

From 2009, the European Community has conferred substantial resources to Member States, to allow scientific in-depth analysis and practical applications of this approach through different financings such as National Operative Programme *Research & Competitiveness* 2007- 2013 "Smart Cities and Communities". Among others, this Programme has funded a research project called "Smart Energy Master for the energy management of territory (SEM)", which involves the Department of Civil, Building and Environmental Engineering of the University Federico II of Naples.

Focus of the SEM project is the identification of best practices and integrated solutions for energy saving and efficiency at urban and metropolitan scale. Within the SEM project a survey entitled "Governance Analysis Project for the Smart Energy City (GAP)" is under development.

Scope of this study is to verify whether - and how - the adoption of the Smart City paradigm can support the radical process of administrative transformation that Italian cities must face after the approval of the regulation 56/2014 «*Dispositions on Metropolitan areas…*». This analysis has taken into account the ongoing actions in the Metropolitan areas, which can be considered as the first applications of the "Smart City" model, because they also make extensive use of ICTs for the deployment of services and apps for citizens.

Among the various Italian Metropolitan areas, this research has focused on the best practises in the field of energy saving/efficiency as this topic has a particular relevance in the pursuit of a sustainable development for the protection of environmental resources which, as mentioned, is a crux of the Smart City model.

This paper presents the first results of the research activities conducted on two case studies: Genoa and Naples. Although Genoa is in the North of Italy and Naples in the South, they present some "physical analogies": both are coastal towns, and both have a historically stratified urban settlement and a complex morphology. Furthermore, although with different levels of development, they are both experimenting noteworthy actions in the energy sector, for the application of the Smart City model. The aim of this research is the evaluation of the two approaches adopted, considering the present energy management of their territories. Moreover, on the one hand it draws attention to the vocations and weaknesses and on the other to the development trajectories of the implemented strategies.

2 MEASURING THE SMARTNESS

In the last decade, a wide literature on the matter of Smart City has been produced to define contents, strategies and objectives. Simultaneously, numerous contributions have been dedicated to "measuring" the level of smartness of the different cities, to define their strategies.

In Europe, one of the most known and qualified studies is the one conducted in 2007 by the Vienna University of Technology, University of Lubiana and the Delft University of Technology on medium sized cities (Giffinger et al., 2007). This research states that the good performance of a city can be measured by

the combination of endowments and activities of self-decisive, independent and aware citizens in a framework constituted by 6 characteristics of smartness: "*Smart Environment", "Smart Mobility", "Smart Governance", "Smart Living", "Smart People" and "Smart Economy"*. The structure of Giffinger's model countains 31 factors, divided into 6 characteristics, creating the framework to identify 74 indicators in order to describe different aspects of urban life. E.g. referring to the characteristic "Smart Mobility", the component "Sustainable, innovative and safe transport systems" articulated into 3 indicators: "Green mobility share", "Traffic safety" and "'Use of economical cars".

In the United States, among various attempts to measure smartness of cities, the study "The Smart Cities Wheel" (Cohen, 2012), emerges, conducted in 2011 by the climate strategist Body Cohen from University of Colorado. Cohen deals with the theme of the classification of the level of smartness of the world's largest cities, using the same characteristics identified by Giffinger but connected to only three factors.

In Italy, an application aimed at establishing a national ranking has been conducted by FORUM PA, which has proposed the "I City rate" index (Forum PA, 2014). Also in this case, the model proposed by Giffinger is applied, though with some differences; it did not identify factors but only about 100 indicators, divided into Giffinger's six characteristics.

Another interesting research at the national level has been conducted by the National Council of Economy and Labour (CNEL) and the National Istitute of Statistics (ISTAT) in 2010 to define a method to evaluate the Sustainable and Equal Wellness (in Italian: Benessere Equo e Sostenibile - BES from which the name UrBES derives) (Cnel, Istat, 2013). The research identifies a set of indicators to measure BES, considering different aspects of urban living and not only GDP. The pursuit of new dimensions and new indicators is particularly interesting for a city that aspires to be "smart" not only in the sense of being more efficient from an economic, environmental and infrastructural point of view, but also in the sense of social inclusion and sustainability. Though not explicitly aimed at the definition of the Smart City, UrBES has many similiarities with Giffinger's study, proposing a quantitative evaluation, also for not easily measurable aspects of urban life, such as people's open-mindedness. These two studies reach comparable conclusions, though with some differences in the methodology and adopted procedures (DIST Polito, 2013).

Still referring to the Italian case, starting from 2013, the "Smart City Index" has been proposed (Between, 2014), a ranking of 116 Italian provincial capitals. The peculiarity is that, instead of measuring the level of smartness of a specific city, the attention is focused on the evaluation of the distance between the city identified as the best and the others.

From the comparison of all these studies, the great importance assumed by the cities' performances in the field of energy and environment emerges. They underline how the cities smartness is strictly connected to a vision that considers environmental protection of natural resources and energy efficiency as essential elements (Benevolo, Dameri, 2013). Besides the mentioned studies, there are many other surveys that measure the smartness, such as: Smart Cities in Italia: un'opportunità nello spirito del Rinascimento per una nuova qualità della vita (CERTeT Bocconi, ABB, The European House – Ambrosetti, 2012), EfficienCities (Cittalia, Siemens, 2012), La mobilità sostenibile in Italia (Euromobility, 2013), Ecosistema Urbano (Legambiente, 2014), Qualità della vita (Il Sole 24 ore), Smart cities and housing markets: evidence from Italy (Maltese, Mariotti and Boscacci, 2013) Dati ambientali nelle città (Cnel, Istat, 2012).

The limits of these works is that they take a somewhat extremely synthetic picture of a very complex phenomena. Therefore, besides consulting scientific literature on the identification of quantitative indicators describing the present state and the vocation of each urban area, this research has analysed policies and actions being developed in each territory to give a framework of their trends of development.

3 RESEARCH METHOD

In order to define the current inclination towards “smartness” of Italian cities and, at a later stage, verify the consistency between allocations, strategies and actions currently underway, a methodology applicable in different metropolitan territories has been developed. This survey has been structured in two macro-phases; the first aimed at collecting information studying documents, databases, projects, programmes and actions and the second based on stakeholders interviews.

A huge amount of materials, documents and information available on the web about the cities’ actions, often uncritically promote them as "smart", but they actually lacks innovative contents and methods.

Through field analysis, we have tried to give a picture as close as possible to the reality of each metropolitan area, to understand whether the projects and actions are effective and coherent with the objectives.

A systematic set of information (administrative documents, proposals, projects, etc.) has been developed, which gives a complete overview of what is been done in the 12 metropolitan Italian cities (instituted by Delrio Law n.56/2014).

The research has been structured in different phases.

In the first phase, based on the extensive available literature, the set of indicators to characterize territorial and urban “smartness” was defined. Indicators were selected by taking into account their occurrence in the different studies, the availability of data at different scales (national, regional, provincial and municipal) and the reliability of the sources. In particular, regarding this last aspect, we used data provided by the Italian National Institute of Statistics (ISTAT) and by public and private research institutions.

This process led to the identification of 39 indicators calculated in a 10 year period, to also evaluate the development trends of the metropolitan systems. We have employed those indicators on different scales:

a. metropolitan capital;
b. metropolitan municipalities minus capital;
c. metropolitan area (a + b);
d. region;
e. nation.

We have distributed 36 indicators into 6 smartness characteristics both taken from literature; they have given a first overview on the smart characterization of the examined cities.

The second phase dealt with the screening of the actions, either currently underway or simply planned.

The selection of actions took into account: the actual state of completion; the consistency between early assumptions, targets and results achieved; the effectiveness in relation to impacts (economic, social, environmental, etc.) on the city; its reproducibility in other territorial contexts. The screening was carried out through an indirect analysis of documents, news available on the web and through the comparison with the urban planning documents, and the Sustainable Energy Action Plans (SEAP).

Actions have been classified by:

- their type (researches, interventions, projects, technologies, products and innovations, plans and programmes, promotion and awareness actions);
- their smart characteristic;
- their actuators (public bodies, companies, associations, institutions of research);

During the third phase, the fieldwork consisted in interviews to actors and stakeholders, based on in- depth analysis sheets on the different actions, previously collected.

The selection criteria of the significant actions to focus on, favoured those included in Smart Environment, and, in particular, those related to the energy sector, that is the focus of the SEM research project.

4 GENOA AND NAPLES: TWO SMART APPROACHES IN THE ENERGY FIELD

Focus of the SEM project, as stated, is to increase the energy efficiency of the territory and in the course of the activities, a special attention was given to the Italian metropolitan cities that are experimenting innovative actions in this field.

The analysis revealed t that Naples and Genoa (Figure 1) are characterized by a marked concentration of actions in the "Smart Environment" category, with a focus on energy issues. In particular, the energy aspect is the determining factor in the difference of the approach that the two cities are following for "urban smartness"; difference in both the number and the scope of the actions put in place. Moreover, as explicitly stated by interviewed respondents, since Genoa represents a "model" for Naples in the development of intervention strategies for the implementation of the Smart City, it seemed interesting to analyse in detail the two cities to determine whether and how effective a policy can be if it replicates the actions in several metropolitan areas.

Furthermore, as mentioned in the introduction, since one of the objectives of the research project was to precisely verify the incisiveness of some actions in the implementation process of a metropolitan Smart City, the possibility offered by Naples and Genoa to verify the effectiveness of actions in contexts that, although similar, have different vocations and services seemed particularly interesting.

Subsequently, the first findings of the research activity are then synthetically shown below and divided in two principal components:

- the Smart vocation of the two metropolitan areas;
- the ongoing experimentations which adopt the Smart City model, with special regards to those in the energy field.

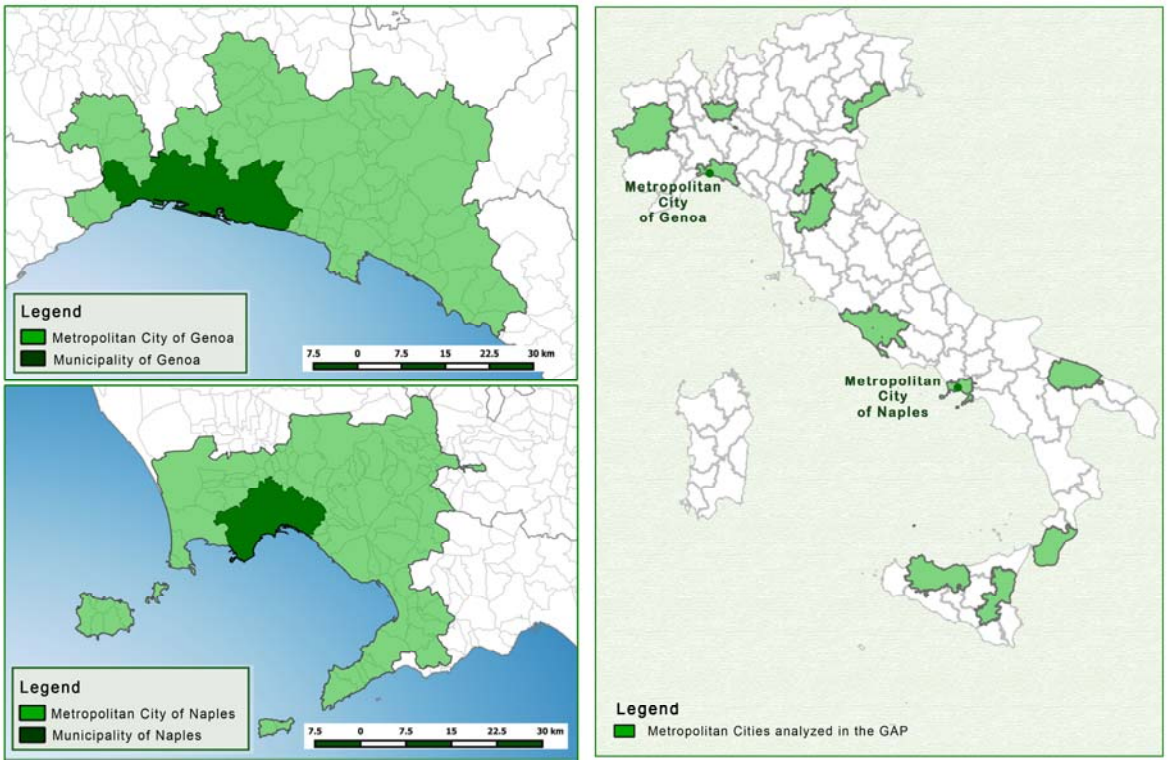


Fig. 1 Location of the two Italian metropolitan case studies

4.1 SMARTNESS INDICATORS AND ONGOING ACTIONS IN THE METROPOLITAN AREA OF GENOA

The metropolitan area of Genoa is composed of 67 municipalities, with a population of 855,834 and covers an area of 1833 km^2, with Genoa as its capital, which has a population of 586,180 and covers an area of 240 km^2.

The application of the methodology for the study of Genoa has allowed us to build a picture of its performance in relation to the smart characterization and brought out its strengths and weaknesses, but also its vocation and its level of propensity towards the Smart City. The 36 indicators referring to a ten year period and at different spatial scales provide the trend of the performance of each analysed aspect.

Figure 2 shows the values of Genoa in the different dimensions of smartness, differentiating the metropolitan territory from the Capital. The performance of the metropolitan area of Genoa than the Capital's emerges, with regard to all the characteristics except Smart Environment where a strong predominance of the capital city is evident.

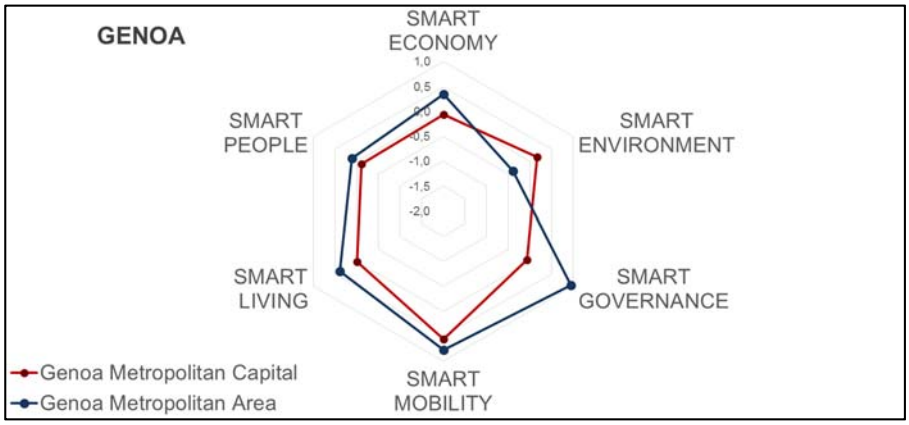


Fig. 2 Smart characteristics for Genoa and its metropolitan area

Concerning "Smart Environment", in particular, the identified indicators are:

- PM10 emissions;
- green urban spaces;
- energy consumption;
- Sustainable Environmental Action Plan;
- renewable sources from solar PV systems;
- recycling.

In particular, in relation to the focus of this paper, analysing the values of the indicators related to energy , the findings show that energy consumption for the metropolitan city of Genoa in 2011 are in line with the Italian average (1179 kWh/cap for Genoa against 1177 kWh/cap for Italy). In addition, it is interesting to note that, as shown in the graph on the urban smartness, the capital city has a lower energy consumption than the metropolitan territory, whose values are higher than national's. However, values referring to 2011 are higher in all territorial scale compared to 2001 (Figure 3 first part). As for energy production per capita by photovoltaic for 2014, the graph shows a greater inclination of metropolitan municipalities rather than the Capital to install photovoltaic systems. Probably, it is linked to the objective difficulty to install them in the city centre (Figure 3, second part).

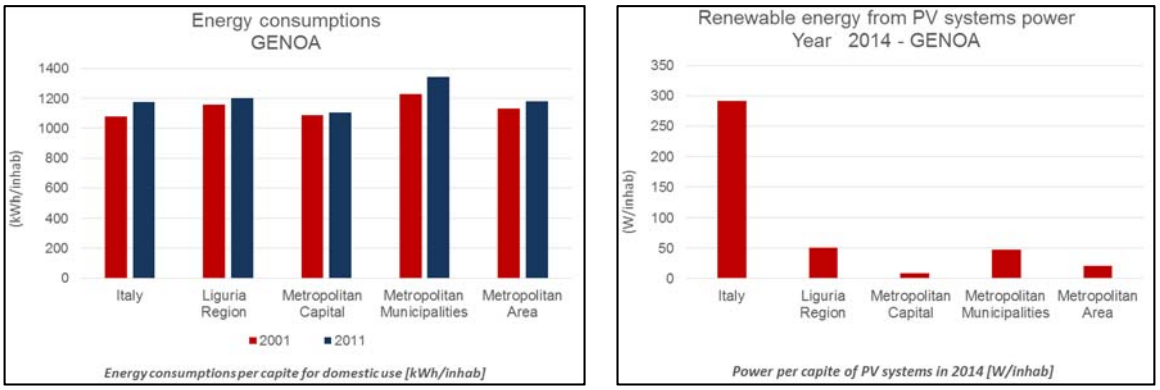


Fig. 3 Histograms related to energy consumption and renewable energy indicators for Genoa

The second phase which is, as mentioned, about the screening of actions to implement a Smart City, revealed that a significant number of actions concerned Smart Environment (Figure 4).

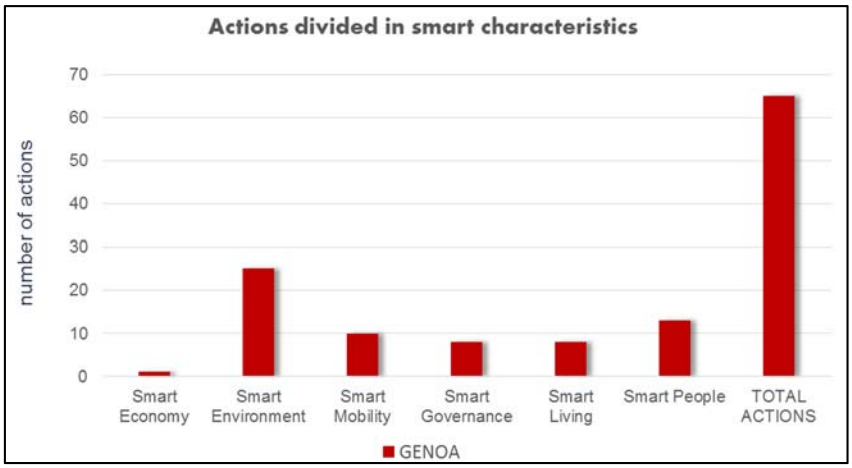


Fig. 4 Actions divided by characteristics in the Metropolitan City of Genoa

In particular, the first graph in Figure 5 shows that Genoa is mainly investing in interventions, infrastructures and projects (57.14%). This testifies its propensity to implement the Smart City. In the second graph of Figure 5 on the articulation of the actions for actuators, there is a clear preponderance of the local authorities and institutions. This finding is consistent with the type of prevalent actions (infrastructures and interventions) that can only be implemented by public local entities rather than by associations, companies or research institutes.

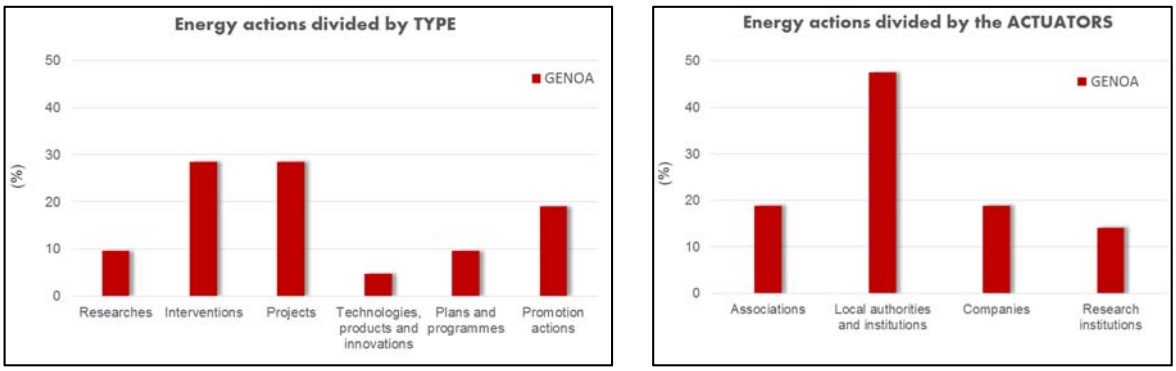


Fig. 5 Energy actions divided by type and actuators for Genoa

As the graph below shows (Figure 6), among all the actions associated to the Smart City, those related to energy issues have a significant share, 32% of the total.

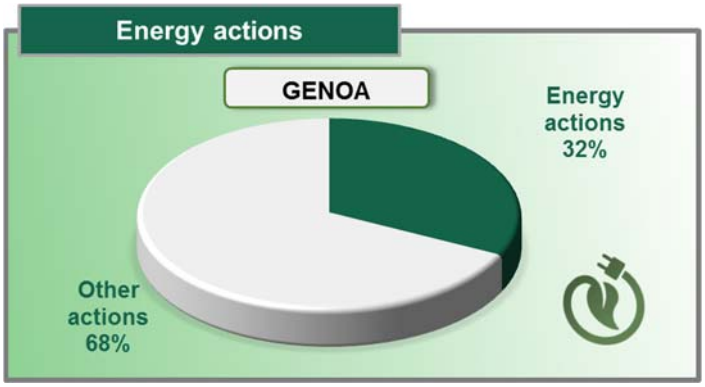


Fig. 6 Share of energy actions on the total actions for Genoa

From this initial analysis, we can deduced that in order to reduce energy consumption, that is very high and above the national average, Genoa is heavily investing in experiences, projects and actions to address energy efficiency and savings.

4.2 SMARTNESS INDICATORS AND ONGOING ACTIONS IN THE METROPOLITAN AREA OF NAPLES

The metropolitan area of Naples is composed of 92 municipalities, it has a population of 3,054,956 and covers an area of 1,171 km^2. Its capital, Naples, has a population of 962,003 and covers an area of 119.02 km^2. Figure 7 shows the values of Naples in the different dimensions of smartness.

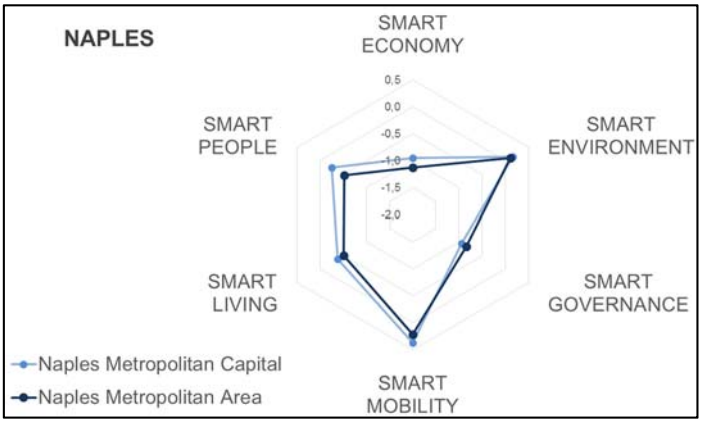
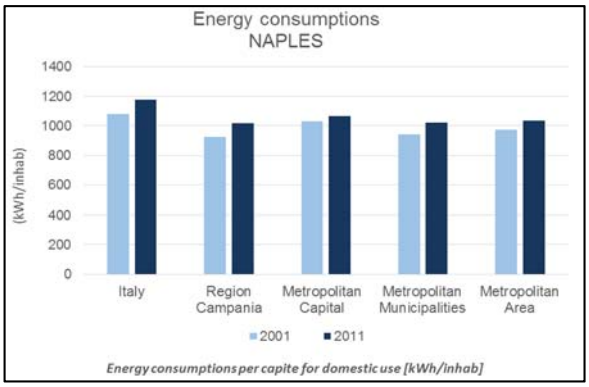


Fig. 7 Smart characteristics for Naples and its metropolitan area

Analysing the Neapolitan case, we can say that, regarding residential energy consumption, Naples shows slightly lower values than the National average both in 2001 and in 2011 (Figure 8, first part). The graph on the energy per capita produced by photovoltaic systems, also in this case, shows far superior values in the metropolitan municipalities than in the capital city, once again, probably because of the difficulty to install the facilities in the historical centre (Figure 8).



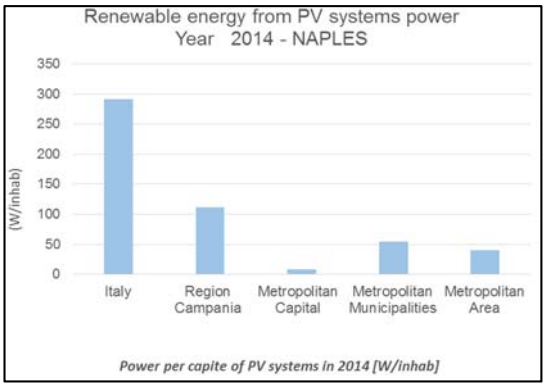


Fig. 8 Graphs related to energy consumption and renewable energy indicators for Naples

As with Genoa, in Naples the number of actions aiming at the Smart Environment is clearly superior to all other actions (Figure 9).

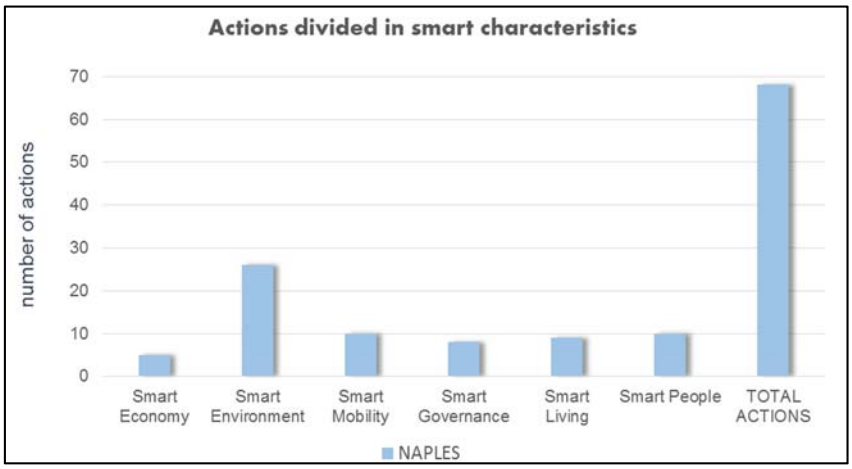
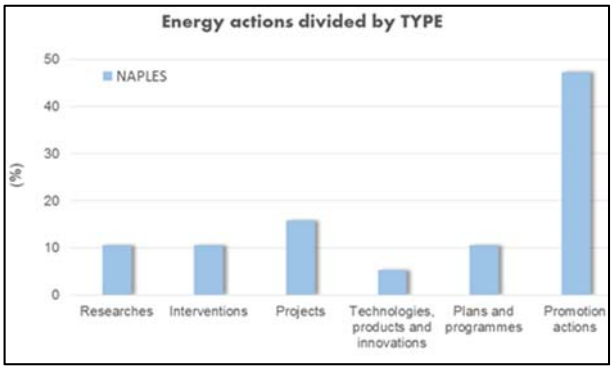


Fig. 9 Actions divided by characteristics in the metropolitan area of Naples

Regarding the type of actions that have been tested in the city, the first graph in Figure 10 shows that Naples is investing in promotion and awareness (47.4%), and this may refer to the need to "enhance attentiveness to the conservation of environmental resources". Companies and associations emerge strongly as the drivers of the actions, followed by research bodies, local authorities and institutions. Intersecting this information with the one above, we can derive a picture of how companies and associations are active in this field, especially through awareness raising and promotion activities (Figure 10, second part).



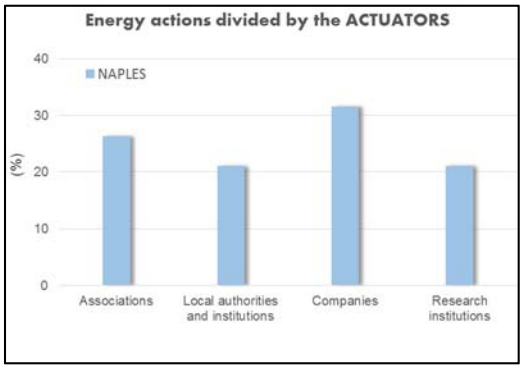


Fig. 10 Energy actions divided by type and actuators for Napoli.

Finally, the last graph shows the amount of energy actions compared to the total. As in the case of the Capital of Liguria, they are a very significant number (26%) (Figure 11).

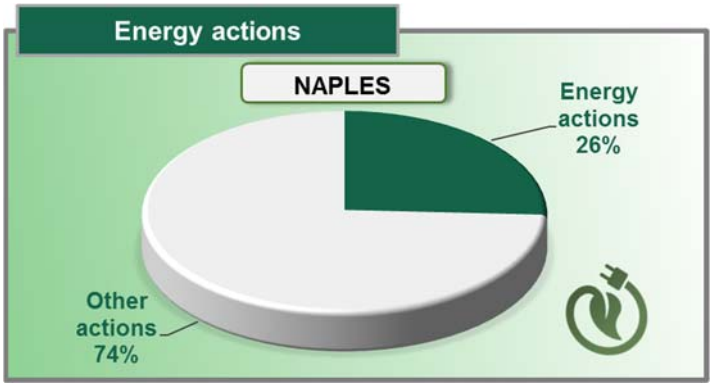


Fig. 11 Share of energy actions on the total actions for Naples

4.3 ACTIONS DEVELOPED IN BOTH CITIES IN THE ENERGY FIELD

The in-depth field analysis of ongoing actions has allowed the completion of the picture of the path undertaken by the two cities on the Smart City subject and, at the same time, the verification of their effective implementation. From the meetings with the different stakeholders consulted, the fact that Genoa represents a reference for Naples emerged, for its capacity to bring together different actors to initiate the actions in the fields of: energy efficiency, sustainable mobility, implementation of digital infrastructures, promotion of citizens awareness.

In 2010 in the capital of Liguria, Genoa Smart City Association (GSCA) was constituted, with the task of coordinating sustainable actions and supporting the "information society" and also, especially, with the purpose of coordinating workshops with stakeholders (Local Authorities, companies, citizens associations, research institutions and universities). Another purpose is to activate actions by means of public/private partnership, in order to be more effective thanks to their joint participation and to accelerate the activation processes of actions in the city. More than twenty projects have been developed in the last three years thanks to the support of Genoa Smart City Association which, in this way, has represented a useful governance instrument, free from the traditional and sometimes muddled administrative procedures.

Based on the Association's success, in 2012 Naples followed its example, creating the premises to fund Naples Smart City Association (NSCA), born at the end of 2014. Taking example explicitly from the Genoese association, NSCA has among its objectives the creation of a forum where local stakeholders could debate on innovative projects and discuss about common issues to create critical mass and share experiences as confirmed by the stakeholders' interviews.

In Genoa and in Naples, some actions have been independently developed, to reduce energy consumption in the residential sector. Two such actions, implemented in Genoa and Naples, are the "Elih-med" project, promoted by the EU, and "Condomini intelligenti" promoted by Muvita association, that aim to the efficiency of the residential stock.

In detail, Elih-med (Energy efficiency in Low Income Housing in the MEDiterrean) is an EU transnational cooperation programme among the "Territorial Cooperation objective" of the EU Cohesion Policy defined by the frame work of the Med Programme – Objective 2.2. The project involves seven European countries Italy, Spain, Greece, Slovenia, Cyprus, Malta and France and was tested in four Italian cities including Genoa and Frattamaggiore (a municipality in the Neapolitan metropolitan area). Its attention is focused on energy

efficiency in low income housing (LIH) in the Mediterranean area and on the involvement of the inhabitants in energy retrofits. Its objective is to identify and test, through large scale actions, the feasibility of innovative technical and economically efficient solutions by means of financing mechanisms supported by European Regional Development Fund (ERDF). The final aim is the completion of the maximum number of possible interventions with particular reference to the Local Authority's social housing patrimony now neglected and equipped with total inefficient cooling and heating systems and building envelops. Because of this, pilot buildings have been chosen as case studies, to involve inhabitants in choosing technical solutions.
The Genoese pilot project involved two buildings localized in Valbisagno, precisely Lungo Bisagno Dalmazia (9 dwellings on two floors) and Piazzale Adriatico (36 dwellings on six floors), entirely owned by the Local Authority and destined to social housing. The energy efficiency interventions chosen were external insulation, the substitution of window and door fixtures, the roof insulation, and the installation of cooling and heating systems. These improvements brought the energy class of the dwellings from G to B or C.
The pilot intervention in Frattamaggiore involved a multistory building with 18 dwellings. It included the substitution of window fixtures with triple glazing windows and thermal fixtures, the installation of a 1,4KW solar PV plant per dwelling, a 1,8 m^2 solar thermal collector per dwelling. The expected result of these operations was a 40 to 60% reduction of energy consumption; this is now verified.
The Condomini Intelligenti project is also focused on the reduction of energy consumption of residential multistory buildings. Nevertheless, unlike Elih-med, which uses European funds, Condomin Intelligenti takes advantages of the virtuous mechanism of ESCos (Energy Service Companies), which shoulder the economic risks of the interventions. This project started in 2011 from an initiative of the Muvita Foundation, (100% Province of Genoa), which developed an integrated system to evaluate the feasibility and manage the interventions, promoting, at the same time, citizens' awareness and involvement in the processes.
After the first intervention on a super-multistory building in Genoa, the system was structured through preliminary energy audits on condominiums all over the metropolitan area to identify a methodology to draft "guidelines" for the energy efficiency actions. The condominiums can independently apply to the public call submitting an agreement with an ESCo, which funds the operations. Annual saving obtained by the reduction of energy consumption of each building forms the ESCo's payback, until the total interventions costs are refunded (usually 10 years). The initiative's success is, on the one hand, in setting up a self-financing mechanism, thanks to ESCos, so that the only expense for Local Authority is the initial drafting of the energy audits; on the other hand, in improving citizens' awareness, by organizing seminars for specialists and apartment block administrators.
Once again, Naples chooses to start experiences successfully experimented in the capital of Liguria. Thus, in November 2013 an agreement was signed between the two cities to import the Condomini Intelligenti package within the Neapolitan boundaries. National Association of Building Constructors (ANCE) of Naples has promoted this initiative. The funding for the first step of energy audits was requested to the Economic Development Ministry in order to let the operations start as soon as possible.

5 TWO DIFFERENT PATHS FOR A COMMON GOAL

The general picture of the current propensity to smartness of Italian metropolitan areas has highlighted the existing similarities. Indeed, from the analysis of the experiences and policies initiated in the metropolitan areas of Genoa and Naples, among the many themes defining Smart City, the energy component emerges as a central subject. Findings showed that in both case studies, smart actions are primarily aimed at energy saving or, alternatively, at environmental protection. The analysis of the two case studies allowed us to draw a comparison on the state of the two cities. The Comparison of the indicators relating to the six characteristics of smartness showed that the metropolitan area of Genoa performs better than its Capital, while the situation is reversed for Naples, recording the best values for the capital city. In light of the

analysis conducted, it seems possible to state that the two cities are undertaking a common path in the implementation of strategies to transform into a Smart City, focusing especially on the energy aspect.

On the one hand this development path begins also thanks to the EU's guidelines and funds, on the other, it is evident that the relationship between energy and the city becomes more and more crucial in the major European cities' agendas (Gargiulo, Pinto and Zucaro, 2013).

In spite of the relevance of this aspect, from the in-depth analysis of literature on the Smart City, it seems like indicators measuring the effectiveness of strategies are almost neglected.

Moreover, at least in Italy, though remarkable progress in terms of open data, finding up to date data related, for example, to energy consumption at different scales seems to be still very difficult.

Furthermore, while actions at building scale are numerous, they are few and isolated examples at the urban scale. Indeed, the most important Italian regulation introducing prescriptions on energy planning issues, is the Law n.10/1991 "*Regulations for the national energy plan for the rational use of energy, energy saving and development of renewable sources of energy"*. This law, rather outdated by now, introduced the drafting of plans that address the deployment of energy from renewable sources, the identification of territorial energy basins, the localization of the electric energy systems and the energy balance of territorial jurisdiction (Battarra, 2014). Although this regulation compels the municipalities with more than 50.000 inhabitants to draft specific Municipal Energy Plan (PEC), only few Italian municipalities have complied.

Only recently (indicatively from 2008) some cities, at least in theory, are performing actions improve energy efficiency and increase the use of renewable sources, which seem to be integrated, mostly after the voluntary adhesion to the Covenant of Mayors and the drafting of Sustainable Energy Action Plan (SEAP) (Verones, Zanon, 2012).

The importance of the Covenant of Mayors is in having brought to the local stakeholders' attention the energy issue and to government instruments such as the Town Plan.

As a matter of fact, the EU proposed the Covenant of Mayor as a bottom-up initiative for virtuous communities that intend to take part to a coherent implementation of European policies at a local scale. The operative instrument, represented by the SEAP, could realistically affect the local scale if it is mainstreamed in the regular urban planning, and could become an opportunity to initiate interventions and to evaluate the actions that has been proposed. Without these premises, even the adhesion to the Covenant of Mayors would not bring the expected results for the participant communities and would not influence the resource management procedures (De Pascali, 2015).

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IMAGE SOURCES

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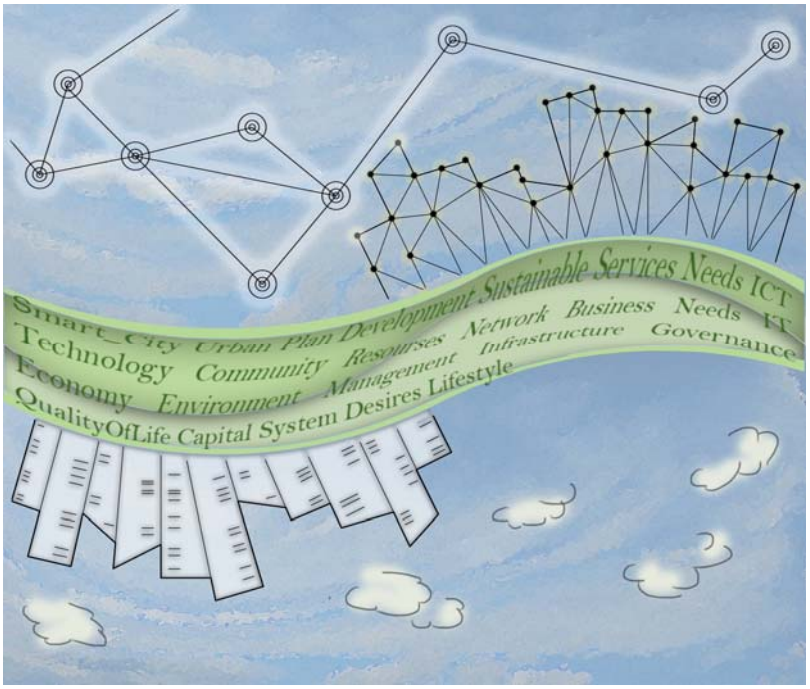

LESS SMART MORE CITY

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ABSTRACT

Smart is an expression used in recent years in science, and it refers to someone or something that shows a lively intelligence, with a quick learning curve and a fast response to external stimuli. The present scenario is dominated by the accelerated technological development that involves every aspect of life, enhancing the everyday tools through the use of information and digital processing: everything is smart, even cities. But when you pair the term smart to a complex organism such as the city the significance of the two together is open to a variety of interpretations, as shown by the vast and varied landscape of definitions that have occurred in recent years. Our contribution presents the results of research aimed at analyzing and interpreting this fragmented scene mainly, but not exclusively, through lexical analysis, applied to a textual corpus of 156 definitions of smart city. In particular, the study identified the main groups of stakeholders that have taken part in the debate, and investigated the differences and convergences that can be detected: Academic, Institutional, and Business worlds. It is undeniable that the term smart has been a veritable media vehicle that, on the one hand brought to the center of the discussion the issue of the city, of increasing strategic importance for the major challenges that humanity is going to face, and on the other has been a fertile ground on which to pour the interests of different groups and individuals. In a nutshell we can say that from the analysis the different approaches that each group has used and supported emerge clearly and another, alarming, consideration occurs: of the smart part of "Smart City" we clearly grasp the tools useful to the each group of stakeholders, and of the city part, as a collective aspiration, there is often little or nothing.

KEYWORDS:
Smart City, urban challenges, definition, text analysis, trends

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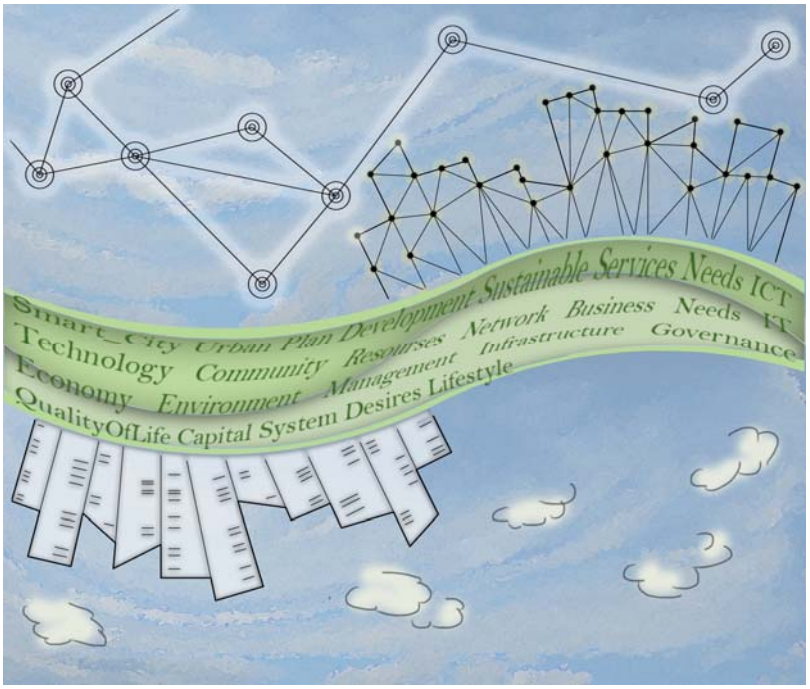

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摘要

智能是近年来应用在科学领域的一个表达，它指的是拥有智慧、快速学习曲线和能够对外界刺激进行迅速反应的人或事。如今日益迅速的技术发展已经渗透到生活的各个方面中，通过利用信息和数字处理提升了日常工具的使用：所有的事物都是智能的，连城市也是。但是，当把智能与一个复杂的有机体——例如城市——结合在一起，这两者的叠加就有了很多开放的解释，正如这些年不断出现的各种定义和诠释一样。我们的研究呈现了调查结果，旨在分析并解释这种支离破碎的场景，但不完全是通过对智能城市的 156 个定义的语料库进行词法分析。研究特别发现，参与辩论并调查分歧和意见的主要利益相关群体为：学术圈、机构人员和商业界人士。不可否认的是，智能一词已经成为真正的媒介载体，一方面它让讨论的中心聚焦在城市问题和人类即将面临重大挑战时日益增加的战略重要性上，另一方面，它也成为不同团体和人士关注的焦点。简而言之，我们说从分析中可以看出，每个组别所使用和支持的方法不同，此外调查还惊奇地发现：对于“智能城市”的智能部分，我们可以清楚地掌握利益相关者所使用和借助工具，而有关城市这一群体愿望，我们获得的信息很少或者几乎没有。

关键词
智能城市，城市挑战，定义，文本分析，趋势

1 INTRODUCTION

In recent years the smart city model has established itself in the international scientific debate devoted to the study and the management of the evolution of the city. Initially born from the evolution of the studies on the effects of emerging digital technologies on the development of society, the Smart City has subsequently become a reference paradigm for the strategic growth and development choices of urban centers. A major novelty of this approach is the cross-cutting debate involving representatives of various groups, stakeholders with different objectives, which have aspired to define the content and purpose of this paradigm. The concept of Smart City, within a few years, has become a general term used to indicate positive processes of any kind related to urban areas: environmental, economic, social, transport, etc.

In this fragmented scenario, even the "experts" seem to be victims of confusion, so much so as to give rise to a question: What is a smart city? And especially what is a Smart City for an urban planner? To attribute the intelligence of a city to its technological equipment is certainly simplistic: a city, smart or not, can be a crossroads of technological knowledge, but it is chiefly the place in which man, environment and technology interact to improve quality of life. Any model of urban development, in this subject area, is linked to the development of tools of territorial knowledge and management, making it possible to design the urban organism based on new requirements (energy, waste, sustainability, etc.) placed on top of the increasingly pressing global challenges (climate change, land use, etc.).

Regardless, it is clear that the "smart city" is a crucial flywheel for the development of the city due to the vast amount of investments that it is able to convey; as shown by the presence of the term in many funding and development programs promoted by the European Union in recent years, from the Strategic Energy Technology Plan (SET) in 2009 to the most recent Horizon 2020 program of 2014, as well as EU strategy papers (Gargiulo, Pinto, & Zucaro, 2013)[1].

How useful, then, is the current debate on the Smart city to determine concretely a practice of urban development and what are the key elements of this "new?" urban model that emerge, free from sectorial interests?

This work intends to define on a purely scientific level and from a decidedly critical angle, some points that may help to answer the most frequently asked questions.

Given the heterogeneity of the ways to define what is, or what a smart city should be, the study of the documents on the subject has led to the identification of three main groups of stakeholders that have taken part in the debate: the scientific community, institutions, and businesses. Agreed that the role of the mass communication media, for its capacity to influence public opinion, plays an important part in the debate, and it could almost be considered a fourth group, it is not possible to evaluate its contribution separately; each group uses it to propose their vision. Through the textual analysis proposed, it is possible to determine the way each expresses itself using typically media language tools to attain its objectives; selling product for businesses, gaining consent for institutions, and proposing its critical point of view for the academic world.

We examined 156 "definitions" formulated in the last 15 years, analyzing, with lexical analysis techniques, differences and similarities between the methods of conceiving the smart city of the three groups, and especially its evolution over time.

The assumption from which this analysis starts is well summarized by statisticians (Lebart & Salem, 1988) that said "it is not always necessary to know what two people wanted to say, but to know that they have not

[1] "….Many of these characteristics are given in the three documents analyzed, and from an integrated interpretation the four main actions, listed below, that European cities should undertake in the near future in order to achieve smart, sustainable and inclusive growth: adopt multilevel governance models through the distribution of responsibilities between different government and institutional levels; promote integrated urban policies by adopting a holistic and strategic approach; focus on new information and communication technologies (ICT), in order to provide citizens with new media opportunities and easier access to public and cultural content; ensure sustainable territorial development, based on an efficient use of resource…"

said the same thing." By analyzing the different formulations that are made of the term smart city in our opinion it is, in fact, possible to highlight, to what extent the changes advocated in the individual "definitions" represent a "sincere" answer to major present urban challenges, or are mere media ploys, in defense of vested interests.

1.1 STATE OF THE ART

In recent years a number of often discordant definitions of smart cities have accumulated, fueling the risk of disorientation arising from the abuse of the term. In an attempt to clarify the concept, some studies have ventured in the analysis of the vast corpus of definitions produced, trying to identify the most representative or exemplifying.

The report "Smart City development projects and financing instruments" (Cassa depositi e prestiti, 2013) identifies 23 key definitions, while the document "Mapping Smart Cities in the EU" (European Union (EU) Directorate General for Internal Policies, 2014) 10 and the studies "Defining Smart City - A Conceptual Framework Based On Keyword Analysis" (Mosannenzadeh & Vettorato, 2014) and "Diversity Of Theoretical Approaches To The Concept Of Smart City" found respectively 22 and 12.

The most comprehensive collection of definitions is represented by the report "Smart Sustainable cities: An analysis of definitions" (ITU-T International Telecomunication Union, 2014) which categorizes and analyzes 116 unique ones, even if it includes a number that are not explicitly or exclusively linked to the concept of Smart City. Some of these studies such as (ITU-T International Telecomunication Union, 2014) and (Cassa depositi e prestiti, 2013) conclude the analysis of the vast variety of existing definitions with a synthesis effort, proposing their own composite definition.

For the same reason work groups were born, such as ANSI Network on Smart and Sustainable Cities (ANSSC) that from 2014 coordinates the standardization of metrics and procedures for evaluation of the Smart City. Because of course the assessment of the performance of an organism requires first a definition of the requirements to be met. The Smart City is therefore increasingly becoming an open container in which periodically we try to bring order among the many themes that are, from time to time, thrown inside in an attempt to outline the shared priorities for the future of cities. In this direction are some studies, such as the report "Mapping Smart Cities in the EU" (European Union (EU) Directorate General for Internal Policies, 2014) that identifies six themes that follow those described by (Giffinger, Fertner, Kramar, Pichler-Milanovic, & Meijers, 2007), to describe the main characteristics that can measure the smartness of the city; or the article by (Cavada, Hunt, & Rogers, 2014) that identifies three main nodes of urban development in a Smart way: Information and Communication Technologies (ICT), Resilience and Sustainability, Innovation and Business.

However, to identify the basic requirements of the urban organism it is necessary to start from a system of shared needs that should not be defined on the basis of individual interests. Keeping this in mind, some studies in literature have analyzed the concept of smart city considering the belonging of the proponents to discernible groups.

In the creation of their index "Modelling the Smart city performance" (Lombardi, Giordano, Farouh, & Yousef, 2012) identify four groups: University, Governement, Civil Society, Industry; the proposed distinction between civil society and government is not present instead in the study "Smart Cities: Contradicting Definitions and Unclear Measures" (Cavada, Hunt, & Rogers, 2014) that concisely specifies three groups: People, Governance, Companies. The same classification, albeit with different labels, is also present in the study "Defining Smart City - A Conceptual Framework Based On Keyword Analysis" (Mosannenzadeh & Vettorato, 2014), which identifies three main domains involved in decision making process related to the Smart City: Academic, Industrial and Governmental; This difference in approach to the issue of smart city is emphasized in the study "Smart cities: theoretical framework and measurement experiences" (Santis,

Fasano, Mignolli, & Villa, 2013) which concluded that the world of institutions, academia and business In defining a Smart City, emphasize only some aspects.

This heterogeneity in the way of imagining the Smart City, where different specific interests fit, is favored by an additional factor of confusion: reading the definitions, it's not clear whether the smart city is an ongoing phenomenon that we need to study, dominated by the use of new technologies, or a synonym of the city we should strive towards. The definitions go from the proclamation of absolutely general principles, as the one proposed by (Rios, 2012) which considers the city as an entity that inspires its citizens to improve themselves, to the most punctual in their indications, like the one proposed by the consortium The Climate Group (The Climate Group, ARUP, Accenture and The University of Nottingham, 2011) that identifies what issues will be promptly resolved through the use of ICT, or the study "The Vision of A Smart City" (Hall, 2000) that identifies in the technology apparatus of the city the tool to achieve the proposed objectives and describes the apparatus in its hardware and software sub-components.

These definitions highlight what is undoubtedly one of the central issues of the debate: the role of the information and communications technologies (ICT) as the main instrument of urban transformation to meet the challenges of the millennium. The range goes from the report of the Smart Cities Group (M.I.T., 2013) that considers the role of ICT hegemonic, to "Smart cities and the future internet: Towards cooperation frameworks for open innovation" (Schaffers, Komninos, Pallot, Trousse, & Nilsson, 2011) that considers the investment in ICT as only one of the tools necessary to obtain the Smart objectives; up to the studies such as "Digital Dimension of Smart City: Critical Analysis" (Jucevičius, Patašienė, & Patašius, 2014) that, in studying the digital dimension of Smart cities in the social field, asserts that " many social systems can be smart without necessarily basing their activities on Information and Communication Technologies (ICT)"; although the same study has also concluded that "even if it is true that ICT does not dominate any of the features essential for the Smart city, it is important to all."

It follows therefore that the different characteristics of those who have suggested their own definition of "Smart City", their multiple interests, and the complexity of their individual visions, have created an extremely complex field that has generated in recent years several attempts of analysis and synthesis.

The purpose of this study is to better outline the different approaches to the issue by the various groups that have taken part in the debate, defining their objectives, in order to return to the center of the discussion the city as an organism and not as the sum total of individual interests.

2 METHODOLOGY

To respond to the questions we posed we made use of lexical analysis tools, which allow us to highlight in a textual corpus the semantic dimensions and the themes underlining the same textual data to identify the views of the authors of the analyzed texts in a given time frame.

The assumptions made before undertaking the study involved the selection of appropriate methods to deal with content analysis to get answers to the questions posed, and thus the criteria for the collection of the material to form the textual corpus on which to apply them.

2.1 CHOICE OF ANALYSIS AND DATA COLLECTION METHODS

To analyze the textual corpus, three separate lexical analysis techniques were chosen, each returns different information:

- Network Text Analysis;
- Lexical Correspondence Analysis (LCA);
- Method of frequency analysis of lexical units classified in thematic categories.

The Network Text Analysis is an automatic elaboration system that clearly identifies the key words of a set of texts. Dividing the text corpus in function of the characteristics of the authors it was possible to identify,

on the basis of a simple comparison, which concepts are the most representative of each group and, in particular, in our case, the main engines of development of a Smart City in the different visions. the Lexical Correspondence Analysis (LCA) is an analytical method capable of detecting the latent meaning in a set of texts; being an application of factor analysis to the study of texts, it is mainly based on "differences" and not on "measure" (Trobia, 2005); in other words, a word is all the more significant as it is specific to certain groups of texts. To determine the latent meaning, in our case, implies identifying the main processes that each group peruses in the debate on the Smart city also recognizing vocabulary differences that return information about the message recipients: Why do we talk about Smart City? And who is involved?

The method of frequency analysis of lexical units classified in thematic categories is a technique of textual analysis useful to study the temporal trends of predefined variables. This method is very effective in highlighting the evolution of a single form or group of forms (themes), and determining the weight of each variable compared to the total. Environmental challenges, the economic, social and technological development are the themes linked to the concept of Smart City that were examined. The same method was also used to test the role and the weight that each group assigns to issues relating to the specifics of urban planning, defined as the government of urban transformations.

The three analysis methods described have provided different information complementary to each other, which have been collected in two summary tables that can offer a more complete overall picture in relation to differences in vision between the groups of individuals who have spoken (Tab. 6) and the evolution of the concept of Smart City in time (Tab. 7).

For the application of these methods it was necessary to collate the corpus that, for our purposes, included the largest possible number of definitions of Smart City.

The collection of definitions took place according to the following selection criteria:

- Exclusion of all assertions for which there has not been an effort of synthesis which created a definition;
- Exclusion of texts not written in the language of the majority, namely English;
- Exclusion of all statements that do not exclusively reference the term "Smart City", such as digital city, sustainable city smart, intelligent city;
- Exclusion of the statements that totally incorporate pre-existing definitions, preferring the original expressions.

With this method 156 unique definitions were collected; for each the following information: 1) Text, 2) source, 3) type of source, 4) author, 5) year 6) group of stakeholders (Fig. 1).

Text	Source	Type of source	Author	Year	Group of stakeholder
The phrase Smart is not new. It may have origins in the Smart Growth movement of the late 1990s, which advocated new policies for urban planning	Smart City Progetti di sviluppo e strumenti di finanziamento (distribuito da Cassa depositi e prestiti S.p.A)	Monographic Report	Harrison & Donnelly	2011	ACADEMIC
A smart city is, above all, a city capable to effectively meet citizens' needs	TOWARDS AN URBAN PLANNERS' PERSPECTIVE ON SMART CITY	Article on journal	PAPA, R.; GARGIULO ,C; GALDERISI, A	2013	ACADEMIC

Fig. 1 Extract of the definition collection table

Regarding the last point, the strong characterization of those who have proposed their definition has allowed the division into three classes: Academic, Institutional and Business. This division comes from the study of the scientific literature that almost universally recognized, albeit with different names, these three spheres of influence.

The discriminating element for the breakdown was the type of source from which the definitions were extracted, from:

- Scientific publications from magazines and conference proceedings, go to Academic;
- White papers, institutional documents, go to Institutional;
- Gray papers, documents published by industrial consortia, go to Business.

The entire corpus, thus selected, has also been normalized according to the most appropriate criteria for each method. The following describes in detail the procedures and decisions taken in relation to each of the three methods.

2.2 NETWORK TEXT ANALYSIS

The basic assumption from which this type of text analysis starts is that a text or a set of texts can be represented as a network of words in relation to each other and that the position of the concepts within this network allows to better understand the prominent themes of the text as a whole. In particular we decided to apply the software developed and made available by NodusLabs (Paranyushkin, 2011) that performs the encoding of the text from the proximity of the concepts and the density of their links. The program first automatically proceeds with the normalization of the text by removing meaningless words (stopwords), symbols, punctuation, and so on, and aggregating similar morphisms. Subsequently, the program processes the analytical data by counting the number of times that each word is located close to another within two words; after this stage a proximity analysis of individual words within groups of five words follows, in order to identify sets of local significance.

The information is then graphed using the Force Atlas algorithm (Fig. 2) and, to emphasize the representation, the size of the nodes is varied as a function of their "betweeness centrality", namely the measure for each node of how often it appears in shortest path between any two other network nodes. The higher the value, the greater the role the node has as a link between the different sets of meanings in the communication. The four link words (nodes) with highest values are the "most influential keywords", which have been the main subject of our analysis. This methodology has been applied automatically, first to the entire corpus of 156 definitions, and then dividing it in the three subgroups assigning each definition to the Academic, Business or Institution world.

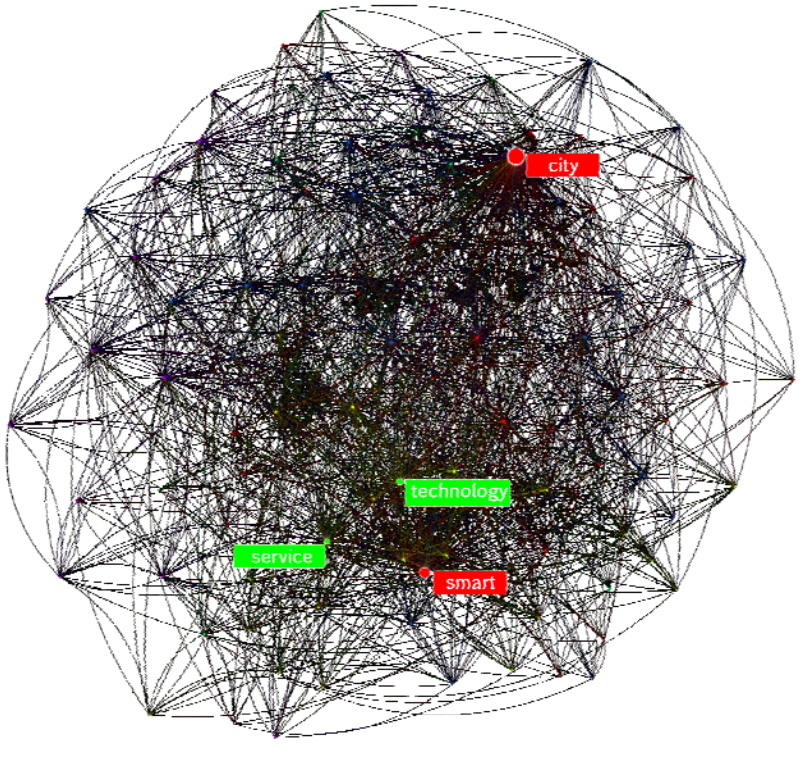

Fig. 2 Graphical representation of the network analysis of the total corpus

2.3 LEXICAL CORRESPONDENCE ANALYSIS

The process of analysis begins with the construction of a contingency table (lexical table), which presents terms in rows and in the columns the modes of the variables assigned to the texts, which in our case are the year of publication and the groups of stakeholders (Tab. 1). Plotting the joint frequencies matrix of the variables with specific calculations, we can determine significant associations between groups of words and modes, starting from a probabilistic hypothesis of regular distribution of the forms: when a word is distributed equally in all the sub-texts it is considered trivial; when, instead, it is over-represented in one of the sub-texts it is considered characteristic (Della Ratta, 2007).

Lemma	Academic	Business	Institution
Access	2	7	1
Activity	7	2	2
Administration	7	6	0
Advanced	5	6	1
Area	6	10	4

Tab. 1 Extract from the contingency table of our lexical corpus. At intersections between rows and columns the occurrence of each lemma in all definitions belonging to the corresponding mode (in this case relating to groups of stakeholders).

The software called SPAD was used to analyze these connections, and to break down the lexical table in a series of factors, each of which represents an aspect of the latent type of association present in the data. Based on the results the software plots the two-dimensional dispersion graphics, representing the factorial space on which entries and modes are projected. The origin of the axes of the graph is the center of gravity of the cloud of points; the more the elements are far from the origin the more their profiles are far from marginal. Examining the entries that are located in periphery, it is therefore possible to attribute to the factorial axes their latent meaning and define the factor space, giving a name to the four quadrants. On the basis of the positioning of the mode in this space so defined, it is possible to describe the unique characteristics that distinguish them (Fig. 3). To create the vocabulary that has been analyzed the following steps were required:

- Normalization, which consists in the homogenization of the spelling used.
- Lemmatization, which consists in grouping of entries in graphic forms and involves, for example, that the forms of nouns and adjectives are traced to the masculine singular form.
- Selection of the forms on the basis of a minimum threshold frequency, in our case equal to 7.
- Elimination of the so-called empty forms that have only grammatical meaning in relation to other words[2].

The vocabulary thus obtained determines the row entries of the lexical table.

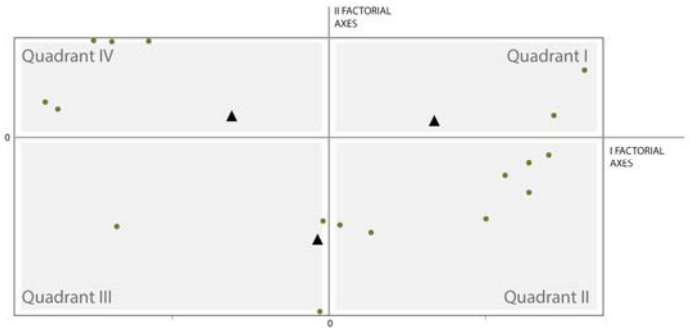

Fig. 3 Scatter chart prepared by Spad software. The two main axes represent the factors and divide the factorial space into four quadrants; black triangles and green circles represent respectively projections of modes and terms on the two factorial axes.

[2] These are mainly instrumental forms (of, and, that, for, etc.), uninformative and present in all texts. More generically, in each context, all those words that do not report a content relevant for the analysis are defined as empty forms. For this reason, also some adverbs and adjectives that are not considered significant have been eliminated from the vocabulary.

2.4 METHOD OF FREQUENCY ANALYSIS OF LEXICAL UNITS CLASSIFIED IN THEMATIC CATEGORIES

The procedure, before the analysis and interpretation of the individual collected definitions, needs a step to break down the selected corpus in units of analysis, represented, in our case by [**k**] Keywords, and a step of classification of these units into thematic categories.

After the selection of the Keywords the categories were defined ex post[3]. *"What themes are prevalent in the new vision of the city?"* is the first question that has guided the analysis of the texts and the definition of the following thematic categories [4]: Business, Community, Resource e Network.

The definition of the first three categories derives from the consideration expressed by other authors such as (Papa, 2013), and confirmed by a first investigation of the entire corpus, that the Smart City represents an evolution of what has been defined sustainable city, whose functioning would result from a proper interaction of economy, society and environment.

Compared to the sustainable city, to describe the main topics of Smart City, another category has been inserted that we call Network, linked to the development and use, in recent years, of new information and communication technologies. The themes identified can be defined as follows:

- **[B]** *Business.* includes concepts that refer to a city that interacts with global challenges in terms of economy and investments such as: *economic growth, economic development, start-up, marketing*;
- **[C]** *Community.* Collects all aspects closely related to the organization, the development and the government of the city to provide services in order to achieve a better quality of life. Within this group keyword such as *needs, living, urban planning, security, and lifestyle*;
- **[R]** *Resource.* Considers a series of keywords that refer to a city that interacts with global challenges in environmental terms closely related to resources, natural and otherwise. Some keywords are *climate change, energy, resource, sustainability, resilience*;
- **[N]** *Network.* Collects keyword that relate to the use and implementation of both soft and hard infrastructure, thus promoting mobility, both physical and virtual of people, experience and knowledge; within this group we find keywords such as *infrastructures, ICT, mobility, technology*.

But in the new vision of the city 'What is the role of the town planning? '', and "What role and weight does each stakeholder assign to the specific topics of the discipline of urbanism? ".

To answer these questions, the study focused on the thematic category Community [C], which, in its definition contained elements not related to a specific discipline but generally attributable to collective aspirations; further analysis was carried out, therefore, splitting the category in question into two subcategories, taking as sole criterion the will to distinguish all the keywords related to social aspects, from those related exclusively to urban organization, to its development and its transformation: the first set, called [S] Social Priority, includes keywords such as *quality of life, living and people*, while the second, [U] Urban Planning, includes keywords such as *urban planning* and *urban development*.

To assign keywords to each category [B], [R], [N], [S] and [U] the following classification criteria was used: 1) completeness: no keyword is left out; 2) mutual exclusivity: no keyword is part of more than one category; 3) pairwise comparison: since there is no rule of unique assignment; 4) relevance: the categories identified are considered a priori useful; 5) homogeneity: cases with different characteristics do not fall into the same category.

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[3] The choice of categories can be ex ante or ex post. Ex ante when we have pre-existing categories before the analysis of the corpus, when you want to compare the results with those of other studies, when the theories on a subject are widely established and there is no need to verify them. Ex post that relies on the texts of the corpus to define the concepts useful in describing the investigated phenomenon, when you have a fragmented and unclear vision of the phenomenon, when you want to develop new theories and conceptualizations.

[4] Currently in the analysis of content it is possible to identify two types of categories: thematic (the unit of analysis relate to the same subject) and semantics (the unit of analysis have, in the unit of context, the same or similar meaning).

To ensure the principle of mutual exclusivity we used specifications, in most cases attributable to adjectives, which accompany the coding of keywords and help the correct assignment of each in thematic categories[5].
"Given the role of town planning" by what means is the new city preparing to face the transformation of the territory? To answer, all the keywords within the category theme **[U]** Urban Planning were examined, extrapolating the ones most representative both for meaning and for frequency, and analyzing the trend over time and by groups of stakeholders.
The data was summarized in a matrix considering all the variables (Groups of stakeholders: **Ac**ademic, **Ins**titutional and **Bus**iness and years: ≤2010, 2011, 2012, 2013 and 2014) as in the Tab. 2.
Completed the matrix it was possible to proceed with the combination of the variables coded in order to investigate the trends of categories and key concepts.

Definition	Keyword	Specification	U	S	B	N	R	AC	INS	BUS	Year
A city where information technology is being incorporated into services that affect urban problems	ICT					1		1			2013
	services		1					1			2013
	problems	Urban	1					1			2013
A real smart city develops the city to reach the aim of improving the quality of life. It needs sound and innovative economic development as a means to reach this aim. Uses ICT as a tool with a great potential for ameliorating daily life, public services and the economy.	Quality of life			1					1		≤2010
	development	economic			1				1		≤2010
	ICT					1			1		≤2010
	services	Public	1						1		≤2010
	economy				1				1		
Smart cities: Innovative urban developments that leverage ICT for the management of natural energy consumption at the community level and other technologies to balance environmental stewardship with comfortable living.	development	Urban	1							1	2014
	ICT					1				1	2014
	energy	consumption					1			1	2014
	technology					1				1	2014
	environment	stewardship					1			1	2014
	living	comfortable		1						1	2014

Tab. 2 Excerpt from the table used for the analysis

3 RESULTS

The analysis of the output provided by each of the three methods of lexical analysis described in the previous paragraph has produce several insights. Sifting through the different uses made of the term *smart city* we can, through these instruments, identify whether, and to what extent, the changes advocated in the individual definitions represent an effective response to major modern urban challenges, for example related to the use of land or rationalization of energy resources, or are media instruments in defense of vested interests. Such analysis techniques are, therefore, a useful tool to start a shared analysis of urban transformations necessary for the future of the city, without being blinded by misleading philanthropic claims.

3.1 NETWORK TEXT ANALYSIS

[5] Un esempio di questa operazione è riscontrabile nella codifica del termine 'Development' che ha rivelato, durante la lettura dei testi, diverse accezioni, ciascuna delle quali ha determinato l'assegnazione della stessa keyword in categorie differenti: cultural development [C]; economic development [B]; technological development [N]; sustainable development [R].

The main output of this analysis are the *most influential keywords* or node words that are common to the greatest number of contexts (Tab. 3).

TOTAL	ACCADEMIC
Nodes (Words): 100 Edges (Co-Occurrences): 1483 Most influential keywords in this text: city smart technology service	Nodes (Words): 100 Edges (Co-Occurrences): 1250 Most influential keywords in this text: city smart technology ICT
ISTITUTIONAL	**BUSINESS**
Nodes (Words): 100, Edges (Co-Occurrences): 626 Most influential keywords in this text: city smart sustainable management	Nodes (Words): 100, Edges (Co-Occurrences): 1207 Most influential keywords in this text: city smart service technology

Tab. 3 For each corpus the total number of co-occurrences that define the connections, the four node words that connect the stronger contextual themes.

Lemma	Total	Academic	Business	Institutional	Sum
City	1	1	1	1	4
Smart	1	1	1	1	4
Technologies	1	1	1		3
Service	1		1		2
ICT		1			1
Sustainable				1	1
Management				1	1

Tab. 4 Most influential keywords per sphere of influence

From the table above:

- The word ICT is central only to academia;
- The node word technology is present in the total corpus, business and academia;
- The institutional world uses unique words;
- The node words of all the definitions are the same as the corpus of the business world

These words are not necessarily the most important for the themes found in the text but the ones that strategically link together many of the themes found. We, therefore, propose the following considerations:

- For academics the main interest is the use of new information technologies, which therefore represent the true discriminating character of this urban model.
- Although sharing the interest of technological development with the academic world, the image of the *Smart City* proposed by the business world is centered around the concept of services; for the business world, therefore, a *Smart City* is able to develop and use technology to serve the citizens; since they are manufacturers of devices and sensors we could wonder whether it is not instead a city at the service of technology.
- Institutions have a completely different vision where technology does not seem to play a central role, instead the issues of sustainability and management emerge strongly, in continuity with the previous city models: the smart city is a city that can manage change in a sustainable way. The

institutional world seems to not have the need to characterize this new model, but probably uses the brand to perpetuate already initiated policies[6].

- What is most striking is the exact correspondence between node words and totality of definitions and of the business world, demonstrating how companies are driving the debate on the smart city.

3.2 LEXICAL CORRESPONDENCE ANALYSIS

The LCA was applied twice on the same textual corpus, using as discriminating modes once the groups of stakeholders and then the year of publication. Following the procedure of analysis described in section 2.3, we proceeded to the interpretation of the scatter charts, with the support of numerical tables, processed by the software together with the graphics, which summarize the coordinates of each lemma for each factor (Tab. 2-3). The results analysis procedure is organized according to the following steps:

- Interpretation of the factorial axes
- Interpretation of the quadrants
- Positioning of the modes (groups of stakeholders, year of publication) within the factorial space

1) LEXICAL CORRESPONDENCE ANALYSIS PER GROUPS OF STAKEHOLDERS

INTERPRETATION OF FACTORIAL AXES

The first step consists in the interpretation of the two factorial axes, which in the specific case represent the 100% of the total variance.

The Ist factorial axis has two opposed groups of words that characterize the two semi axis:

- Positive semi axis: *Vision, Efficiency, Access, Sector, Operation, Solution*.
- Negative semi axis: *Governance, competitiveness, capital, human, policy, modern, transport*.

In the first group words such as *Efficiency, accessibility, solution, vision*, understandable concepts to a wide audience even of non-experts, evoking a fully functional urban dimension. Thus emerges a language, very close to the world of marketing, which focuses on an ideal view of the object (in our case the Smart City) rather than comment on specific processes and tools that describe it. On this basis, this semi axis was named "SUGGESTIONS".

The second group includes words such as *governance, competitiveness,* and *policy* related to a more specialized and less evocative language, that focus on the tools and processes of urban transformation. Words such as *human* and *social capital*, combined with *modern* and *transport* suggest a cross sectorial discussion that involves the field of humanistic and scientific research. This axis was therefore named "tools of transformation."

The IInd factorial axis has two opposed groups of words that characterize the two semi axis:

- Positive semi axis: Policy, capital, human, living, administration, investment, intelligent
- Negative semi axis: Mobility, data, planning, competitiveness, communications, efficiency, reduce

On the positive semi-axis terms that seem to describe a vision of cities attentive to the management (*administration, policy, intelligent*) resources in economic terms (*capital, investment*) and social (*human, living*) emerge; on the negative semi axis instead urban issues are part of a wider path (*mobility*) where the exchange of information and best practices (*data, communications*) become the lifeblood in the resolution of global challenges (*reduce, efficiency, competitiveness*). The two semi axis have therefore been defined respectively "optimization of local resources" and "NETWORKING EXPERIENCES".

[6] It's important to point out that most of the definitions collected from the institutional world, and included in this category, belong to documents of the European community; for many of them environmental issues, particularly those related to resource management, whether energy or economy, are central.

INTERPRETATION OF THE QUADRANTS

The interpretation of the axis analyzed earlier, returns a description of the factorial space by assigning a specific meaning to the four quadrants. The first quadrant shows the image of a city in which the use of ICT and the increasing accessibility to these means is the real engine of development of urban areas in terms of management of economic and social resources. The development of new digital technologies takes on, in the second quadrant, a greater interest in relation to the possibility of exchange of experience, know-how, information, best practices between different realities to address common issues and global challenges. Unlike the previous one, the third quadrant, is more focused on the development of tools for urban governance and sharing of experiences becomes a necessary tool to optimize these processes. In the fourth quadrant, the development and implementation of policies and governance tools are more related to the optimization of local resources in economic and social terms.

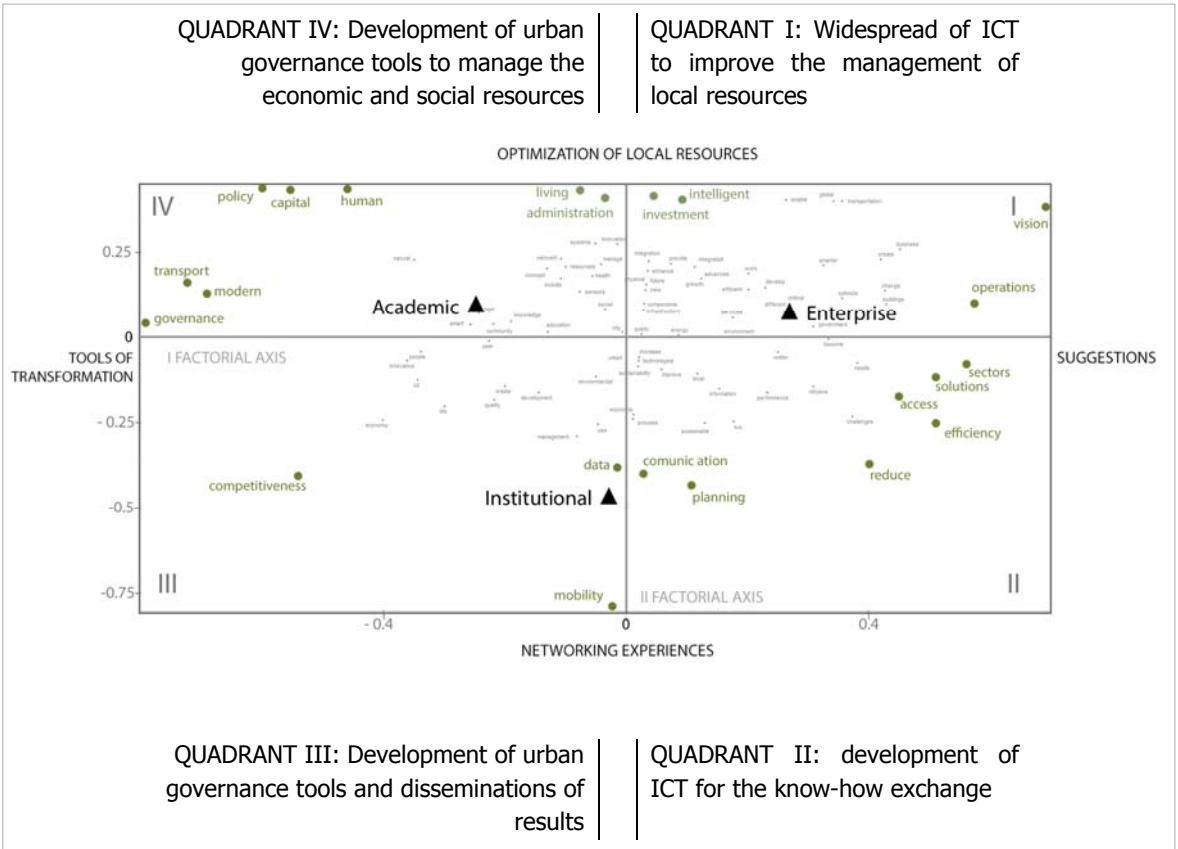

Fig. 4 Results of the LCA per groups of stakeholders

PLACEMENT OF THE GROUPS OF STAKEHOLDERS IN THE FACTORIAL SPACE

Starting from the considerations made above on the 4 quadrants, it is possible to detect differences in the approach of the three groups of stakeholders under consideration in addressing the issue of the Smart City by analyzing their placement on the factorial plane.

In particular, the opposition is very clear along the horizontal axis of the academic world with that of business, which are located respectively in the I and IV quadrant but is found "lying down" on the first axis. From the description above, it is clear that the development of ICT has led, in the academic world, to pay greater attention to the impact of this revolution in the human and social field and a reflection on the potential of these systems in the management policies of urban organism. On the one hand, therefore, interest of the branch of social sciences emerges, who see in a more or less critical way, the Smart City in

the new forms of social interaction, the other the increasing attention from more "technical" disciplines who see this technological revolution, new urban systems optimization tools. On the other side it is obvious that the business world insists more on the attractiveness of new technologies; while sharing with others a series of keywords of the concept of Smart City, it appears more interested in the construction of a language that can reach a wider section of the population, through the use of evocative words.
The institutional world is placed in Quadrant III, and is characterized mainly by the second axis. Its position denotes, therefore, a clear predominance of issues relating to mobility, considered as networking and dissemination of know-how and best practices; This is probably related to the high incidence of the main evaluation factors present in the program guidelines of European calls; they see in multiculturalism and sharing the main requirements for participation, as well as a greater interest in the global challenges in which cities play a decisive role.

2) LEXICAL CORRESPONDENCE ANALYSIS PER YEAR

INTERPRETATION OF FACTORIAL AXIS
In this case the first two factorial axes represent 65% of the total variance.
The Ist factorial axis has two opposed groups of words that characterize the two semi axis:

- Positive semi axis: *critical, administration, operations, physical, activities, sensor, optimize*
- Negative semi axis: *challenge, change, vision, development, policy reduce, energy*

In the first group there are terms related to the production processes (*operations, phisical, activities, sensor, optimize*) that, together with the words *critical* and *administration*, indicate the attention to the development of new technologies and their management. On the opposite axis instead attention is more focused on the socio environmental challenges, terms such *challenge, change,* and *vision* combined with *development policy, reduce,* and *energy* indicate greater interest to the global challenges with particular emphasis on the reduction of energy consumption. The two semi axis have therefore been defined respectively "TECHNOLOGICAL DEVELOPMENT" and "GLOBAL CHALLENGES".
The IInd factorial axis has two opposed groups of words that characterize the two semi axis:

- Positive semi axis*: work, increase, business, public, administration, efficiency, solutions, digital*
- Negative semi axis: *activities, capital, sensors, mobility, smarter, network*

The second axis has on the positive semi axis themes with big media appeal in these tough times, related to employment and management of public money (*work, public, administration*) which are accompanied by the need for economic investments (*solutions, Increase, business*) and related to the production and spread of digital technology (*efficiency, digital*). The negative semi-axis is characterized by terms that conjure the possibility of improving urban performance through the study and analysis of the habits of the inhabitants; the focus is on the potentiality of control (*sensors*) of human activities networks (*activities, mobility, network, capital*) for the creation of smarter cities (*smarter*). The two semi axis have therefore been defined respectively "investment in digital technology" and "BEHAVIOR ANALYSIS".

INTERPRETATION OF THE QUADRANTS
The interpretation of the axis analyzed earlier, returns a description of the factorial space by assigning a specific meaning to the four quadrants. In the first quadrant issues, related to the production, deployment and diffusion of new technologies, especially digital ones, emerge which turn out to be the real engine of economic development of the city.

Instead, in the second quadrant issues related to the development of new technologies for the implementation of the performance in terms of urban development of social networks and infrastructure emerge.
In the third quadrant, development and education of citizens become the real engine of change to address global challenges, a central theme in the fourth quadrant. In this case the challenges, are economic social and environmental: a city is smarter as it is prepared to face the major challenges of the future.

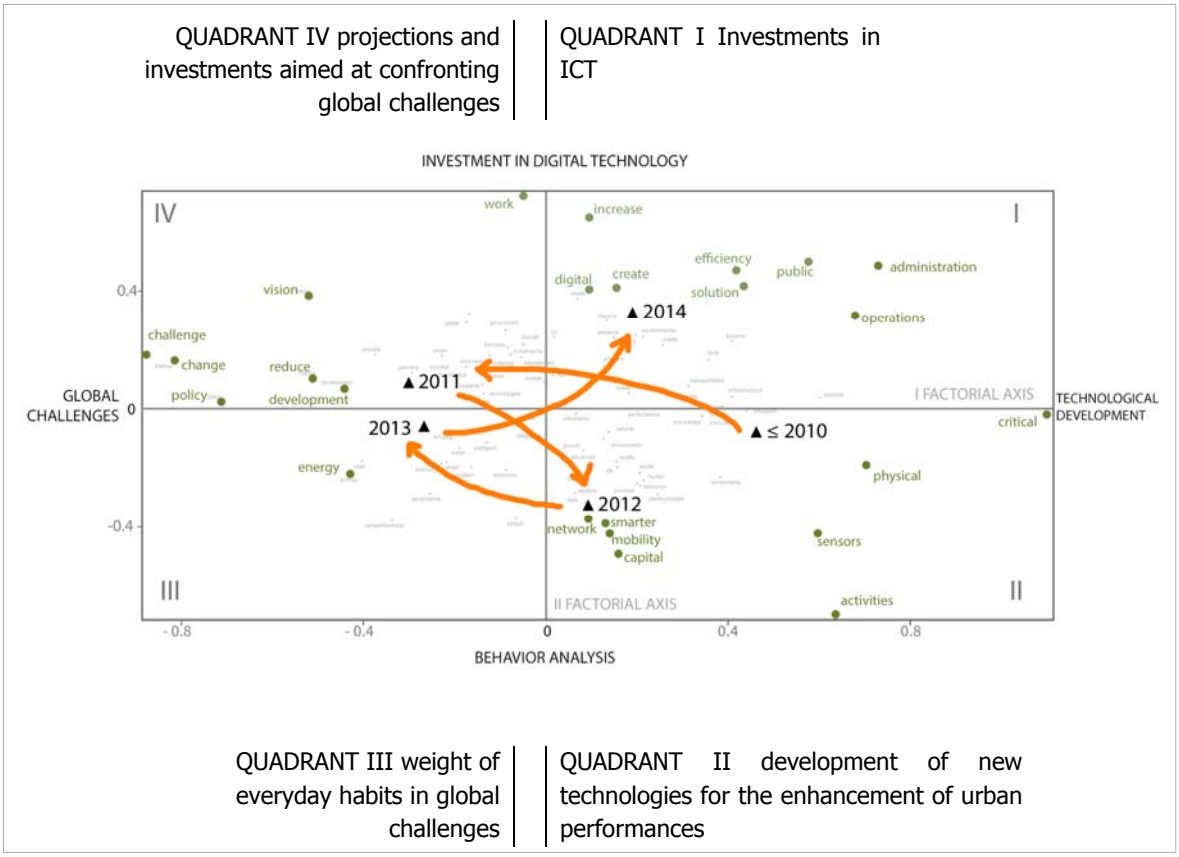

Fig. 5 Results of the LCA per year

PLACEMENT OF THE GROUPS OF STAKEHOLDERS IN THE FACTORIAL SPACE

Starting from the considerations made above on the 4 quadrants and analyzing the positioning of several years on the factorial plane, we can describe the evolutionary trajectory of the themes that have characterized the debate about the Smart City over time.
Based on the description of the interpretation of the factorial space the debate prior to 2010, located in quadrant II seems to be characterized by greater attention to the development of new technologies regardless of the possible fields of application. In 2011, located in the fourth quadrant, switching from a focus on the new tools provided by technology to a greater consideration of the role of cities within the global challenges: control of the new devices has a positive effect on the ability to cope with global challenges starting from city management. To achieve the goals set by the challenges the simple technological development is not enough: in 2012, located in the fourth quadrant, but more "lying" on the second axis than in 2010, the idea that a city to be smart should also implement its networks and social infrastructure seems to prevail. in 2013 the focus moves back to the challenges, but unlike in 2011 with a meaning slightly influenced by social as well as environmental aspects; Finally, in 2014 the development of new technologies is once again at the center of the debate, driven by strong economic interests it becomes the real engine of growth; addressing the major challenges by incorporating into the debate issues of great media impact such as work and the management of public resources. It does not appear coincidental that

the strong media character emerges in this last year when, as we shall see in the next section, the main producers of smart devices are more present in the debate on the smart city.

3.3 METHOD OF FREQUENCY ANALYSIS OF LEXICAL UNITS CLASSIFIED IN THEMATIC CATEGORIES

TRENDS OF THE DEFINITIONS

Before proceeding with the application of the analysis, how much the three groups of stakeholders have debated on the issue of Smart City over time was verified. Besides being a useful reference to the study of the results of other analyses, this data has yielded the first important considerations: initially the debate on the smart city is the prerogative of the scientific community, while in 2013 we see a substantial increase in definition by the world of business, represented mainly by manufacturers of electronic devices and software; This probably is due to the spread that the concept of smart city reached just recently becoming a significant element of media appeal; it is no coincidence that in all the web pages of the leading manufacturers of electronic devices (Siemens, IBM, Hitachi etc.) there is a section dedicated to the Smart City. While, on the one side, the academic world seems to abandon the initial enthusiasm for the potential of a Smart City, on the other businesses, use the brand to launch their products in a market mature to accommodate them. How does this difference in approach translates into concrete terms? The frequency analysis of lexical categories has shown the trends of the main themes of a smart city identified by the various groups of stakeholders involved in the debate.

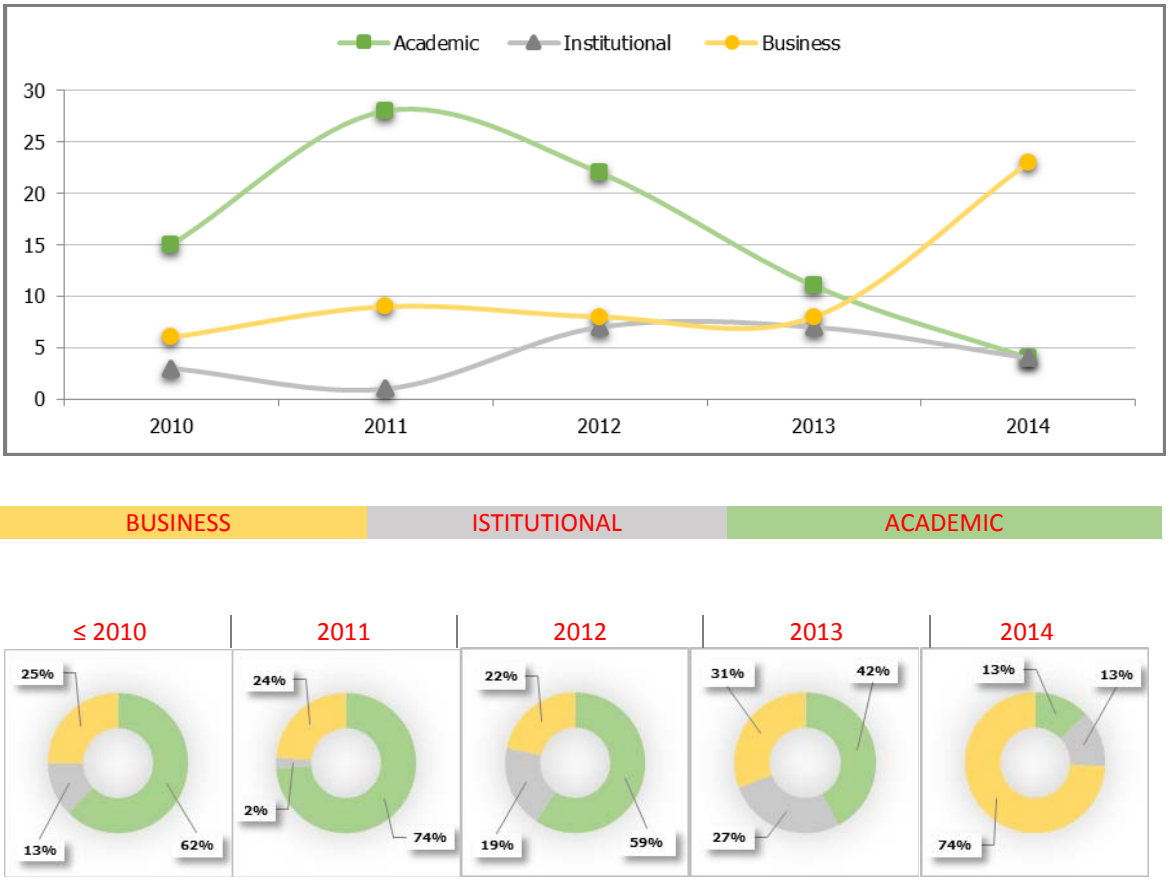

Fig. 5 Trends of groups of stakeholders and corresponding weights

From the subdivision of the keywords in thematic categories as described in section 2.4 the following graphics have been developed:

- Trends of the themes for the groups of stakeholders: is the weight that each thematic category plays in the debate within each groups of stakeholders over time;
- Trends of the groups of stakeholders by theme: shows the behavior and the relationship between groups of stakeholders with regard to a specific thematic category over time;
- Trends of the sub-themes [S] Social Priority and [U] Urban Planning: is a focus within the thematic category [C] Community in order to understand the weight of urban transformation in the debate for the three groups of stakeholders in time.
- Trends of the main keywords within the category [U] Urban Planning to understand in which terms the challenges of urban transformation are tackled by the three groups of stakeholders over time.

TRENDS OF THE THEMES FOR THE GROUPS OF STAKEHOLDERS

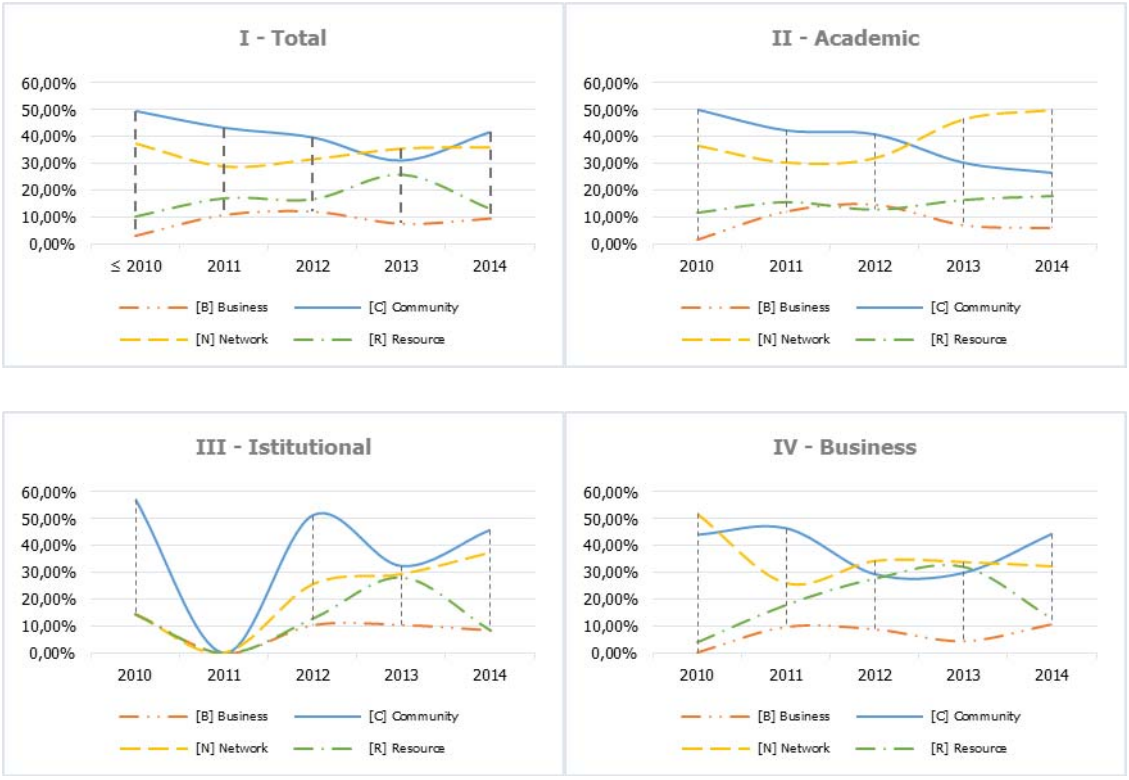

Fig. 6 Trends of the thematic categories per group of stakeholders

From the analysis of the quadrant I, relating to the 156 definitions, aspects related to global challenges in social and territorial terms and the use of new information and communication technologies are the main themes addressed in the new vision of the city emerge, in spite of a lack of importance given to issues related to economic and environmental aspects, except for a peak of the latter in 2013. The relevance of the topics covered changes within individual groups of stakeholders. The academic world, in the early years, discusses the theme of the Smart City privileging issues related to social and territorial government; by 2012, however, the focus is on the infrastructure system implemented by new technology and its physical and virtual interconnection ability. This change in vision may be due to a greater participation in the debate in the early years, by the branches of social science academics who give way to the scientific and experimental academics, more attracted by the potential of new technologies.

We see this change in the business world (see quadrant IV) albeit with inverse trends; this is probably due to marketing strategies: to a first phase in which the product itself is presented on the market follows a second linked to the need to effectively reach a wider audience, leveraging topics closer to individual aspirations. Institutions instead assign less weight to the technological aspects focusing on the social and giving much more weight than the other groups to environmental issues; This order of priorities is altered from 2013 when it seems to get closer to the positions of businesses.

TRENDS OF THE GROUPS OF STAKEHOLDERS PER THEMATIC CATEGORIES

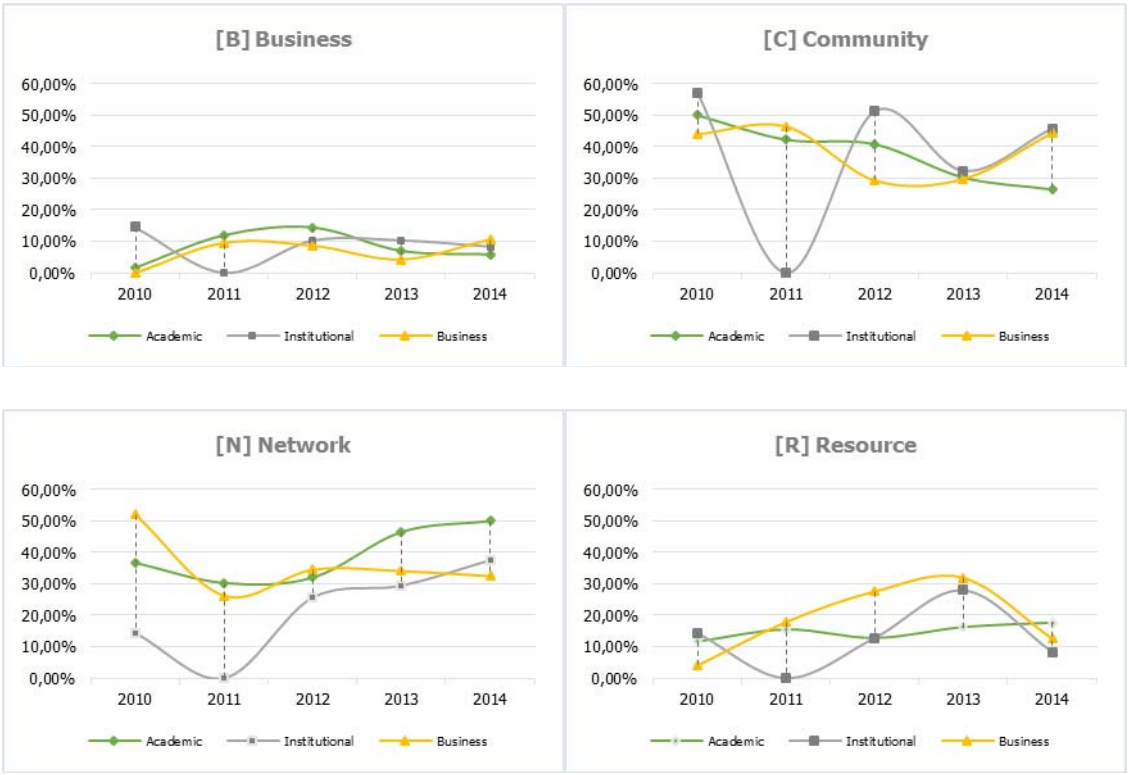

Fig. 7 The trends of the groups of stakeholders per thematic categories shows the relations amongst the groups.

Looking at the above charts we find confirmation of what we have alleged: in 2013, the curves relating to the business and the institutional world tend to coincide; at a time when the business world enters with more energy in the debate, it seems able to affect institutional priorities, that at the same time move away from the new themes discussed by the scientific community. Another hypothesis, perhaps more likely, is that companies have reformulated the vision of the smart city to tap into funding provided by the EU through programs such as Horizon 2020.

The following table provides a summary of what has been said so far:

	[B] Business	[C] Community	[N] Network	[R] Resource
1°	**Ist**ituzional	**Ist**ituzional	**Acc**ademic	**B**usiness
2°	**Acc**ademic	**B**usiness	**B**usiness	**Acc**ademic
3°	**B**usiness	**Acc**ademic	**Ist**ituzional	**Ist**ituzional

Tab. 5 ranking of the groups of stakeholders per thematic category

TRENDS OF THE THEMATIC SUB CATHEGORIES: SOCIAL PRIORITY [S] E URBAN PLANNING [U].

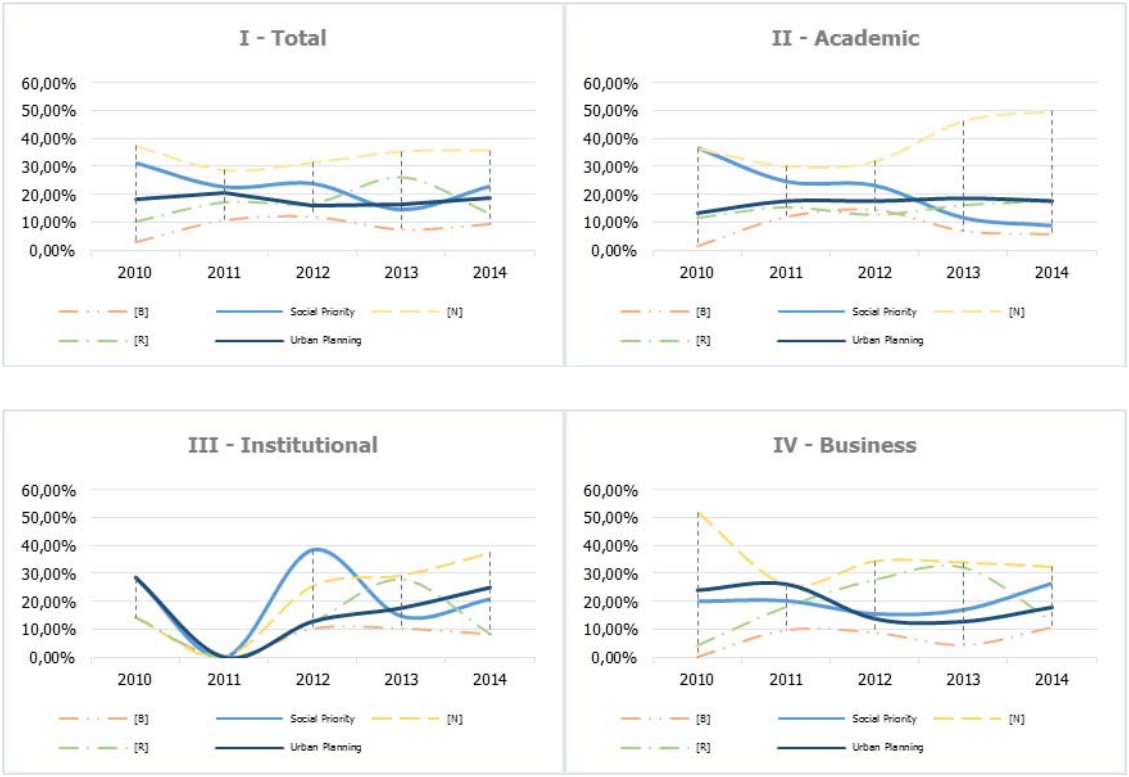

Fig. 8 Trends of [S] Social Priority and [U] Urban Planning

Given that new technologies both hard and soft, and environmental challenges that the economic and social world is facing will determine in fact a monumental change of urban environments, what vision of the city as a community of people who share a physical space arises from the debate on the smart city? To this end, the study focused on the analysis of a single thematic category, Community within which two spheres of influence of the urban / regional system coexist: one linked to the physical transformation of the city associated with the subcategory [U] Urban Planning, and one linked to socio-cultural aspirations of its people, collected in the sub-category [S] Social Priority. Looking at the box I – Total (Fig. 8) all those that place at the center of discussion aspirations and needs of the individual and groups are generally confirmed as central themes; visions and perspectives that imagine a city that invests in human and social capital and its development in terms of well-being, lifestyle and safety. A vision that is shared initially by the academic world but loses force over time, as shown by the descending curve [S] (Fig. 8, Box II). The constant trend of the curve [U] shows that the scientific community, in speaking of the city smart, does not abandon the traditional themes linked to the government of the territory but never assigns it a prominent place. The curve Social Priority [S] is interesting in the IV quadrant where the themes that take shape in the public interest objectives become key topics of discussion for the business world. This confirms what has been said in previous analyzes about the progressive shift of interest towards themes of greater media appeal. Also in this case, the positions of the business world tend to coincide with those of the institutions from 2013.

It is, therefore, evident that the role assumed by planning, understood as government of territorial transformations, is rather marginal in the debate on cities demonstrating little interest in an organic vision of the urban system, probably delegated to a more or less sincere trust in the potentiality of managing the complexity with new technologies.

TRENDS OF THE MAIN KEYWORDS WITHIN THE CATHEGORY URBAN PLANNING

A further study consists in the analysis of the sub-category Urban Planning, in order to understand in what terms, despite it not having a key role, city planning finds its place in the debate on the Smart City. The main keywords (in percentage terms) that emerged from the analysis are: services, which means the fulfillment of essential needs of the community; planning, related to the choices and strategies for transformation and organization of regional planning; governance which seek a governance model characterized by a greater degree of cooperation and interaction between the various actors.

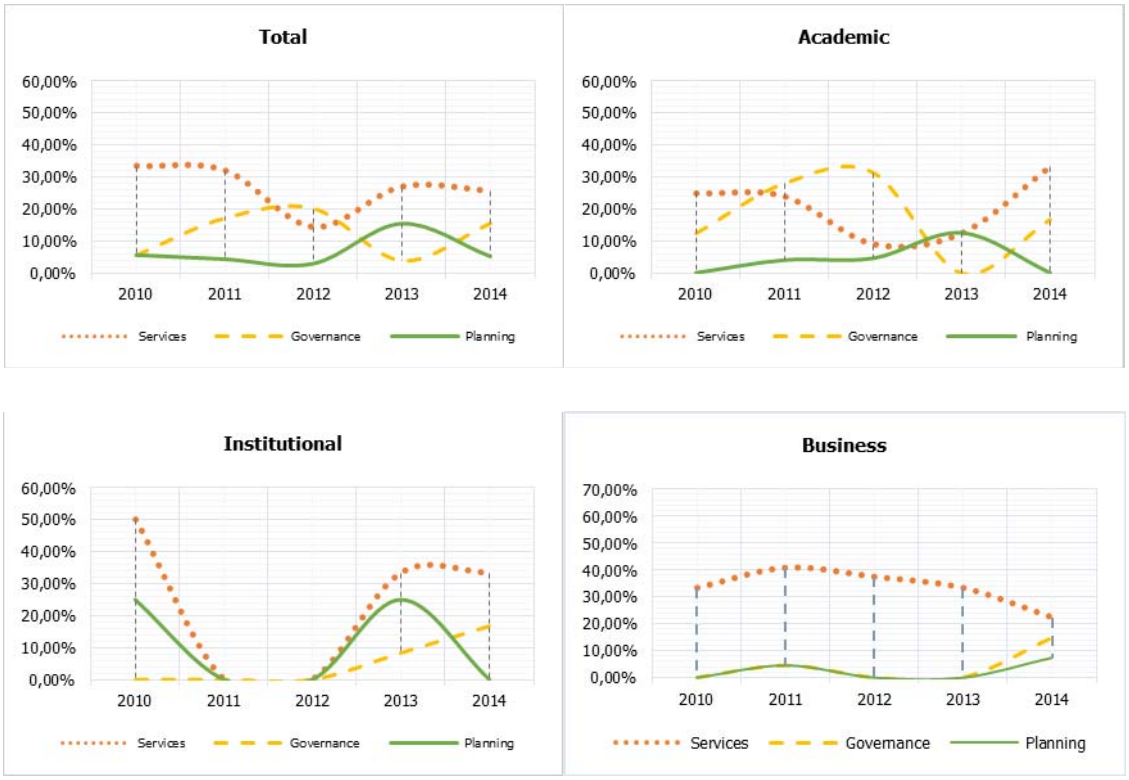

Fig. 9 Trends of Services, Governance, Planning

Meeting the needs of the community by providing services to the citizens is to be, for all three groups of stakeholders, the priority in the new vision of the best way to conceive the urban system. In particular, such an aspiration involves the stakeholders' part of the business world, most likely because they are interested in reaching a wider audience. The concept of planning, in the traditional sense of the term has maintained a more or less constant trend with low percentages while the issue of governance has gained weight in recent years for all three groups of stakeholders. This is probably due to the fact that as (Rhodes, 1997) states "The concept of governance, now widely used to describe the many types of social and economic coordination, is a change in the meaning of government that refers to a new process and new ways of governing". The governance is, therefore, a new urban development model that takes into account different interests; this model is characterized by a mechanism of incremental growth of the social capital that is based on a greater degree of cooperation and interaction between the stakeholders in the cities.

3 CONCLUSIONS

The results of the analysis conducted, summarized in Tables 6 and 7, show that the different approaches to the issue of the smart city, by the three groups of stakeholders, are clear. Businesses, represented mainly by manufacturers of electronic devices and software, increasingly involved in the debate on the smart city, see in the spread of this model a significant element of media appeal for the sale of their products; studying the evolution of the concept in the years and the type of language used the marketing strategies employed, emerge: a first phase in which the product itself is presented on the market and a second phase has followed, linked to the need to effectively reach a wider audience, relying on topics closer to individual aspirations and focusing on topics of great media impact such as jobs and management of public resources. The institutions seem to be more interested in the themes of sustainability and cultural and social mobility, reducing the emphasis on new technologies, which only enhances the ability to circulate know-how; they do not appear to have the need to characterize this new model, but probably use the brand in favor of already initiated policies. The scientific community has rather more diverse views, originating from the different souls that constitute it, placing the focus of debate on the effects of the development of new information technologies on society; positions coming from the social sciences, that initially prevail, see, in a more or less critical way, the Smart City as new forms of social organization and cultural development, due to an increasing ability to interconnect both physically and virtually; while, at a later time, "technical" disciplines move into the debate, mostly attracted by the potential of new technological systems as a tool for managing the different components of the urban organism in all its forms. Beyond the differences that characterize the three groups, identified by the study, an alarming fact emerges: the almost complete absence in the debate of the inevitable challenges that cities will face in the near future. Issues such as the limitation of the use of land, the energy efficiency redevelopment of existing buildings, the preservation of the city from the consequences of climate change, etc., and especially the need for an organic vision of the urban system as a whole that addresses all these issues, are only marginally touched by this debate in favor of a, more or less shared, trust in the potentiality of management of complexity through the use of new technologies. In this context it is difficult to set priorities for interventions to be implemented in urban centers channeling investments in a strategic manner. It is not therefore secondary to figure out who "leads the game" and especially those who "follow": whether to offer solutions for the smart city are businessmen linked to business profits, or institutions crushed by the political election cycles, how can we avoid the risk that everything is conditioned by short term plans? From the various studies on the temporal evolution of the paradigm we see, in this apparently fragmented and inconsistent field, that the balance of power between the parties involved in the debate is consolidating. From the LCA, which identifies in the investment in the digital technologies the latent underlying significance in the recent debate, and the analysis of the frequency of lexical units, showing a clear convergence in the topics proposed by the business and institutions worlds, it is clear that the debate is increasingly in the hands of businesses, institutions taking a secondary role, while the scientific community tries to carve out their own space with difficulty within the themes promoted by research funding. Therefore ICT corporations have become the agents of the socio-cultural and technologic dynamics in their quest to determine how to turn their proprietary technology into something that can used in the physical world, selling networking devices to cities, governments, and even consumers to connect to, and to each other, the physical components of the cityscape. The idea perused is that the communication and control potential would allow for a "city operating system" where the city becomes a data-gathering machine collecting data from every object, and every person trough the sensor platform already embedded in our smartphones. This information could then be used by some other company to optimize the allocation of resources, both physical and human, and directly improve every aspect of the city with optimization algorithms. At first glance these elements create new opportunities, per quantity and quality of the available data, to comprehend the problems of the city and at the same time define new

governance tools for the transformation of the city, seen as an innovation laboratory. However it is not conceivable that the city, whose development logic is primarily based on the equilibrium between elements of chaos and diversity (Greenfield, 2013) may commit its evolution to the logic of algorithms. The indicators that a city is "smart" cannot be just what kind of technologies are being used, or how much energy is being saved, but rather its' ability to act as an essential component of the complex extensive system, that requires participation, human capital, education and awareness of the urban development processes (Papa, 2014). In the timeless debate on how to govern the transformation of the cities, to ensure the maximum advantage for the citizens, which is the task of town planners, the introduction of ICT brought another component. The debate at some point has been waylaid moving it away from the discussion on how to improve the city and what makes it suitable to address users' needs, how do we instill in cities the capacity to develop and react to changing conditions; in a word how do we make cities "smart". Regarding ICT the discussion at first was: how do we use the potential of these technologies in the transformations we envision for the city? Later as other, more vocal, stakeholders joined the discussion town planners lost their central role and, as each ICT company vies for its market share, the theme has become what technology should I employ to make the city perfect. Media and the publicity machines of the ICT industry have blinded us with visions of utopian efficient cities of the future that relay entirely on their products to function, a simplistic view that ignores the basic facts that town planners know well. Cities are complex systems that project on the physical world the complexity and social structure of the human way of life. A system that is in constant state of flux as each individuals' and each groups' ambitions assert themselves briefly and then input in the cities long-term transformation process their desires. The debate should therefore focus once again on how to balance the aspirations of the users and how to interpret them in the physical world, also with the useful help of tools such as ICT, instead of following blindly promises of order and perfection that may come when companies have acquired omniscience. We shouldn't forget that all the ICT infrastructure that could make something "smart" are meaningless if we forget that the central point of the discussion is the "City".

Stakeholder / Method	Academic	Institutional	Business
Network Analysis	ICT	Sustainable Management	Services
Most influential keywords			
LCA	Transformation tools	Networking Experiences	Suggestions
latent meaning			
Frequency Analysis	Network	Community	Community
Main thematic category			

Tab. 6 Summary table: different visions of smart city among the stakeholders

Year / Method	≤2010	2011	2012	2013	2014
LCA	Technological development	Global Challenges	Implementation of technological and social networks	Social Challenges	Investments in digital technologies
latent meaning					
Frequency Analysis					
academic	Community	Community	Community Network	Network	Network
institutional	Community	-	Community	Community Network Resource	Community Network
Business	Network Community	Community	Network Community Resource	Network Resource Community	Community

Tab. 7 Summary table: evolution of the concept of Smart city over the years

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IMAGE SOURCES

Cover image by Arch. Immacolata Di Francesco

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URBAN DEVELOPMENT IN TUSCANY

LAND UPTAKE AND LANDSCAPES CHANGES

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ABSTRACT

The phenomenon of urban sprawl has been already recognized as one of the major anthropic threats to natural ecosystems and landscapes while the negative aspects of the phenomenon are still only marginally taken into consideration in the scientific and local government circles. The recent decision of the European Parliament points out that the degradation, fragmentation and non-sustainable use of land in the EU is jeopardizing several important ecosystem services, threatening biodiversity and increasing Europe's vulnerability to climate change, natural disasters and desertification. The study regards the processing of data on urban land conversion over the past 50 years and the effects in the areas of high environmental vulnerability in one of the most important Italian region: Tuscany. The historical data were compared from a qualitative and quantitative viewpoint with the present-day geography of settlements, which showing changes found in today's settlement-territorial structure. The conclusion reports focuses on collated environmental criticalities and the margins for recovery of the compromised territories that still today receive little attention from central institutions and local authorities, in addition to data on landscape effects to be construed as signs of specific trends underway today and scarcely taken into account by land management tools.

KEYWORDS:
land uptake, GIS analysis, urbanization impact, land-use change, landsca

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土地与景观摄取

托斯卡纳城市发展

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A 摘要

城市扩张早已被认为是自然生态系统和景观面临的主要人类威胁，而这种现象的消极方面却仍处于科学界和当地政府部门考虑范围的边缘位置。欧洲议会最近的决定指出，欧盟境内的土地退化、零碎化和不可持续使用正危及一些重要的生态系统服务，威胁着生物多样性，并增加了欧洲面对气候变化、自然灾害和荒漠化时的脆弱性。本研究将聚焦于对托斯卡纳这个最重要的意大利地区过去 50 年城市土地转化数据的处理以及高环境脆弱性地区所产生的影响。这些历史数据将从定量和定性角度与现在的居住区地理进行比较，展示在现在的居住区域结构中发现的变化。结论报告除了关注那些将被解读成当前具体趋势信号以及很少被土地管理工具重视的景观效应数据以外，还聚焦于那些现在仍未从中央机构和地方当局那里获得太多关注的受损地区所面临的环境危险程度和恢复空白。

关键词

土壤消费, 景观, 地理信息系统

1 INTRODUCTION

The research presented here was aimed at investigating the urban development as one of the more relevant factors of landscapes changes of one of the most famous Italian regions, Tuscany, and its effects over the period of half a century. The study was carried out by analysing the settlement condition during two distinct temporal periods: that immediately following the second world war and the first decade of 2000. Tuscany is one of the most well-known Italian regions in the world, with one of the highest international tourism rates thanks in part to Florence, which was one of the most important cities in Europe during the Renaissance period, and in part to other cities such as Pisa, Siena and Lucca, which are well-known for historical, architectural and cultural reasons. However the region is famous for its landscape those has become an Italian trademark in the world's collective imagination (Paolinelli and Valentini, 2009). Suffice it to say that Tuscany hosts seven of the more than fifty UNESCO sites established in Italy, and that the European Landscape Convention was signed in Florence on 20 October 2000. This latter, to date signed by six EU member countries and ratified by 32, recognises Tuscany as a substantial economic asset, as well as an aesthetic and cultural one (http://conventions.coe.int/Treaty/ita/Treaties/Html/176.htm). It is one of the largest regions of Italy (the fourth out of 20) and hosts more than 6% of the national population thanks to a wide range of economic opportunities in the agricultural, industrial and artisan sectors, but most especially in the tourist sector with its many centres of art, its aforementioned rural landscape, the vast architectural heritage and a long and beautiful coastline along the Tyrrhenian Sea (over 400 km – about one fifth of the entire western coastline of the peninsula). The latter includes some of the most famous Italian seaside resorts such as the Versilia, the island of Elba, the Grosseto coastline and the Argentario promontory. Regional bodies have estimated that were over 11m tourist in 2006 , a third of which were concentrated in the province of Florence, and about 40% of which came from outside of Europe (HTTP://IUS.REGIONE.TOSCANA.IT/CIF/PUBBLICA/TIC2007/ZIP_PDF/TURISMO.PDF). Tuscany's tourist influx accounts for almost a quarter of the national total and the related economic dynamics are further strengthened by an affluent real-estate market that has seen, for several decades now, wealthy international clients buy and renovate buildings in rural and historic centres (Geri et alii, 2010; Paolinelli, 2012; Rosignoli et alii, 2013; IRPET, 2014a; Falqui et al., 2014). The settlement-type transformations that occurred over time were influenced in ways and with impacts that were different from the regional geo-climatic characteristics and political choices that have affected the urban aspect and agricultural landscape. Regional agriculture has long been characterized by the sharecropping model (Reid and Joseph, 1975; Shaban, 1987; Singh, 1989), an agricultural practice that has produced profound changes in the regional landscape over time. Over the centuries the introduction of sharecropping created an increasingly dense mesh of small farm holdings in land thickly planted with trees, where a large proportion of the rural population lived in isolated houses (Rombai, 2002; Vos, 1993). Sharecropping characterized regional agricultural production until the 1960s when, thanks to an act prohibiting the possibility of entering into new sharecropping contracts (Act No. 756, 15 September 1964), the sharecroppers abandoned the small farms holdings and adapted the landscape to agricultural mechanization. It is important to stress that, at the end of the 1930s, 4,125 of the 5,666 estates surveyed in central Italy were located in Tuscany (particularly in the central-southern part of the region), and they covered 40.9% of the agricultural and forestry area, and united over 70,000 farm holdings. Most obviously prevalent were the small and medium-sized farms – the former were most numerous in the provinces of Massa Carrara, Lucca and Pistoia, and were the ones most geared to the intensive cultivation of vegetables and flowers; while the latter were most numerous in the provinces of Florence and Arezzo. The large farms, instead, were a prerogative principally of southern Tuscany (the provinces of Livorno, Pisa, Siena and Grosseto). On average a farm contained 18 hectares, but it varied between the six hectares of Lucca and the 68 of Grosseto, where the many large cultivated areas included vast forests and pastures, as well as arable land. Generally, the largest farms covered the extensive arable

lands of Maremma as well as the mountainous areas (where the quantity of forest and pastureland was also significant), and the smaller ones covered the hill areas, which were the most marked by intensive farming (arable land with grapevines and olive trees). Urban conversion of the land in Tuscany is a territorial pathology resulting from economic dynamism and a population growth that, particularly over the past decade, has increased greatly. Although the international scientific world has highlighted the problems and environmental consequences of extended urban transformations for many years (Sala et al., 2000; Lambin et al., 2001; Ellis and Ramankutty, 2008), only a few studies of Italy published in international magazines have begun to provide more precise details on the character of the phenomenon of "land take" and of the artificialisation of the land (Pileri and Maggi, 2010; Romano and Zullo, 2012, 2014; Salvati et al., 2012). Very few regions (only three out of 20) have vectorial information on land consumption spanning 50 years, and there is even very limited data for smaller time frames between 1970-2000, both in terms of information on the overall expansion of urban areas and a historic series of statistically significant data, while in other countries there is much more data and there are many more articles (Hall et al., 1973; Mellor, 1983; Yanitsky, 1986; Irwin and Bockstael, 2007; Zaninetti, 2006; Garcia-Call, 2011; Hauri et al., 2006; Catalán et al., 2008; Illy et al., 2009). In addition, no local authorities (regional, provincial or municipal) have yet organised coordinated surveys, and although programs monitoring the phenomenon on a national scale have recently started to spread (Munafò and Tombolini, 2014), they are only on a small scale so we are still far from having any kind of systematic data collection that would allow us to make credible comparative evaluations (Sharma et al., 2012; Lowry, 1990). The negative aspects of the phenomenon are still only marginally taken into consideration in the scientific and local government circles (Grubler, 1994; Heilig, 1994), and for many years now the lack of a standard of reference for the protection of the land in all its uses has been highlighted (Pileri and Lanzani, 2007), while at the European level, the proposal for a framework directive on land (COM/(2006)/232) was recently withdrawn (Office Journal 22 October, 2014 C 153, dated 21 May 2014) by the European Parliament and Council, who have adopted Decision no. 1386 (20 November 2013) of the Union's 7th general programme of action regarding the environment until 2020: "Living well within the limits of our planet", which represents a binding declaration of intent from the environmental point of view. This decision points out that the degradation, fragmentation and non-sustainable use of land in the EU is jeopardizing several important ecosystem services, threatening biodiversity and increasing Europe's vulnerability to climate change, natural disasters and desertification. Only in 2013 did this issue appear on the Italian government's agenda, and it was followed by many legislative proposals (on 13 December 2013, the parliamentary bill presented by Minister Catania "Regulations relating to the utilization of agricultural areas and containment of land consumption", was approved by the Council of Ministers) aimed at curbing the negative effects of the urban land conversion phenomenon. In this sense, in order to understand its dynamics and causes and, based on these, to develop appropriate political-territorial strategies, it is essential to reconstruct the evolved dynamics of the settled areas over the entire national territory, based on standard data consistent throughout the country and with a level of accuracy that allows for an assessment of the extent of changes to the territory from the post-war period to the present day.

The objective of this paper is to provide a contribution in this direction by focusing on a significant area of the country, i.e. Tuscany. The description of the area of study outlines the socio-economic and territorial characteristics; the section on the methodology describes the origin of the data and the techniques used for their processing; and the section on the results illustrates the regional settlement conditions detected in the 1950s, and by comparing them to the conditions today, exposes the resulting changes found in today's settlement-territorial structure. The conclusion reports on and analyses the information that emerged during the study, focusing on collated environmental criticalities and the margins for recovery of the compromised territories that still today receive little attention from central institutions and local authorities.

2 AREA OF STUDY

Tuscany covers an area of approximately 23,000 km^2 (equal to about 8% of the whole national area) and is divided between 287 municipalities, each of a relatively large size and on average almost double that of national standards (8,000 ha compared to 3,600 ha), and stretching across ten provinces. without getting into detail about the vegetation, it is the region of Italy that has the highest forest coverage, with about half of its territory given over to woodland use (compared to 25% nationwide) and another 40% to agricultural use. the morphological features of the rest of Tuscany consist of hills (over 66%) and plains (about 8%). the mountain ranges of the Apuan Alps, Garfagnana and Pistoia are all located in the northern part of the region, next to the Tuscan-Romagna Apennine ridge, and occupy slightly more than 25% of the area with an altitude of almost 2,000m above sea level (Fig. 1a). The urbanized areas are largely concentrated in the plains, with a significant industrial production component. The regional council's resolution no. 69/2000 identifies 12 industrial districts, including the leather goods and footwear sectors that have for some time represented regional excellence (in the Santa Croce sull'Arno district and the leather and footwear district of Valdarno superiore).

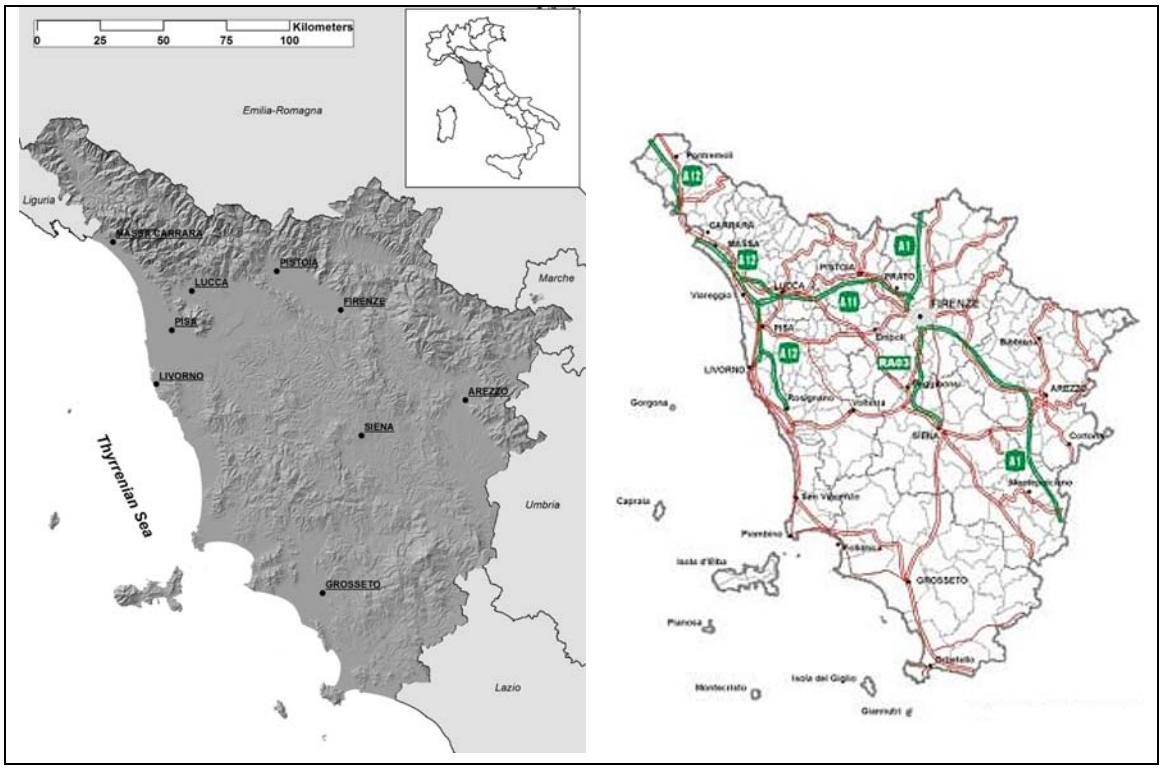

Fig. 1a/b Study area (on the left) and Tuscany Highways System (on the right)

The industrial development of Tuscany was largely founded on local systems of small and medium-sized enterprises, but today even more so on the role of big businesses, especially metalworking (in Florence, Pistoia, Pontedera). the gross domestic product (GDP) of Tuscany accounts for about 6.8% of the total italian GDP, although its per capita values are equal to other areas of the country (in particular Trentino, Lombardy, the Veneto and Friuli-Venezia Giulia). In recent years, Tuscany has arrived at between 8th and 10th place on the list based on its per capita wealth, with a figure that places it above the national average (http://www.irpet.it/index.php?page=infotoscana_economia). With over 10,000 km of roads and a density of approximately 0.5 km/km^2, the level of infrastructure in the territory (Fig.1b) is quite high compared to the Italian average of approximately 0.36 km/km^2 (data source http://www.openstreetmap.org) even if the roads have only been slightly extended (by about 500 km thanks to the A1, A11 and A12 roads).

The ISTAT (Central Institute of Statistics) census of 2011 indicates that there are over 3.6 million inhabitants in the region, equal to 6.2% of the national population, with an increase of nearly 500,000 compared to data collected at the 1951 census (about 3.15m or 6.6% of the Italian population of the time). Analyzing the demographic variation between 1951 and 2011 on a municipal basis (Fig. 2) it can be noted how all the coastal towns and the island of Elba show a marked population increase during the period indicated. The same phenomenon also happened in the inland municipalities of the provincial capitals, those along the Basso Valdarno (Livorno - Pisa - Florence) and along the A11 motorway axis (Florence, Prato, Pistoia, Lucca, Viareggio). By contrast, there was great fall in population in the Apennine area bordering Emilia-Romagna and Liguria, as well as in most of the municipalities located in the central area of the region. Among the provincial capitals, the only ones to show a demographic decline between 1951 and 2011 were Lucca (-1.2%) and Florence (-4.4%).

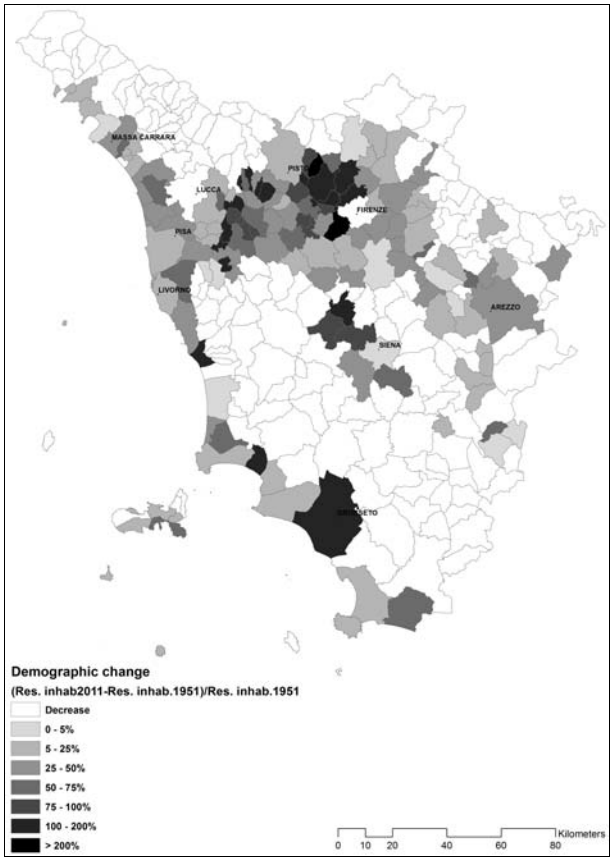

Fig. 2 Demographic change between 1951-2011

The curve of regional demographic dynamics (Fig. 3), analyzed over 60 years, shows continuous growth between 1951 and 1981 when the population increased by over 400,000, that is more than 13,000 inhabitants a year and about 60 inhabitants for every hectare of land surface. between the early 80s and until 2000, there was a significant demographic downturn leading to the loss of more than 80,000 inhabitants (4,000 per year). however a stark reversal has occurred over the past decade, with a rather rapid demographic recovery that resulted in the highest level of inhabitants in the region's recent history: more than 170,000 new residents in ten years (on average 1,700 new residents per year).

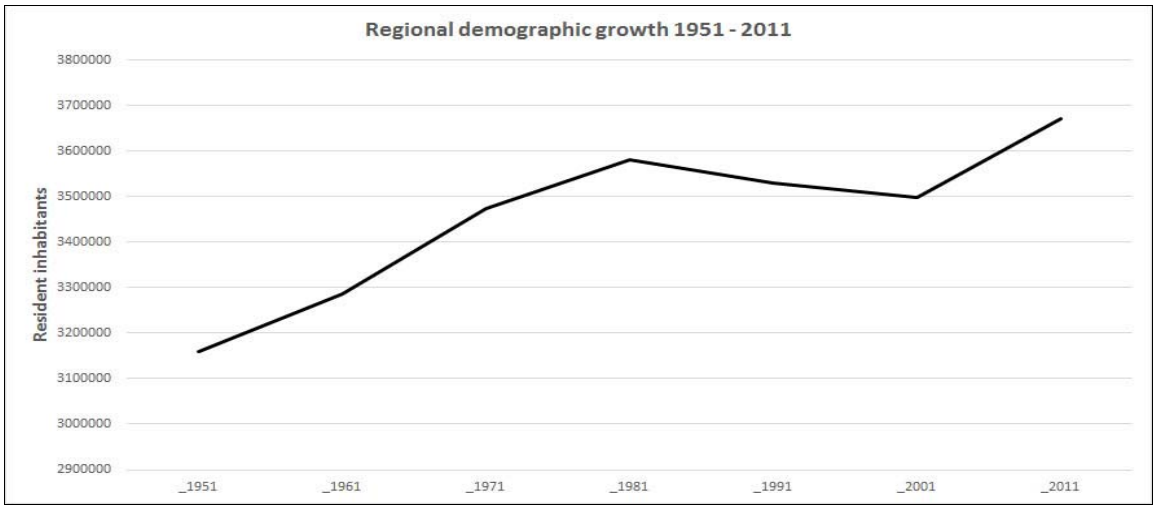

Fig. 3 Regional demographic growth between 1951-2011

Immigration data shows that this population increase is due almost exclusively to non-eu immigrants, with an increase of 226% between early 2000 and 2011, bringing immigrant levels up from 175,000 to an estimated almost 400,000 today (Cappellini, 2009). this accounts for 11% of the whole population, compared to 8.5% nationally, confirming that thanks to the economic characteristics that have been described, Tuscany is very attractive to immigrants, where even employment conditions seem to improve, despite the well-known crisis that has tormented italy for several years now (Caritas and Migrantes, 2011; Benassi and Porciani, 2010). The population density of the region of Tuscany has increased from 137 habitants per km^2 in 1951 (very close to the national one of same period, which was 157 habitants per km^2) to the current 160 habitants per km^2, which is more than 80% of the national value of 197 habitants per km^2.

3 MATERIALS AND METHODS

Analysis of the evolution of the settled areas in Tuscany was, for the historical period, carried out using maps published with a scale of 1:25,000 by the IGMI (Italian Military Geographic Institute) between 1949 and 1962. It is the 25v series, organised into 3,545 elements (panels) with dimensions of 7'30" longitude and 5' latitude, mapped to a scale of 1:20,000 according to the Gauss map representation and framed within the national geodetic system (the international ellipsoid oriented to Rome M. Mario – ED40) with a grid mileage in the projection consistent with the Universal Transverse Mercator system (European datum ED50). The areas urbanised in the 1950s, formed of those areas covered by main and ancillary buildings (such as car parks, internal roadways for the districts, storage areas, cargo-handling and various other buildings), can be extracted from these maps, which are only available as raster versions. The data from the research carried out on the 1:25,000 maps was then compared with that of the current urbanised areas (updated in 2007, http://www.regione.toscana.it/-/geoscopio), which are available in vector format from regional cartography created using photo-interpretation and the orthophoto mapping traverse methodology at the nominal scale of 1:10,000. In terms of urbanised areas, those destined for urban use with the replacement or maintenance of the natural soil were taken into consideration, including the built-up parts of the land and those destined for additional settlement uses, such as public and private gardens, sports facilities, unsurfaced roads and other waterproofed or non-waterproofed service areas (Romano and Zullo, 2013). Also included in the "urbanised" land were those areas with rural buildings and fixtures designed to support agricultural and zootechnic functions, even if their characteristics cannot strictly be called "urban". The method used for urbanized areas detection differs from that used by the Tuscany Region (2012) based on sampling points at 1: 10.000. This approach estimates the extension of the classes of land use on the basis

of sampling points distributed according to a probabilistic scheme (region divided into square of 4 hectares inside of which was randomly select a point of survey according to the scheme of systematic sampling nonaligned). In the research described in the article the historical urban areas have been digitized by skirting the built environment shown in cartography IGM (urbanized perimeters extracts from cus Tuscany Region, Fig. 4). It should be noted that the historical cartography IGM does not report the "urbanised" areas, but only those "built", for which the data obtained has a level of precision tested order of ± 5%. The comparison between the extension of the historical and current urban areas, by statistical analysis, showed that some local determinants have affected more than others on the dynamic urban region. Further investigation later revealed the dynamics of conversion of urban areas susceptible to the effects such as protected areas, the landscape units and the flood risk areas.

Fig. 4 Detail of the representation of the Tuscany region on the IGM 1:25,000 map of the 1950s (in red actual urbanized areas, in brown urbanized area 50s)

4 RESULTS AND DISCUSSION

In the 1950s there was a sensitive modification of the age-old balance between the rural and urban worlds, thanks to the intensification of two phenomena: the growth of the larger urban settlements and the abandonment of rural areas, especially those of the Apennines.

The settled areas surveyed in the 1950s were found to amount to nearly 21,000 hectares, corresponding to a rate of regional urbanization of just under 1%. Analyses of the situation in 2007 shows an urbanisation nearly seven times greater (Fig. 5), with settled areas amounting to more than 135,000 hectares, a net loss of over 115,000 hectares of land and an urbanization rate that today is almost 6%. The average speed of transformation over the period studied is just over 6 hectares per day (equivalent to about 6% of the speed of the 90 hectares per day estimated for the national territory).

If compared with the other 17 Italian regions that have available data and cover about 88% of the national territory, the rate of increase recorded in Tuscany is the highest (550%) compared to that of the

neighbouring Emilia-Romagna (510%), Puglia (475%) and Sardinia (510%) (Romano and Zullo, 2014b; Romano et al., 2015; Romano and Zullo, 2015).

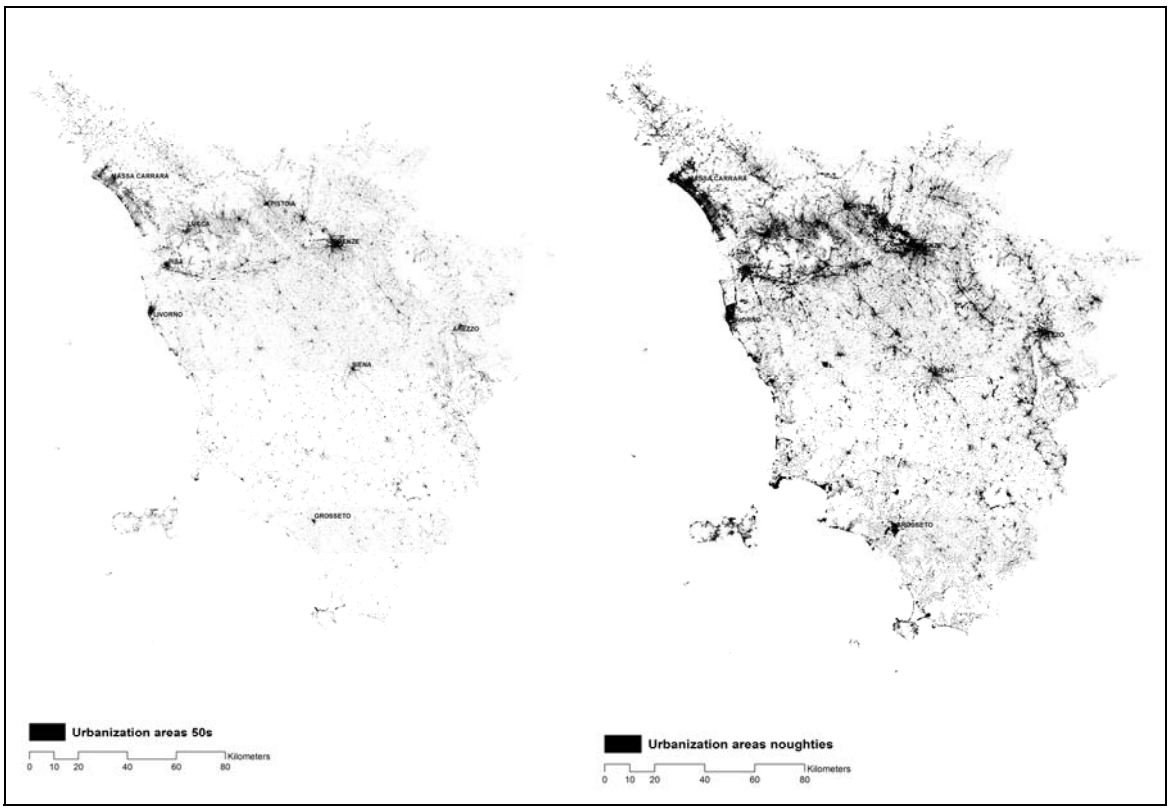

Fig. 5 Maps of the urbanization in the (a) 1950s and (b) noughties

A typical settlement behaviour index is the amount of urban area per-capita (UAPC), which was on average 66 m^2 per inhabitant in the 1950s, but which rose to 370 m^2 per inhabitant in 2007. It is important to observe the correspondence between this value and that of the nation and western European countries, in order to give evidence of a homogeneous alignment on similar models of the relationship between social communities and settlement forms.

The research carried out over most of the Italian regions showed how the UAPC indexes of up to 100 m^2 per inhabitant typified the rural economy realities, while values above 300 were typical of industrial economies and urban lifestyles.

The transition from a predominantly historic widespread rural and polycentric urban landscape to a predominantly widespread urban and post-rural agricultural landscape is also highlighted by the analysis effected by the density of urbanisation which, in the 1950s, was equal to or less than 5% for most of the municipalities. The situation changes dramatically after 2000, where only seven regional municipalities still have an index lower than 1%, 137 up to 5%, more than one-sixth a value between 10-25%, and 11 have urbanised between a quarter and half of their territory (Fig. 6).

While the municipality with the highest rate of urbanization is Forte dei Marmi, which is a Tyrrhenian coast town and whose territory is more than 70% covered by urban areas, figures 5 and 6 very clearly show the leaders in major urban density concentration along the coast and in the interior plains.

From this point of view an analysis of fig. 7 is especially effective, where some peak values of urban density emerge along the Tuscan Coast as part of a phenomenon that concerns all municipalities of this Mediterranean area with the same intensity (Romano and Zullo, 2013, 2014a).

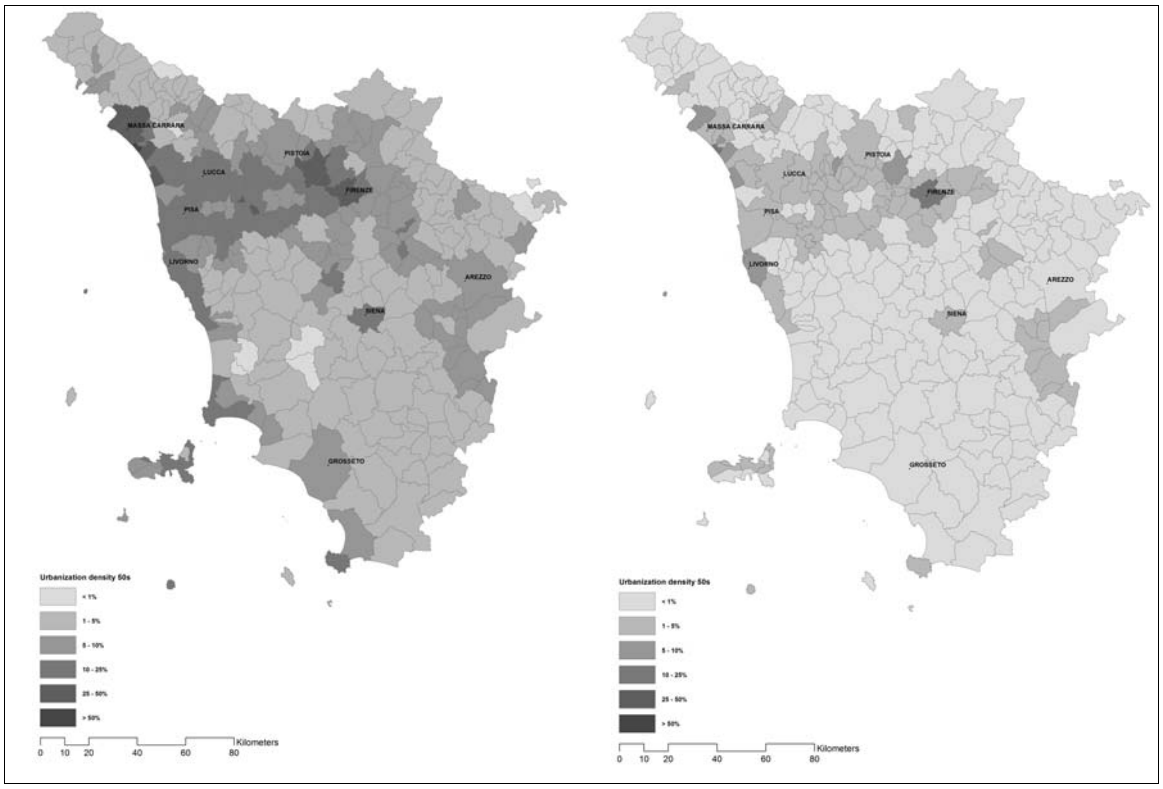

Fig. 6 Map of the percentage of urbanization in municipalities in the (a) 1950s and (b) noughties

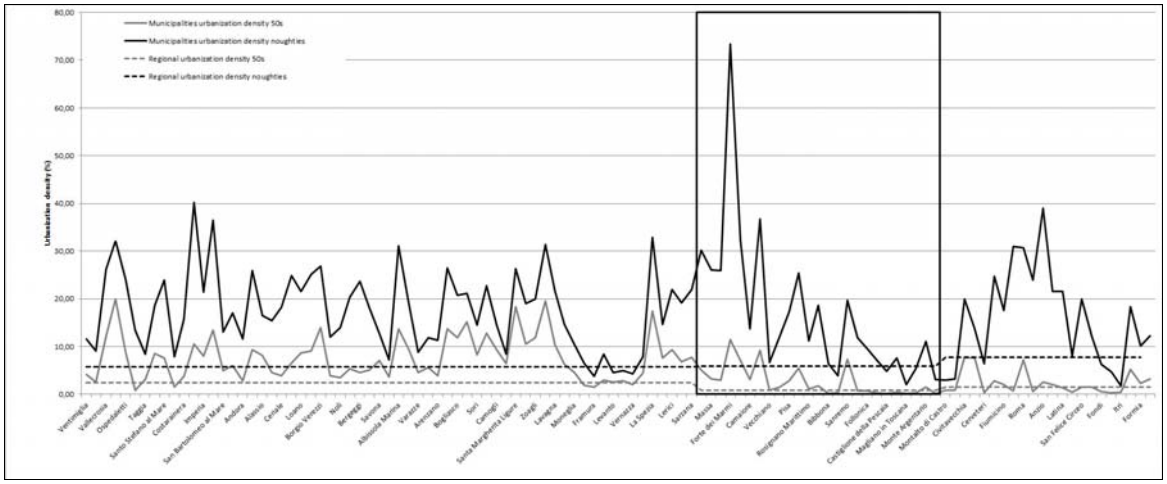

Fig. 7 Diagram of urban density in the Tyrrhenian coast municipalities during the 1950s and noughties, compared to regional averages (the Tuscany coastal municipalities are in the box)

In addition to the dynamics of the urbanised lands, from 2001 it is also possible to check those related to the growth of built-up areas, thanks to the ISTAT surveys, though the 2011 data is not yet available. The institute registers the number of buildings in inhabited areas, where the latter means a "more or less wide area of land, usually known by its own name, on which are located one or more grouped or scattered houses". The buildings are distinguished by their function and are grouped into two categories: the first consists of those for residential purposes while the second covers the buildings and complexes used for production, infrastructure, management, tourist and service purposes. Furthermore, the dates of when the buildings for residential use were built are also noted. For example, according to the data almost 367,000 buildings within the housing category were constructed in the 287 Tuscan municipalities between 1946 and 2000 (on average 18 per day). Considering the demographic increase of about 339,000 people during the same period (1951-2001 ISTAT data), to all intents and purposes just over one residential building was

constructed for each new inhabitant. It is also interesting to note that until 1946 there were little more than 300,000 buildings in this area. In other words the residential building heritage has more than doubled compared to the period after the second world war. Fig. 8 fully confirms the phenomena already highlighted by Figures 5, 6 and 7, with the highest growth groups concentrated in the coastal areas and on the plains of Lucca, Pistoia and Florence. The cited data about growth of urbanized and built up spaces identify a relevant group of factors of landscapes changes. Transformation of urban and agricultural landscapes as also lost of rural landscapes are joined with socio-economic changes and produce environmental and cultural changes. Lost of soil, as also of biological and semiological diversity are the main ones.

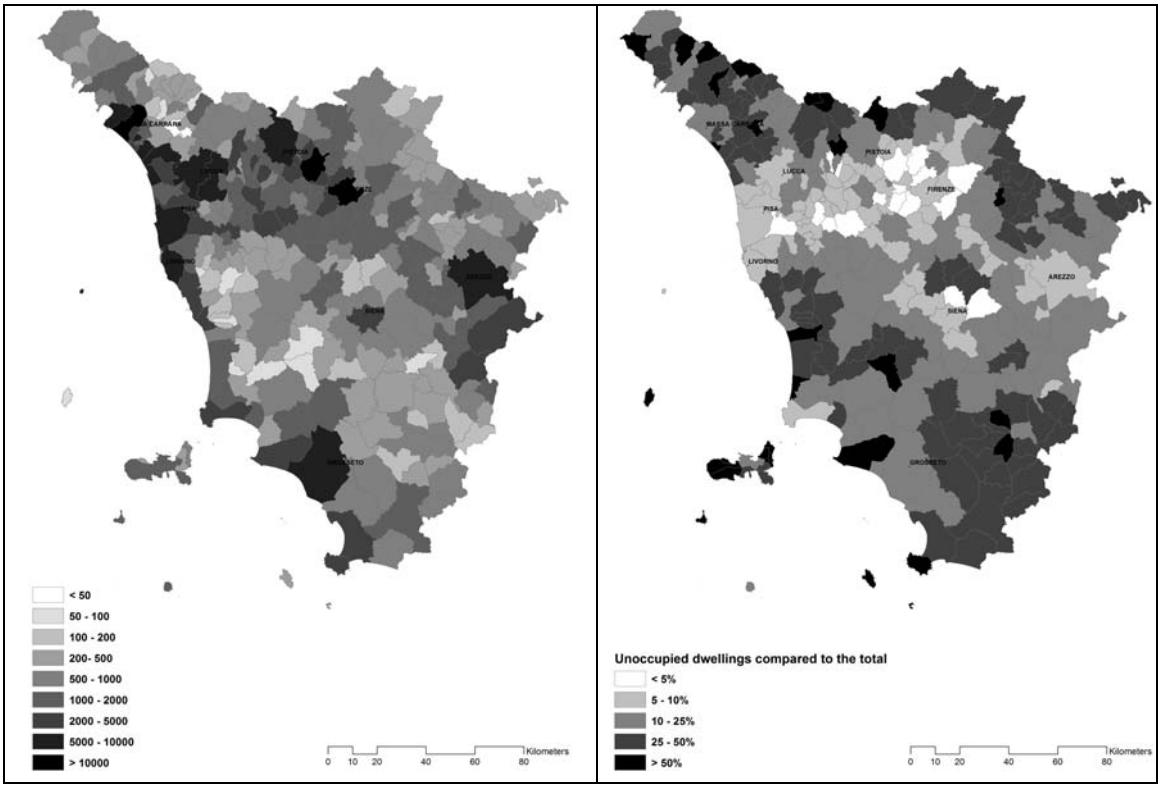

Fig. 8/9 The dynamic growth of residential buildings in the Tuscany municipalities between 1946 and 2000 (on the left); Percentage of unoccupied dwellings in 2000 (on the right)

Figures 8 and 9 show some processing of the ISTAT 2001 census data on residential buildings and housing. In particular, figure 8 confirms the urban nature of the northern sector of the region with the island of Siena and, to a lesser extent, Arezzo. It also provides interesting information about the coastal municipalities (from Massa to Capalbio) where the clearly considerable building development of these strong tourist areas has had significant repercussions on the extremely fragile coastal ecosystems. Figure 9 reinforces what has already been said by clearly showing that there is a large presence of empty homes along the Tuscan coastline that are, in all likelihood, accommodation used for tourist purposes and second homes (remembering also that ISTAT does not include accommodation facilities under the label of homes). A focus on the municipalities of the Tuscan coastline (about 25 out of a total of 287, making up 12% of the entire regional territory) shows the antinomy between population growth and increased urbanization. By analyzing the ISTAT data in detail is obvious how there was an increase of more than 160,000 people in this area between 1951 and 2001, concentrating slightly less than half of the total population increase of the whole region in a territory that covers only 12% of the whole of Tuscany. An increase that was also recorded by the 2011 census, showing over 15,000 more residents than in 2001. The number of buildings for residential use (Fig. 8) has more than tripled in the period between 1946 and 2000 (over 137,000 compared to the almost 43,000 present until 1946) with a net increase of more than 94,000 buildings, which amounts to

about 1,750 new buildings each year. By comparing this figure to the regional one seen earlier for the same period, it is clear that a quarter of the residential buildings constructed in the region were built in these areas, significantly increasing the anthropic load on the coastal ecosystems, which are subject to pressures that have often compromised their equilibrium and stability.

It should also be highlighted again that of the more than 420,000 homes present in 2001, more than 94,000 are empty (roughly one house in four), as shown in Figure 9. High percentages of empty homes also are detected in the northern part of the region along the border with Emilia-Romagna and in the central part (Maremma), but this is mainly due to the abandonment and depopulation phenomena encountered frequently in the Apennine areas of the peninsula and in the rural areas that suffer a marked socio-economic marginalization (IRPET, 2012).

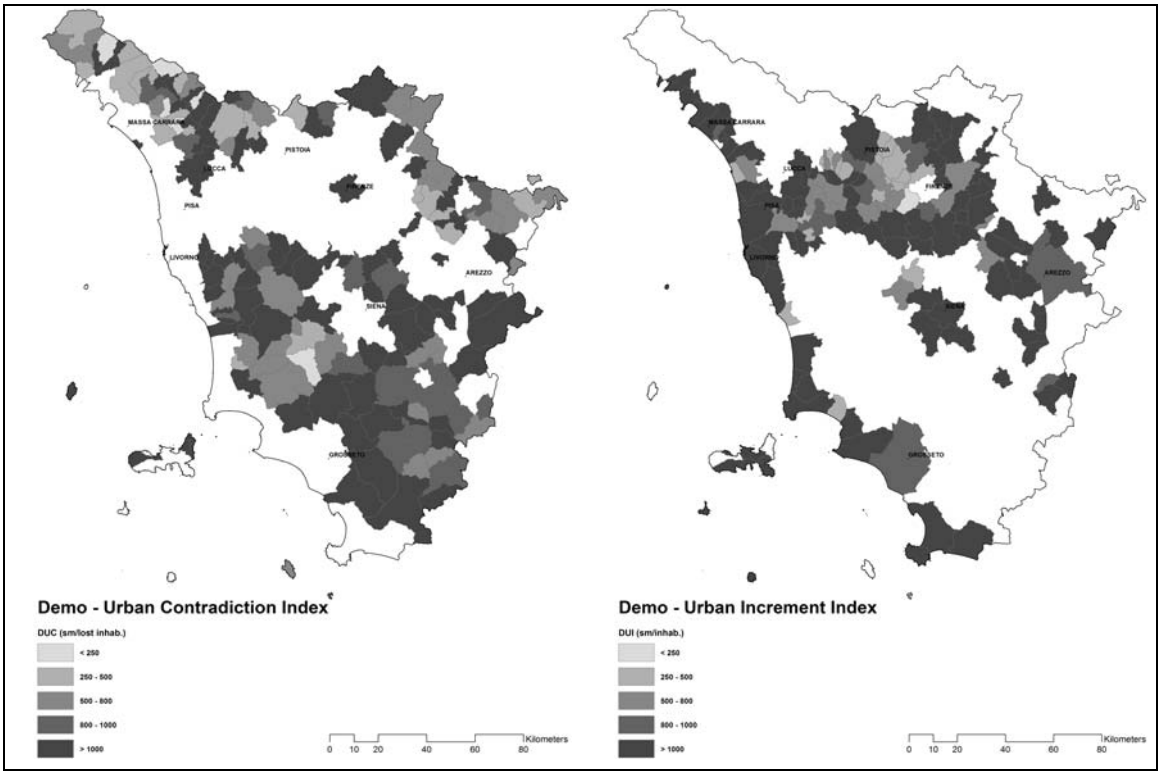

Fig. 10 Map to select the positive values of the urban-demographics increment index (on the left) and a map of the urban-demographic contradiction index (on the right)

The UDC (Urban-Demographic Contradiction Index) and its complementary UDI (Urban-Demographic Increment Index) can both connect and evaluate the population dynamics and urban growth (fig. 10). The UDC index shows the urbanised areas created for each inhabitant that has been lost by the city, while in contrast the UDI index shows the increase in urbanised area per inhabitant acquired by the municipality, irrespective of the territorial range of the municipality itself. This parameters has been obtained as follows:

$$UDI = \frac{\Delta URB(T1-T0)}{\Delta POP(T1-T0)} \qquad UDC = \frac{\Delta URB(T1-T0)}{-\Delta POP(01-51)}$$

Where:

- Δurb(t1-t0)=difference between urbanized areas in municipalities between the t1 (2007) and t0 (1954);
- Δpop(t1-t0)=variation in the population residing in municipalities between the t1 (2011) and t0 (1951);
- -Δpop(01-51)=demographic drop in municipalities between the t1 (2011) and t0 (1951);

All the municipalities in the Apennine range in the northern part of the region, together with those bordering the region of Liguria, most of those located in the Tuscan Maremma area can all be found under the conditions highlighted by the UDC index, with fairly high index values (over 800 m^2 per inhabitant lost). It must be said that high UDC index values can also be attributed to strong depopulation situations with limited variations in urbanized areas, so the information reported by this index must always be compared with the demographic dynamics. The geography of the UDI index (image on the right of figure 10) shows how the municipalities on the coastline (except Florence and Lucca), most of which are provincial capitals, and their hinterlands, as well as most of the territory of the island of Elba, can be found within this index. Over 60% of the municipal territories that emerged from this selection show a high UDI index value (over 1,000 m^2 per inhabitant).

ALTITUDE BELTS (M ASL)	AREA (KMQ)	TERRITORIAL PERCENTAGE DISTRIBUTION	URBANIZED AREAS (KMQ) 50s	URBANIZED AREAS (KMQ) NOUGHTIES	URBANIZATION DENSITY 50s	URBANIZATION DENSITY NOUGHTIES
<100	5,012.55	21.81	104.55	729.88	2.09	14.56
100-300	7,243.25	31.51	53.50	356.63	0.74	4.92
300-600	6,553.28	28.51	40.01	214.82	0.61	3.28
600-1000	3,214.24	13.98	10.83	54.74	0.34	1.70
1000-1500	871.10	3.79	0.51	5.91	0.06	0.68
1500-1800	87.18	0.38	0.01	0.55	0.01	0.63
>1800	4.96	0.02	0.00	0.01	0.00	0.17
Total	**22,986.56**	**100**	**209.41**	**1,362.53**	**0.91**	**5.93**

Tab. 1 Division of the Tuscan territory into altimetric bands (DEM 20 m). Related settlement values over the time-span of the study

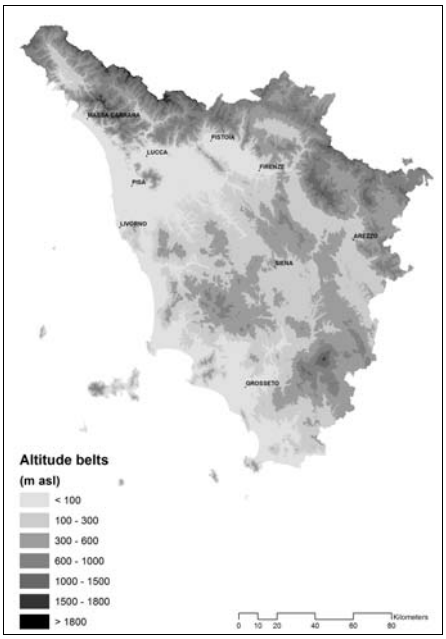

Fig. 11 Articulation of altitude belts in the Tuscany region

The data already shown indicates how morphology and altimetry have assumed a key role in influencing the dynamics of urbanisation growth. Half of the region lies between sea level and 300m above sea level, while a third lies between 300 and 600 m asl. By analysing the level of urban density within these bands in the 1950s, you can see how the portion of land lying at an altitude of less than 100 m is the one with the highest index value (2%) while all the remaining bands show settlements of less than 1%. The situation changes dramatically in 2007, where at altitudes of less than 100 m asl, the settled areas had grown seven times bigger compared to after the second world war, with a settlement conversion rate that is at almost 15% today. The same rate of increase was also recorded for the low hilly altrimetric band of 100-300 m asl, where the urbanization rate was 5%. The high-hilled bands, which hold the vast majority of the agricultural

landscapes and, most especially, the valuable vineyards and olive groves (which are of fundamental importance from a social, economic and ecosystem point of view), have instead grown to five times the size of the historic settled area.

4.1 THE PHENOMENON IN THE AREAS OF HIGH ENVIRONMENTAL VULNERABILITY

PROTECTED AREAS AND LANDSCAPE UNITS

The Protected Areas in Tuscany stretch to just under 150,000 hectares, and include the National Park of the Apuan Alps, the National Park of the Casentinesi, Monte Falterona and Campigna forests, and the National Park of the Tuscan archipelago. The habitats protected by the EU directive 92/43/EEC (SCI), on the other hand, extend over nearly 306,000 hectares. However there is much overlap between the two areas, and between them they cover 350,000 hectares. To these must also be added the Special Protection Areas (SPA) introduced by the EU Directive 79/409/EEC, which occupy a total of nearly 132,000 hectares, most of which also fall under the Protected Areas classification. So putting the Protected Areas, SCI and SPA altogether, 15% of the total Tuscan region is protected. Through a comparison with the Physio-graphical Landscape Unit surveyed by the ISPRA (Advanced Institute for Environmental Protection and Research) in 2004, it can be observed how the most protected categories are the "terrigenous mountains," with a surface area of over 118,000 ha, and the "heterogeneous hilly landscapes," which stretch to over 85,000 ha. Far less represented in this analysis are the plains that fall within the protected areas and have a surface area of just over 8,000 ha. The landscape effects of urban proliferation can be better understood by analyzing the urban dynamics that have affected these areas over the past 50 years (Fig. 12).

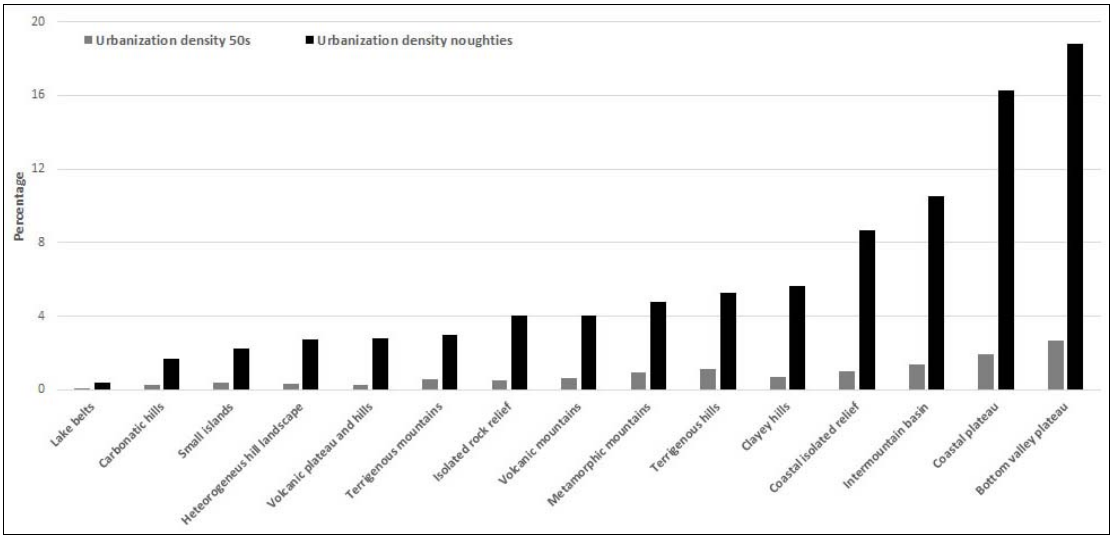

Fig. 12 Differences in the density of urbanization in the Tuscan landscape bands over the period studied

In the years after the second world war, both the coastal plains and the valley floors showed the highest rates of urbanization (about 2%), compared with the hilly categories which showed instead an increase of less than 1%. Analysing the situation in subsequent years shows that while the classification order remained unaltered, the percentages increased considerably: the urbanisation of the flat categories exceeded 15%, with nearly a fifth of the valley floors territory having been urbanised. The rates of urbanization of the hilly landscape band also increased from an average of 0.5% recorded after World War II, to an average of 3.5% – seven times more than the preceding temporal section, thereby testifying to a greater settlement pressure on the hilly morphologies with attendant effects on both local agricultural production and on Tuscan agro-ecosystems, which is important at an international level. By analysing the evolution of the settlement

conversion phenomenon of the land within the regional protected areas during the two temporal periods, it seems clear a ten-fold increase in the settled areas, where the just over 500 ha of the 1950s (0.15% of the total of the N2000 Protected Areas) becomes more than 5,000 ha today (1.4%). A study conducted in a 1km sphere (as the crow flies) from the perimeter of these areas showed an equally intense phenomena: the areas covered by the current settlement in this area increased by more than seven times compared to those detected in the 1950s, passing from almost 4,000 ha (1.13% of the buffer area) to over 27,000 ha (8% of the buffer area) today (equivalent to a 16 km^2 area). By comparing these data with those relating to the settled areas surveyed in the two temporal periods across the entire study area, it becomes clear that there was and still is about one-fifth of the settled areas within the perimetry of the N2000 Protected Areas system, with an increase of approximately 23,500 ha – the equivalent to 460 ha of land being consumed every year, or over 12,000 m^2 each day. It's true that in the 50s protected areas were almost non-existent, however, the analysis conducted shows that in these areas the impact of settlement was still limited by the morphological and environmental conditions (high altitude, terrain roughness, climate, hydrogeology).

AREA THAT ARE AT THE RISK AND HAZARDOUS

The settlement changes in the areas identified by the Floods Directive 2007/60/EC adopted into Italian law by the Legislative Decree No. 49 of February 23, 2010 are analysed here. The areas covered by the decree are those that have been assessed as being at risk of flood based the likelihood of a flood occurrence within a fixed time interval (3 levels), which means that the areas at risk of flooding are those with the combination of the probability of the occurrence of a flood event and the potential negative consequences for human health, the land, goods, the environment, the cultural heritage, as well as the economic and social activities stemming from such an event (4 levels). The areas identified by the flood risk maps are a subset of those identified from the mapping of the flood-related hazardous areas, thus the latter will be taken into consideration during the processing of the urban dynamics that have affected these areas over the past 50 years. The areas with a degree of hazardousness stretch to over 223,000 hectares (10% of the regional area), most of which are situated along the coastline, while the remaining parts are located in the surrounding areas of the main river beds and in the northern section bordering Emilia-Romagna, along the regional Apennine stretch (Fig. 13).

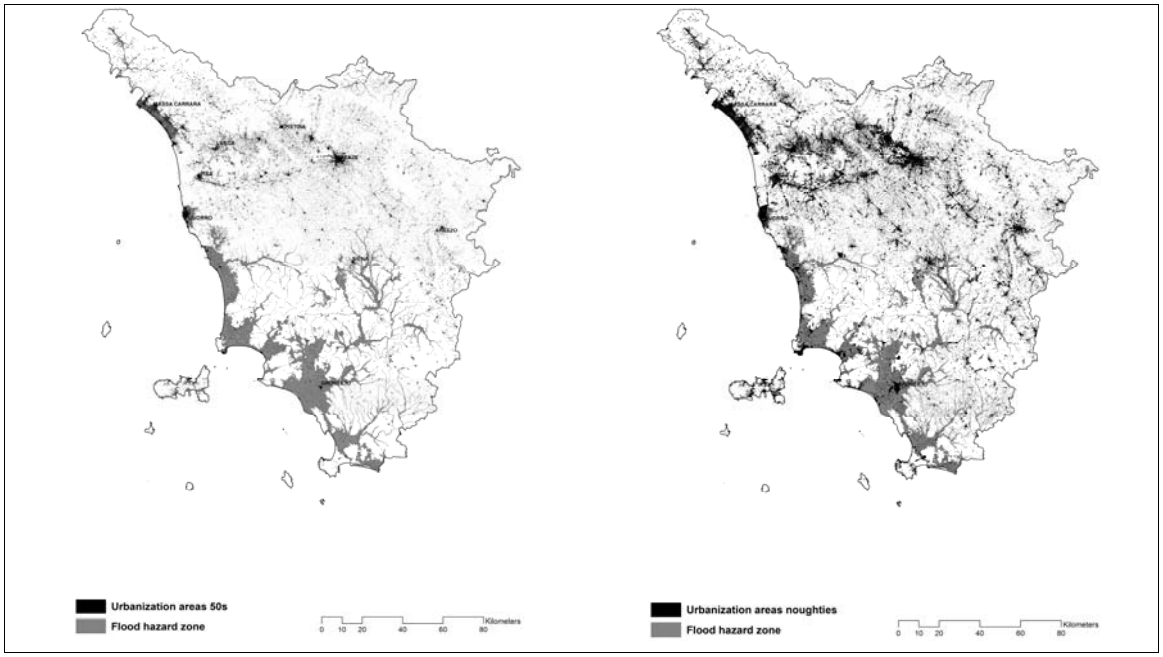

Fig. 13 The geography of the regional urbanized areas within the period studied, with a geographical indication of the flood hazard areas

An analyses of the situation of these areas in the years following the second world war, shows a settlement rate of 1.2%, however, it is interesting to note that 13% of the regional settled areas are concentrated in these territories identified as dangerous in terms of floods. After 2000 the settled areas in these zones covered approximately 24,000 ha (21,000 ha more than what was seen in 1950), which increased the settlement rate to over 10%. Of the more than 115,000 hectares of settled areas created in Tuscany between these two temporal periods, 20% were situated on those areas at risk of flood. These areas affect the territories of approximately 125 out of the total 287 municipalities, currently involving a population that now exceeds 1,200,000 people.

5 CONCLUSIONS

The data that has been presented testifies to the main socio-economic, settlement and infrastructural epochal transitions that have affected Tuscany over the past 50 years. Because of these, landscapes changed. Rural landscapes with widespread settlements often had transitions to industrialized agricultural landscapes and anyway to specialized ones. The polycentric urban settlements lost historical relationships with the rural landscapes matrix. This not only because the rural landscapes has been going to disappear, but first of all because urban settlements change socio-economic and spatial patterns from compact to fragmented and diffuse ones (IRPET, 2014b; Fregolent, 2012).From a quantitative point of view, even though the region registers a notable overall increase in population density (16.8%), it is still 8.7% below the national values of 25.5%. It should be noted that the natural structural diversity of the region - a major factor in its great scenic diversity - such as its biological, ecological, historical-archaeological, socio-economic and scenic aspects, has influenced the geographic distribution of these increments. Population concentrations have occurred in the internal territories at the foothills of the Apennine, with more marked values in the northern areas and with the sole exception of the Florence-Siena axis, and in the central-northern and central-southern coastal regions, where the positive changes almost weld them together. The reasons for these dynamics are many and their nature must be researched within the slow and progressive phenomenon of urbanization of the countryside, which has affected a vast area in the central-southern part of the region. At the same time these reasons may have influenced the different events, such as happened with the city of Florence (Magherini and Mencarini, 2001; Iommi, 2002; Regina et al., 2003), where the demographic decline was strongly influenced by the growth of real estate revenue due to the increasing outsourcing of accommodation and management control that, due to the ability to offer a competitive supply, caused the expulsion of significant numbers of residents. Population growth along almost all of the coastal municipalities is a phenomenon also seen in other Italian regions (Romano and Zullo, 2014), where the settlement pressure related to tourist and beach activities has also strongly influenced the demographic dynamics: at present about one-fifth of the entire population of Tuscany is concentrated in a territory that is only 12% of the whole regional area. It is also interesting to note how the demographic variation recorded for these coastal municipalities is distinctly higher (27%) than the regional one (16%) over the same period.
Even if Tuscany is considered to be one of Italy's regions most attuned to the conservation of its landscape and its historic centres, which supports an economically significant tourist stream, the past dynamics of land transformation do not differ much from those of other geographical areas notoriously less "careful" in this sense. In fact the regional urbanisation rate of 6%, proportional to the region's percentage impact on the national area (6% versus 7.5%) with a contribution to the average daily speed of national urban land conversion, and a rate of increase that is one of the highest in Italy (550%), together with a per capita urbanization equivalent to the national average, are all indicators of a territorial policy which looks with different sensitivities at the historical, artistic and monumental heritage and the environmental matrix.
The analysed data allow us to predict an evolutionary scenario for the regional settlement. As we have seen, over the past 60 years, the population has grown to 513,000 in the context of 1,154 km^2 of urbanised land

(2,250 m^2/inhabitant on average). The ten-year average rate of population growth in the 60 years analysed was 2.5%. Applying the rate of 2.5% for the next 10 years, there will be a further increase in population of about 92,000 inhabitants. The same standard applied to the level of urbanisation (2,250 m^2/inhabitant) would lead to a further 200 km^2 of urbanisation. This equates to a square with sides of 14 km, in addition to that with sides of over 37 km that represents current urbanisation.

The scenario would involve incremental proposed then, with high probability, those particular altitude belts that already showed a high vulnerability to land uptake. It is more than half of the region at altitudes between sea level and 300 m, in which the settlement has grown sevenfold over the past half century (actual urbanization rate is 10%). Such a perspective requires obviously a reflection in the headquarters of territorial governance, especially for a region highly vulnerable landscape in economic point of view.

Demographic data show that in the last ten years, the regional population increased by more than 170,000 units (5.3% more than in 2001, compared to 4.3% nationally calculated in the same period) and, if such a trend were to continue, it is probably that results in additional needs of urbanization and edification, maybe oriented social housing, with important consequences on the spatial changes in land use over time. To predict how these changes will affect the changes of the soil you can use different models and scenario analysis (Bibby e Sheperd, 2000; Nemmour et aliii, 2006; Villa et al., 2007; Mas, 2009; Mazzeo, 2012; Di Giacomo, 2015). Such models can be a useful tool both policies is territorial planning with important implications on future territorial and landscape asset.

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IMAGE SOURCES

Fig.1b http://www.greenreport.it/news/acqua/terza-corsia-sulla11-una-boccata-dossigeno-ma-per-uno-sviluppo-old-style/

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SMART CITY, METROPOLITAN AREAS AND COMPETITIVENESS

THE CASE STUDY OF FLORENCE

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ABSTRACT

The many challenges currently faced by cities around the world require the adoption of innovative strategies and actions. Among the various paradigms, many urban development processes have taken on board the paradigm of the Smart City, which is emerging strongly in the European context. Through the application of new technologies in different areas of the urban system, the paradigm aims to enhance quality of life and wellbeing of local communities and promote the creation of a more efficient, sustainable and competitive urban system. Furthermore, in Italy the major cities are also undergoing territorial and administrative reorganization, following approval of Law 56/2014 establishing the Metropolitan City as the governing authority of metropolitan areas. Research conducted on some of the Italian metropolitan areas has sought to ascertain whether and how the adoption of the Smart City paradigm could contribute to the constitution of metropolitan governance. Through a review of the scientific literature on the Smart City and territorial competitiveness and through the analysis of policies and initiatives implemented in some metropolitan areas, several relationships between the Smart City and territorial competitiveness have emerged. Above all, one of the cities that has invested more on increasing its own territorial competitiveness through the adoption of the Smart City paradigm is Florence. Hence this paper, after describing the relationships emerging from the scientific literature between Smart Cities and territorial competitiveness, examines the policies and measures adopted in Florence for the constitution of the Metropolitan City.

KEYWORDS:
smart city, competitiveness, metropolitan city of Florence, innovation and knowledge, tourism and cultural heritage

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智能城市，都市圈和竞争力

佛罗伦萨个案研究

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摘要

在一些城市中，对一种新型发展过程的定义开始出现，其重点是新科技在城镇体系不同领域中的使用和应用。这种新型发展过程旨在提高生活质量、当地社区的健康以及促进一种更加高效、可持续的城市系统的建立，使其更具竞争力。都市圈的重组问题就结合了这样的过程，响应了最近批准的德里奥法，该法将意大利的大都会作为都市地区的管理机构。智能城市、都市圈和竞争力是本文的三个主题，目标则是以佛罗伦萨为个案研究对象，结合这三个主题就佛罗伦萨大都会采用的最具创新性的政策和活动进行说明。

关键词
智能城市，竞争力，佛罗伦萨大都会，创新与知识，旅游与文化遗产

1 INTRODUCTION

Currently, cities have to face several challenges simultaneously, including rapid urbanisation and the effects of the economic and social crisis. In several urban contexts a new development process is being defined, focusing on the use and application of new technologies in different areas of the urban system. This new development process aims to improve the quality of life and wellbeing of local communities, besides seeking to promote the creation of a more efficient, sustainable and competitive urban system.

In addition to such challenges, the major Italian cities are also undergoing administrative and territorial reorganization under Law 56/2014 (called the Delrio Law) which envisages "Provisions on Metropolitan Cities, on Provinces, on unions and mergers of Municipalities". In this regard, part of the research project entitled "SEM Project - Smart Energy Master for the energy management of territory", developed at the University of Naples (DICEA), analysed several metropolitan areas in Italy in order to ascertain whether and how the adoption of the "paradigm" of the Smart City could contribute to implementing the process of constituting the Metropolitan City in Italy.

Given the many definitions of the term Smart City, our points of reference for this study were the definition used by Giffinger et al. (2007) and that in the report "Mapping Smart Cities in the EU" (European Parliament, 2014). As regards the former, according to Giffinger et al., in the Smart City six dimensions can be identified. One of these is the Smart Economy, which refers to the activation of development processes that increase the competitiveness of urban systems. Indeed, it emerged from our research findings that some metropolitan areas, such as Florence, have invested in policies and actions aimed at implementing the Smart City in order to increase their competitiveness in key sectors of their economy.

Therefore, after describing the relationships identified in the scientific literature between the Smart City and territorial competitiveness, this paper describes the policies and measures adopted in Florence, regarding the sector of cultural heritage and tourism, for the constitution of the Metropolitan City. It is divided into three parts: the first provides a review of the scientific literature about the Smart City and territorial competitiveness; the second explains the research methods adopted in the study; finally, the third illustrates the case study of the Metropolitan City of Florence.

2 SMART CITY AND TERRITORIAL COMPETITIVENESS. THE COGNITIVE FRAMEWORK

There is a broad consensus in the scientific literature on territorial competitiveness that cities are central to the organization and leadership of economic growth and territorial development. Considering the profound changes in economic, social and technological processes caused by globalization and integration, cities around the world are facing the challenge to balance territorial competitiveness with environmental sustainability (Caragliu et al., 2009; Monfaredzadeh and Berardi, 2014; Paskaleva, 2014). In this context, one of the main paradigms that is becoming firmly established, namely the Smart City, could contribute to define strategies to address such a challenge. Yet the relationship between the Smart City and territorial competitiveness is not obvious, although analysis of their features and objectives shows overlaps and relations between these two topics.

Although the lack of a shared definition of the Smart City has been widely discussed (Angelidou, 2014; Allwinkle and Cruickshank, 2011; Chourabi et al., 2012; Komninos, 2011; Lombardi et al., 2012; Nam and Pardo, 2011; Papa et al., 2013; Wolfram, 2012), also due to the different nature of the subjects that have developed such definitions - academia, public institutions, multinational companies - (De Luca, 2014; Mosannenzadeh and Vettorato, 2014), a review of some definitions clearly shows the linkages with competitiveness, that can be considered one of the objectives of the Smart City (Table 1).

Definition	Reference
The 'smart city' has recently been introduced as a strategic device to encompass modern urban production factors in a common framework and, in particular, to highlight the importance of Information and Communication Technologies (ICTs) in the last 20 years for enhancing the competitive profile of a city.	Caragliu et al., 2009
The Smart Cities concept is connected to notions of global competiveness, sustainability, empowerment and quality of life, enabled by broadband networks and modern ICTs. Its implementation requires the development of migration paths regarding Internet infrastructures, test bed facilities, networked applications, and stakeholder partnerships.	Komninos et al., 2011
A smart city is a synthesis of hard infrastructure (or physical capital) with the availability and quality of knowledge communication and social infrastructure. The latter form of capital is decisive for urban competitiveness (…) Smart Cities are also instruments for improving competitiveness in such a way that community and quality of life are enhanced.	Batty et al., 2012
Smart cities are the result of knowledge-intensive and creative strategies aiming at enhancing the socio-economic, ecological, logistic and competitive performance of cities.	Kourit and Nijkamp, 2012
(The concept of) a 'smart city' represents a positively valued, multi-objective policy strategy of integrated urban and ICT development, promising to tackle problems of economic competitiveness, social equity and environmental performance - somehow. Such a strategy attracts stakeholders for its ability to reduce complexity and provide capacity.	Wolfram, 2012
Smart cities are all urban settlements that make a conscious effort to capitalize on the new Information and Communications Technology (ICT) landscape in a strategic way, seeking to achieve prosperity, effectiveness and competitiveness on multiple socio-economic levels.	Angelidou, 2014

Tab.1 Smart City definitions content references about competitiveness

In this regard, according to Giffinger et al. (2007), the Smart City is an opportunity to increase the competitive potential, above all, of the average size city, defined as "a city well-performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self decisive, independent, and aware citizens", where economy, people, governance, mobility, environment, and living are the six characteristics that can be recognized in the Smart City, based on the traditional theories on urban growth and development, such as economic competitiveness, intellectual capital and social participation in society, transport and ICT, natural resources and quality of life (Albino and Dangelico, 2015). The multiple dimensions within the Smart City are also stated in other studies (e.g., Barrionuevo et al., 2012; Batty et al., 2012; Chourabi et al., 2012; Schumann et al., 2012). In particular, the most common of these concern people's wellbeing and quality of life, as well as the economic development of the city.

The relationship between the Smart City and territorial competitiveness is more evident when analyzing the elements that characterise territorial competitiveness. As for the "paradigm" of Smart City, the scientific literature contains several definitions of territorial competitiveness, a subject borrowed from mainly economic studies. According to some authors, competitiveness is synonymous with productivity (Porter, 1996; Fagerberg, 1996; Boltho, 1996). With such a meaning, it is influenced by factors such as the effectiveness of institutions, sectoral specialisation, the spread and quality of infrastructure, and other factors that can support productivity, including the use of new technologies and investment in intellectual capital. The meaning of territorial competitiveness has evolved from one focusing on the ability of a region to attract investment (Cheshire and Gordon, 1996; D' Arcy and Keogh, 1999; Kresl and Singh, 1999) to another centred on the capacity to maintain high standards of living for inhabitants (Lever and Turok, 1999; Malecki, 2000) in a sustainable way (Begg, 2002; Constantin, 2006; Filo, 2014). Such a shift in the meaning of territorial competitiveness, considering what was stated by Giffinger et al. (2007) and other researchers of

the Smart City, shows that regional competitiveness con be considered as one of its properties (Murray et al., 2011; Chourabi et al., 2012).

The study of the Smart City and territorial competitiveness features allows further relationships to be identified. According to a significant part of the literature dedicated to the Smart City, social and intellectual capital is, on the one hand, the basic condition for the implementation of the Smart City paradigm (Hollands, 2008; Paskaleva, 2014) and, on the other, an important endowment that, combined with the use of ICT (Alawadhi et al., 2012; Chourabi et al., 2012), can steer urban development. Indeed, it has been argued (see, amongst others, Caragliu et al., 2009; Touzar, 2011; Kourtit and Nijkamp, 2012) that investing in intellectual and social capital promotes sustainable economic growth, a high quality of life and the competitive performance of cities.

Social and intellectual capital is also a key aspect of territorial competitiveness. The study of the scientific literature also shows that territorial competitiveness is related not only to innovation, but also to the degree of knowledge and learning capability of a territory (Bramanti, 1998; Camagni, 2002; Benneworth, 2007; Murray et al., 2011). These elements are also common features of the Smart City (Abdoullaev, 2013; Sinkiene et al., 2014). For example, according to Hollands (2008) and Komninos (2011), Smart Cities "are territories with a high capacity for learning and innovation, which is built-in to the creativity of their population, their institutions of knowledge creation and their digital infrastructure for communication". Up to this point the relationships arising between Smart Cities and territorial competitiveness support the conclusion that a "smart" city is also competitive when it invests in social and intellectual capital in order to enhance the degree of knowledge and learning capability and promote the development of innovation within the region.

Another common element between the Smart City and territorial competitiveness concerns the form of governance to adopt. According to some authors (including, Caragliu et al., 2009; Nam and Pardo, 2011; Komninos et al., 2011), implementation of the Smart City necessarily requires the development of a particular form of governance. The scientific literature has mainly referred to a form based on the model of the "Triple Helix" of Etzkovitz and Leydesdorff (2000). This model is considered a selective environment for creating knowledge and innovation, which promotes strategies able to exploit intellectual and social capital to induce a "new urban vitality" (Lombardi et al., 2012) and it is characterised by the interaction of three different kinds of actors:

- University: it enhances the value of scientific research products on the market so as to increase the sources of funding for public research;
- Government: it increases the effectiveness of governance through administrative decentralization measures;
- Industry: it incentivises collaboration with universities in order to use the results of scientific research.

The above actors, who are in a perpetual evolution, interact flexibly on different territorial levels, seeking to achieve their own objectives, whilst satisfying those of the other two parties concerned (Fixari et al., 2009).

The authors of this model argue that the network formed by these actors creates necessary conditions to produce knowledge, create economic wealth and control development of urban regions (Leydesdorff and Deakin, 2011). Lombardi et al. (2011) recently proposed a review of this model that includes society as the fourth key actor. The innovation of this model consists in the four "helices" that operate in a complex urban context, where civil commitment with intellectual and social capital stimulates relations among the traditional "helices" - university, government and industry. The interaction between these actors and these forces allows the achievement not only of a "smart" but also competitive development of the city. Indeed, the necessity of governance that involves various subjects and institutions also represents one of the requisites to increase territorial competitiveness (Bramanti, 1998; Camagni, 2002), with the purpose to exploit the intellectual and social capital and promote the development of innovative systems based on knowledge and

learning. According to Fixari et al. (2009) there are two possible approaches to promoting the economic development of an area: the creation of industrial clusters (e.g., centres of competence); the adoption of the triple-helix model. The latter approach, rather than the former, would allow the creation of a structure, led by governments, to promote relations and cooperation between the research world and the business world to encourage innovation through the development of R&D projects. For these reasons, the "triple helix" (or "quadruple helix") model is also an efficient tool to increase the territorial competitiveness of the Smart City.
Hence, from the analysis of definitions and characteristics, it emerges that although the relationship between the Smart City and territorial competitiveness may seem somewhat stretched, the two elements are closely related. In particular, innovation and knowledge processes affecting territories, thanks to the opportunities offered by ICT, are a chance to increase the attractiveness and competitiveness of a region, but only if supported by *multi-actor governance*.

3 RESEARCH METHODS

From the review of the scientific literature, it emerges that the paradigm of the Smart City can be an effective strategy to increase the competitiveness of a territory. For the case study of the Metropolitan City of Florence it was necessary to choose a working definition of the Smart City. Among the several definitions provided by the literature, the one included in the report "Mapping Smart Cities in the EU" (European Parliament, 2014) was chosen as a reference point: "a Smart City is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership". This definition highlights the key role that technology can play in resolving issues at the urban scale. At the metropolitan scale, ICTs should allow area connectivity and decrease the physical and functional gap between the metropolitan city and its hinterland. Furthermore, it highlights that implementation of the Smart City must be committed to a form of multi-actor governance involving the main stakeholders of local innovation processes: enterprises, research centres, governments and society.
The study of the "smartness" of the Metropolitan City of Florence was developed in three phases. The first entailed a survey of the physical, functional and settlement characteristics of the metropolitan area.
In order to draw up a profile of the metropolitan area and measure its potential level of "smartness", in the second phase, a set of indicators structured around the six characteristics (Economy, People, Environment, Living, Mobility and Governance) of the traditional model of the Smart City (Giffinger et al., 2007; Batty et al., 2012; Schuuman et al., 2012) was chosen. To select these indicators the criteria used were the following:

- significance of the indicator in describing metropolitan "smartness";
- use and recurrence of the indicator in the most relevant studies both on the national and the European scale;
- accessibility to official databases;
- availability of data at different territorial scales and temporal phases.

The last phase of the study entailed the screening of Smart City initiatives underway in the metropolitan area. At the beginning, the aim was to identify the initiatives promoted by the main area stakeholders – institutions, research centres and universities, enterprises and associations – through the use of indirect sources, such as instruments for urban and territorial government, web sites of the stakeholders potentially involved in the initiatives, as well as publications.
As regards the definition of the six characteristics of the Smart City (Giffinger et al., 2007), the measures selected in the metropolitan area were those focusing on ICT use and application in several sectors of the urban system (mobility, building, technological networks), but also in public administration and in the services provided to citizens and city users. These initiatives were then classified according to the Smart City characteristics by type and actor (Table 2).

Afterwards, the most significant initiatives of the metropolitan area were chosen among those studied, to carry out "fact checking". The criteria for the choice were:

- level of innovation related to the capacity to contribute to the institution of the Metropolitan City;
- replicability of the initiative in other territorial contexts;
- importance of the initiative in terms of impacts (economic, social and environmental) on the city.

Characteristic	Typology	Implementing Subject
Smart Economy	Research	Local Authorities/Institutions
Smart Environment	Works	Universities/Research Centers
Smart Governance	Projects	Enterprises
Smart Living	Technologies/Products	Associations
Smart Mobility	Plans and Programs	
Smart People	Promotion initiatives	

Tab.2 Classification criteria for Smart City initiatives

Through the collection of "field" data, it was possible to verify the implementation status of the initiatives and their consistency with urban policies adopted in the metropolitan area. A further contribution to the analysis of the initiatives was given by the study of land use policy of the Tuscany Regional Authority, focusing both on the local and metropolitan scale. It was thus possible to contextualise the current initiatives of the metropolitan area within a political strategy to increase territorial competitiveness through the implementation of the Smart City.

4 CASE STUDY: THE METROPOLITAN CITY OF FLORENCE

The Metropolitan City of Florence is located in the central part of Italy. With its population of 973,145 inhabitants, it is the 9th most populous Italian metropolitan area, including 42 municipalities over an area of 3,513.69 km^2. Its administrative centre is the City of Florence which occupies an area of over 103 km^2 and has a population of 358,079 (Fig. 1).

Tourism and cultural heritage play a strategic role in the local economy. Indeed, the Metropolitan City of Florence hosts 187 museums, 97 of which are in Florence. Among all the museums in Florence, the Uffizi Gallery and the Accademia Gallery are, respectively, the 3rd and 4th most visited museums in Italy (IRPET, 2011). Furthermore, Florence's cultural heritage is continuously expanding. Cultural heritage has given the opportunity to promote and sustain the tourism sector. According to the most recent available statistics (2013), accommodation in the Metropolitan City is supplied by 3,019 businesses with a total capacity of over 88,000 beds (Centro Studi Turistici, 2013). Half of such supply is concentrated in the city of Florence (1,095 businesses and 43,000 beds).

Several studies have revealed that cultural heritage has acquired increasing importance in different levels of the economy (Alberti and Giusti, 2012). In particular, there is an increasing awareness that areas might develop their competitiveness by taking advantage of their cultural heritage (Pereira Roders and Von Oers, 2011; Boix at al., 2012). In this context, tourism and cultural heritage play a key role because cultural assets produce tourism and tourism can attract new resources to the culture sector and enhance territorial competitiveness (Alberti and Giusti, 2012).

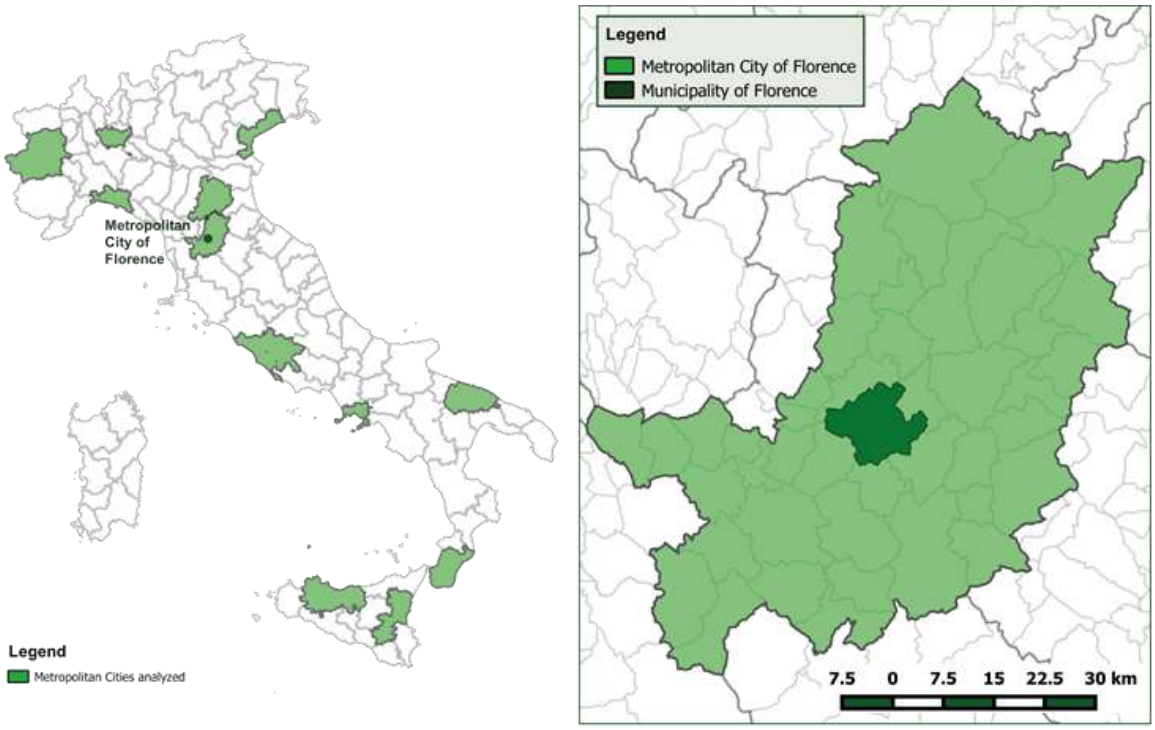

Fig. 1 The Metropolitan City of Florence map

Hence, the Metropolitan City of Florence has promoted processes for fostering knowledge and innovation - key elements for territorial competitiveness and the Smart City - in tourism and cultural heritage that constitute one of the key sectors of its economy. The adoption of "smart" solutions in this sector was also supported by Tuscany Regional Authority policies. One of the strategic directions of the "2011-2015 Regional Development Plan" drawn up by the Tuscany Regional Authority (2011a) concerns "competitiveness in the regional system and human capital". According to this strategic direction, the Plan sets out policies for tourism and culture that are based on innovation, research and development of new technologies. Such policies are also linked to the creation of technological districts and innovation poles (Table 3), which are clusters able to integrate small and medium enterprises and crafts related to tourism.

Clusters are "geographic concentrations of interconnected companies, specialised suppliers and service providers, firms in related industries and associated institutions (e.g., universities, standards agencies and trade associations) in particular fields that compete but also cooperate" (Alberti and Giusti, 2012). They can improve regional competitiveness because, supporting the relationships with institutions and addressing knowledge and information that are necessary for the development, they contribute to innovation processes (Ketels, 2011). In order to promote innovation, knowledge and technology transfer, according to Communication no. 323/2006 of the European Commission, since July 2011 the Tuscany Regional Authority has instituted several innovation poles and technological districts, including the *Tuscan Technological District for Cultural Heritage* and *POLIS (Innovation Pole of Technologies for a Sustainable City)*. The *Tuscan Technological District for Cultural Heritage and the Sustainable City* (*DiT-BeCS*) promotes the constitution and the strengthening of research, innovation and enterprise systems to create successful local products and services in the cultural and landscape heritage sector for international markets. One of the main objectives of the *DiT-BeCS* is involvement of all the actors able to support innovative processes in order to create a virtuous "triple helix" that could promote the economic and territorial development of the region. At present, the district involves several research actors (University of Florence, University of Siena, Normal School of Pisa, CNR) and enterprises (EL-EN, Archeologia, Hyperborea, Pacenti Restauri, Targetti), but also public administrations (Metropolitan City of Florence, Province of Prato, Province of Pistoia, Pistoia Futura, Municipality of Florence) and associations.

	Technology District	**Innovation Pole**
Objectives	R&D with territorial impact	Exchange of knowledge, sharing of facilities and technology transfer among who adhere to the pole
Sustainability	Sustainability is guaranteed in the medium/long-term involvement of financial community and institutional investors who enter the governance of the District and replace public finance	Sustainability is guaranteed in the medium term from management of facilities and delivery/acquisition of qualified services to companies that adhere to the pole
Governance	It is representative of companies and research institutions	It is representative of firms and actors who provide services to businesses
Project activities	Few large projects and industrial research	Many acquisition activities of qualified services
Effects	Medium/long term	Medium/short term

Tab.3 Main Differences between technology districts and innovation poles (SOURCE: Tuscany Region, 2011b)

POLIS (Innovation Pole of Technologies for a Sustainable City) represents the technical secretariat of *DiT-BeCS* and was promoted by the Foundation for Research and Innovation (University of Florence with Province of Florence), in cooperation with other actors in the field of research and in the promotion of the technology transfer (I2T3, University of Pisa, University of Siena, Lucense, CNR and APSLO). It is a structured network of SMEs, large enterprises and research centres (about 500 subjects) and it develops actions and projects aimed at urban sustainability. Its main activities concern: cultural heritage and sustainable tourism; sustainable mobility; sustainable buildings. Moreover, it plays a key role in the "SmartCommunitiesTech" cluster promoted by the Ministry of Education, University and Research (MIUR) and coordinated by Torino Wireless Foundation. Specifically, POLIS is involved in one of the cluster's projects, namely the project concerning technologies for cultural heritage.

The City of Florence has implemented some initiatives in areas covered by the Technological District. One of these initiatives is the *Le Murate Urban Innovation Park. Le Murate* is located in the historic centre of Florence and is a former prison recovered to create spaces dedicated to innovative enterprises for cultural heritage and the sustainable city. The basic idea of *"Le Murate"* is to promote a model of incubation with pre-incubation services, incubation and enterprise aggregation, focusing on cultural heritage, artistic crafts and new technologies. Currently, nine ICT enterprises occupy special furnished spaces, which were created in the requalified complex as an *urban lab*. The *Urban Park* also contains the common services of the *Tuscan Technological District*, including: the Metalab University-Enterprise about cultural heritage; spaces to organise cultural events (SUC, Bookstore, Literary Café, etc.); locations for co-working. Furthermore, it operates in synergy with the network of Florentine incubators, which includes the *Technological Incubator of Brozzi* (City of Florence) and the *University Incubator of Sesto Fiorentino*.

Among the *prospective projects* supported by *DiT-BeCS* there is the promotion of the *Social Museum*. The *Social Museum* is integrated with the topic of the Smart City, especially in: the implementation and spread of ICT-based urban and territorial services; the effects on the quality of life generated by cultural opportunities, tourist attractiveness and security, mobility management, local accessibility; the relation between administration and citizens for the provision of services. Many of the Smart City initiatives regarding the sector of cultural heritage and tourism, promoted by local governments, can be framed within the *prospective project* and be interrelated.

Fig. 2 Piazza delle Murate, core of the Urban Park of Innovation "Le Murate"

One such project was the framework *MyFirenze*, promoted by the City of Florence and activated since 2014 in the Multimedia Centre for City Visitors to Santa Maria Novella train station. It is realized in collaboration with the Media Integration and Communication Centre (University of Florence) and its aim is to enable tourists to plan their trips and optimise their time to visit the city. At first, the tourist finds the information at the tourism information centre and he/she defines the trip itinerary using natural interaction systems (tabletop and wall); then the personal plan is visualized on his smart phone, enabling access to advanced services and for updating the itinerary.

Another initiative is *firenzeturismo.it*, promoted, instead, by the Metropolitan City (former Province) of Florence. Completed during 2013, this initiative consists in a back office to update the database of the cultural events organised in the local area and in an *app* that can be downloaded by all users in order to be updated on all the tourist attractions and the cultural events in the metropolitan area. The official tourist website of the Metropolitan City and the City of Florence was reorganised within the project. The key aspect of this initiative is the integration between the infomobility services (*imobi.fi.it*) and the synergies with the local wi-fi network. The database is connected with the framework of the Multimedia Centre for City Visitors as well.

The main aim of such initiatives is to provide innovative services to the tourists, whose profile is changing both rapidly and profoundly. Hence, it is necessary not only to implement measures to improve the city's image, but also to enhance the user's direct and perceived experience. Therefore, according to tourist demand, local authorities are especially aiming to integrate tourism development with measures for enhancement of cultural resources with the support of new ICTs which allow not only an improvement in quality of service, but also strengthen local identity.

Fig. 3 The wall and the tabletop of framework MyFirenze at the Multimedia Center for City Visitors of Santa Maria Novella train station

5 CONCLUSION AND FUTURE WORK

From the *review* of the scientific literature, it emerged that although the relationship between the Smart City and territorial competitiveness may seem tenuous, the two topics are closely related. In the case study of Florence it was shown that knowledge and innovation not only increase competitiveness, but also allow the implementation of the Smart City. Through analysis of the initiatives, classified as "Smart Economy" and "Smart Living", concerning tourism and cultural heritage there emerged the presence of a well-structured network consisting of multiple stakeholders. As described in the sections above, their mutual interaction, inspired by the "triple helix" model, allows the development of innovation processes throughout the area concerned in one of the main economic sectors of the metropolitan territory. These processes are supported by the creation of shared platforms, both territorial (the Technological District and POLIS) and urban (the Urban Park of Innovation "Le Murate"). Thanks to such platforms, innovative and technological solutions can be designed and implemented to foster and promote cultural heritage so as to transform all cultural resources within the metropolitan area into a competitive advantage, thereby increasing the tourist attractiveness, improving quality of life and also promoting forms of sustainable economic development.

Therefore, if, on the one hand, the use of ICTs, connected with the potential of human and social capital, and *multi-actor governance* are key elements for the implementation of the Smart City, on the other, such elements contribute to increase local competitiveness. However, from the study of the Florentine initiatives it emerged that, despite the policies promoted at the regional level, there is a lack of planning for the promotion of culture and tourism at the metropolitan scale.

The scientific literature highlighted the relationship between territorial competitiveness and several strategic sectors (mobility, human capital, economy, production, research and training, environment) (Papa et al., 2014a; Papa et al., 2014b). At present, research concerns one of the aspects of *urban smartness*. According to the report "SMART CITIES STUDY: International study on the situation of ICT, innovation and knowledge in cities" (CDK-UCLG, 2012), in order to increase their territorial competitiveness cities should develop all the Smart City characteristics. Hence, in the future it would be preferable to evaluate the levels of territorial competitiveness in relation to the characteristics of the Smart City. This study could require the use of indicators to measure "smart competitiveness" of cities and in addition an analysis of the initiatives. Such an analysis could be structured on the basis of the three key aspects shared by the Smart City and territorial competitiveness: knowledge, innovation and governance. Thanks to these integrations, the development of this study could allow identification of the relations between the paradigm of the Smart City and territorial competitiveness.

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IMAGE SOURCES

Cover image: http://www.pescini.com/cms/wp-content/uploads/2015/06/firenze_duomo.jpg
Fig. 1, 2: elaborated by the authors
Fig. 3: D'Amico, Del Bimbo and Ercoli, 2014

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SUSTAINABLE URBAN MOBILITY TOWARDS SMART MOBILITY

THE CASE STUDY OF BARI AREA, ITALY

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ABSTRACT

In the last decades, sustainable mobility policies have seen a growing interest. Furthermore, in the international debate, this concept has increasingly been linked to the most innovative one of smart mobility, which is part of the more general paradigm of Smart City. This paper discusses primary findings of a Research Project conducted at University of Naples, DICEA, funded by EU (PON REC 04A2_00120 Asse II), "Smart Energy Master – Toward Energy-based approaches for Regional Planning".
The primary goal of the work is to make a review of policies, programs, projects for sustainable urban mobility and of smart mobility solutions in Bari area. The second goal is to make an assessment on trends of urban mobility in order to evaluate its sustainability and smartness. A comforting picture, focused on matching the local strategies to European programs, is shown. Finally, a consideration on how the framework "smart" may improve urban mobility planning is proposed.

KEYWORDS:
sustainable urban mobility, smart mobility, Bari

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从可持续城市交通迈向智能交通

意大利巴里地区个案研究

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摘要

在过去的几十年中，可持续交通政策引发了日益密切的关注。此外，在国际辩论中，这个概念已经被越来越多地与最具创新性的智能交通相联系，这是智能城市更为普遍的模式的一部分。这项工作的首要目标是考察可持续城市交通的政策、计划和项目以及巴里地区的智能交通解决方案。第二个目标是对城市交通的趋势进行评估以评价其可持续性和智能性。如图所示集中体现了当地战略与欧洲计划的契合。最后一个目标就是，针对如何让“智能”框架改善城市交通规划进行提议。

关键词

可持续城市交通，智能交通，巴里

1 INTRODUCTION

This paper discusses primary findings of a Research Project conducted at University of Naples, DICEA, funded by EU (PON REC 04A2_00120 Asse II), "Smart Energy Master – Toward Energy-based approaches for Regional Planning".

The primary goal of the work is to make a review of policies, programs, projects for sustainable mobility and of smart mobility solutions which may be currently distinguished in Bari area. In Bari, which is the second metropolitan city in Southern Italy, a wide range of initiatives and solutions of urban transformation in which sustainability is the key element has recently been proposed.

The second goal is to make an assessment on the trends of descriptive parameters of urban mobility in order to evaluate its sustainability and smartness. Diffuse pollution, climate change and energy resources' crisis require cities of the future to increase their energy efficiency as a whole, improving performance and reducing consumption, primarily energy. Undoubtedly, the choices and behaviors in the field of mobility, transport modes and their characteristics, as well as, more generally, the way in which travel decision are made have a high impact on carbon footprint of cities.

In the case study of Bari, traffic measures and investigations driven for the strategic plan MTB show a strong imbalance towards private car. Considering 100 people moving, more than 70 use private car; public transport system, as a whole, captures only 30% of commuting. However since 2004, a coordinated and increasingly shared government program on urban mobility, put in place a wide range of actions aiming at reducing the use of private vehicles. These actions brought benefit to the circulation and livability of the city and a not negligible reversal trend was registered.

In the following section the main European policies on sustainable mobility, which affect both national and local development, are described; in the third section, structural characteristics of mobility in the metropolitan area of Bari are defined; in the fourth section, policies, programs, actions for sustainable mobility and solutions for smart mobility are outlined and effects and effectiveness are measured, where possible for this work, through the assessment of actual trends; in the fifth and final section we summarize the results of this first step of research.

2 SUSTAINABLE MOBILITY IN EUROPE AND ITALY: A BRIEF REVIEW

Sustainable mobility policies and transport planning at urban scale have seen an increasing interest by European Commission. The first policy proposals in the area of urban mobility, the "Citizens' Network", date back to 1995 and 1998. They resulted in the launch of a series of initiatives based upon a "best practice" approach. In 2001 Transport White Paper (EC, 2001) "European transport policy for 2010: time to decide" suggested 60 specific measures to be taken at EU level in the transport sector. In 2005, in order to reduce the energetic and environmental impact of transport, the European Commission adopted the Green Paper (EC, 2007) "Towards a new culture for urban mobility" whose key issues are: free-flowing and greener towns and cities, smarter mobility and urban transport which is accessible, safe and secure for all European citizens. In 2009 the European Commission adopted the Action Plan on urban mobility (EC, 2009). In 2011, Transport White Paper "Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system", had a vision for the future of European transport until 2050. It recommended profound changes in the strategic planning and proposed a series of objectives and concrete measures that focused on transport integration (EC, 2011). In these last two documents is explicitly invoked the Sustainable Urban Mobility Plan (SUMP) as a new planning instrument for solving energy and environmental problems and inefficiencies of transportation in cities with an integrated and sustainable approach (Socco, 2010).

The differences between SUMP and the traditional mobility plans are in the three principles that inspired the whole process of drawing up and implementation of the plan: integration, participation and evaluation in

terms of increasing the efficiency, attractiveness and the overall quality of the urban transport system (http://www.bump-mobility.eu/). The different approach ensures that the focus moves from traffic to people, from mainly infrastructural measures to a combination of demand management actions and policies, from large investments projects to the introduction of the concept of limit in economic, energetic and land resources (EC, 2013). The benefits of the SUMP implementation are: better quality of life, SUMP means planning for people rather than cars and traffic; furthermore, health benefits due to the reduction of air polluting and noise and the promotion of active modes of transportation (walking and cycling); finally, economic benefits: a healthier environment and reduced congestion helps to substantially reduce costs to the local community and attract new businesses (Korver et al., 2012).

Moreover, a European Commission study on mobility plans, which were implemented in Europe, places Italy among the countries with a well-established transport planning with its regulatory support and availability of guidelines (Orchi, Valentini 2014). In Italy the Law 340/2000 (art. 22) (Legge 24 novembre 2000, n. 340) introduced the PUM (Plan for Urban Mobility) as a long term (10 years), systemic and integrated planning instrument for managing mobility in urban areas. This law did not become immediately operational for lack of both necessary funds and the inadequate definition of the approval procedures for plans. This law and the national guidelines, issued in 2005, promote sustainable approaches aimed at reducing levels of congestion, pollutant and noise emissions and energy consumption. In addition, they promote other more general issues like safety, accessibility and the use of sustainable modes of transport, focusing on land use-transport integration. Such scientific and regulatory efforts in the field of urban mobility appear to assume an increasing emphasis. They underline the need to limit the environmental impacts of transport systems and to encourage sustainable mobility policies.

3 THE CASE STUDY OF BARI AREA: RELEVANT FEATURES OF TRANSPORTS' SUPPLY AND DEMAND

The metropolitan city of Bari covers an area of more than 3,800 km² and includes 41 municipalities in which approximately 1,260,000 inhabitants live. It is a polycentric system wherein Bari represents the main but not dominant center because of the presence of three towns with a population exceeding 50,000 inhabitants (Altamura, Molfetta and Bitonto) and a dense network of surrounding medium-sized towns. The road network of the metropolitan city consists of two main routes: the first one is parallel to the coast whilst the second one goes inward the metropolitan area. With regard to the rail transport, Bari area is provided of sufficiently widespread infrastructures network but installations and rolling stocks are often obsolete. The railway network consists of a radial monocentric structure converging in the node of Bari Centrale, from which all the railway lines depart and arrive.

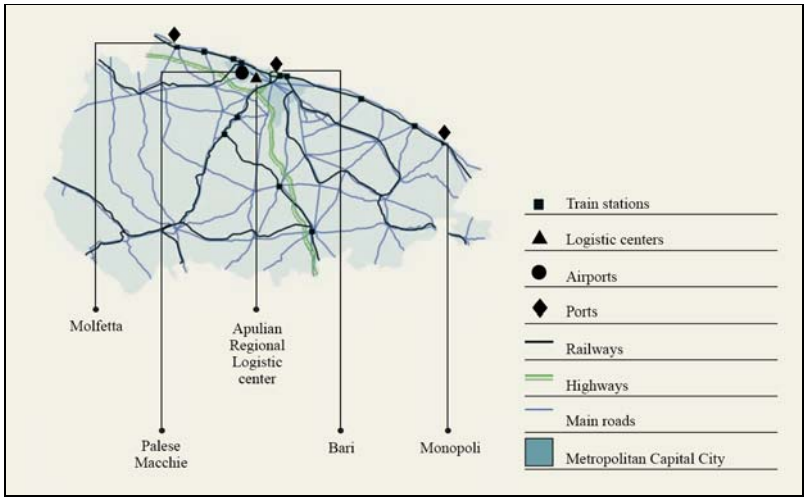

Fig. 1 Mobility infrastructures in Bari area. Source: Cittalia report on metropolitan cities, 2013

Considering public transport supply, four different rail operators act in the given area. Bari is the metropolitan city with the smallest amount (4%) of railway stations compared with the total number of stations in the 10 Italian metropolitan cities[1].

Road transport supply consists of about 60 buses that every day connect Bari with the other municipalities located in the metropolitan area with a total of around 6 million-km per year of road transport services. With reference to public transport, Bari has 38 public transport lines. Three of them (shuttles A, B and C) provide a "Park & Ride" service, connecting interchange parking areas, located next to the access routes with the highest levels of vehicular traffic, and the center of the city. In the following part, relevant data, that mainly characterize the qualitative and quantitative structure of the mobility, are shown. They also help to understand mobility problems. Apulian public transport system serves over 300,000 users a day, providing over 10,000 bus trips and 600 trains. This supply requires a public co-financing amount of about one million euros. It is delivered to the operators of the Local Public Transport who directly employ more than 6,000 people (approximately 1.2 % of the total of the region's workers).

The overwhelming majority of systematic daily travels, with origin and destination in the metropolitan city of Bari, use private car. In fact, daily travels by private car directed to or coming from the center of Bari are 675,000 out of a regional total of about 1,720,000. At same time, with respect to road transport, daily travels inside the city of Bari are more than 125,000. The average rate of car utilization, according to ISTAT 2001 data, scores nearly 1.4 passengers per vehicle. According to some surveys on vehicular flows, carried out by Tecnopolis in 2007 under the Implementation Plan 2009-2013 of the Regional Transport Plan, the total quantity of travels, both on entry and exit from the metropolitan area, is approximately 73,000 meanwhile those related only to the municipality of Bari their rate is respectively 134,000, for entering flows, and 140,000 for exiting flows.

4 POLICIES, PLANS, PROGRAMS, ACTIONS OF SUSTAINABLE MOBILITY AND SMART MOBILITY SOLUTIONS. EVALUATION OF ONGOING TRENDS

In the following section different geographic scales (regional, metropolitan and municipal) will be analysed as it is specifically stated in the title of each paragraph.

In 4.1 paragraph, regional strategies will be illustrated together with capital and current expenditure of Apulian municipalities. In 4.2 paragraph, plans and programs for the metropolitan area of Bari will be described and their effects on Supply of public transport by bus, Index of road accidents and Level of motorization and level of motorization Euro 4 or higher, will be analysed. In 4.3 paragraph, the measures implemented by the City of Bari, at a municipal scale, will be summarized and a first evaluation of their effects will be conducted through a set of performance indicators. In 4.4 paragraph, smart mobility solutions, underway and/or planned in Bari area, at a municipal scale, will be described and then their potential or effective success will be identified.

We are aware that trends in urban mobility are a consequence not only of implemented measures but also of a general change in urban mobility patterns in Italian cities. In this sense, a comparison with trends in other cities, through Istat indicators, will represent the second step of this research.

4.1 REGIONAL STRATEGIES

Regional policies in the field of sustainable mobility are contained primarily within the Regional Transport Plan (PRT) and in the Regional Plan for Space and Landscape (PPTR). Among the most important measures

[1] The list of stations derives from RFI source and relates to the year 2009. The stations here considered are the most important based upon the freights and passengers traffic as well as the services supplied.

identified in the transport network by the Implementation Plan of the PRT for the years 2009-2013, those that concern forms of "clean" mobility are:

- the construction of parking lots and facilities for modal shift;
- the introduction of a co-modal integration model;
- the implementation of measures to improve speed performance of railway lines;
- the promotion of integration between traditional and LRT systems;
- the creation of an integrated and safe network for cycle;
- the promotion of bike sharing and car sharing;
- the implementation of information systems;
- the promotion of alternative mobility services, such as carpooling, through the training of mobility manager.

The Implementation Plan of the PRT for the years 2015-2019 adds directions for the development of intelligent mobility infrastructure through:

- the deployment of ITS (Intelligent Transport Systems) to support the processes of integration between operators, services and users;
- the spread of grids for charging electric vehicles.

With regard to The Regional Plan for Space and Landscape (PPTR), approved in February 2015, it encourages soft mobility and the redevelopment of the railway system, through a "horizontal co-planning" process. A first measurement of the target implementation of regional policies can be made by analyzing the variable of total expenditure of all Apulian municipalities in the field of roads and transport.

In the first phase, current expenditure has been separated from capital expenditure, in order to identify how much money is allocated to roads and traffic sector and how much is destined to public transport; in the second phase, they are compared with the evolution of the demand for public and private transport.

Data regarding the expenditure values have been taken from a study carried out by the Foundation Caracciolo - ACI 2013 whilst data on transport demand come from an elaboration of the Ministry of Infrastructure and Transport on different sources' data.

Analyzing expenditure in the field of roads and transport[2], which includes both road traffic and local public transport, the amount of resources allocated to public transportation can be detected. Moreover not only the attention that municipalities have in regards of the topic but also the margins of intervention for the implementation of government policies of sustainable urban mobility can be consequently detected.

ITEM OF EXPENDITURE	2008	2011	VAR. % 2008-2011
Tot. Traffic and transport	160.259.060	331.959.170	107.14%
Road traffic	63.002.166	238.584.263	278.69%
Public transport	97.256.894	93.374.907	-3.99%

Tab. 1 Current expenditure of Apulian municipalities

Table 1 shows that current expenditure, which is aimed at fulfilling the momentary needs relating to mobility, is more than doubled in the period 2008-2011 but with an unequal distribution in the two sectors of road traffic (+ 279%) and public transport (- 4%). This trend could be a consequence of the relevant operations of maintenance and construction made for the road network or for the establishment of interchange parking and cycle paths. This happened in the city of Bari.

[2] For the analysis the item "functions in the field of roads and transport" of individual municipal budgets have been considered.

It is clear that the relationship between the two areas of spending is highly unbalanced. This relation markedly penalizes the offer of public transport whose effect could be the widespread dependence on private cars. Therefore this trend is confirmed, first of all, by the slight decrease of the public transport demand, which lowered about 1.5% between 2008 and 2010, and, secondly, by the increase of private transport demand by approximately 6% (Table 2).

TRANSPORT DEMAND	2008	2009	2010	VAR. % 2008-2010
Pass-km public transport	1.498.319.537	1.565.710.159	1.479.291.574	-1.27%
Pass-km motorized transport – private vehicles	45.745.587.029	49.852.414.803	48.511.618.008	6.05%

Tab. 2 Transport demand

Moving to capital expenditure, which is important for the development of a safer and more efficient mobility and to implement sustainable mobility policies, a dramatic decline of Apulian municipalities' investments can be seen in Table 3.

ITEM OF EXPENDITURE	2008	2011	VAR. % 2008-2011
Tot. Traffic and transport	206.395.756	149.715.646	-27.46%
Road traffic	204.261.127	149.431.194	-26.84%
Public transport	2.134.629	284.452	-86.67%

Tab. 3 Capital expenditure of Apulian municipalities

It is noticeable that public transport is still the most penalized field with a reduction of approximately 87% (Table 3). This cut on investments could be particularly dangerous and it could hinder the transition process to forms of "clean" mobility in Bari area and, more generally, in Apulia region.
To sum up, it can be said that actions in the field of road traffic, contained in the Implementation Plan of the PRT 2009-2013, have been prioritized in comparison to measures for the enhancement of local public transport. Similarly, the strong programmatic push toward creating intelligent infrastructure for mobility, contained in the Implementation Plan 2015-2019 of the PRT, does not seem to be supported by funds operated by municipalities.

4.2 PLANS AND PROGRAMS FOR THE METROPOLITAN AREA

At metropolitan scale, there are two governance instruments that suggest the main lines of action and intervention for mobility in the metropolitan area of Bari: the Urban Plan for Mobility of the metropolitan area (PUM) and the Sustainable Mobility Programme (PMS).
The specific goals of PUM, approved in 2009, are: the reduction of air polluting, the increase of the safety level of transport, the decrease of energy consumption, the improvement of the accessibility and, finally, the promotion of alternative modes of transport to private car. Furthermore, the main projects for the core of the metropolitan city include new rail transport infrastructures and a modal interchange terminal located next to the Central Station. It will allow modal change to trains, urban and extraurban buses (Papa, Nulli 2010). For those areas which stand outside the core, PUM includes, on one hand, the implementation of the rail transport network, which will enhance accessibility, interconnectivity and multimodality and, on the other hand, the managing measures to integrate schedules, fees and services of supply.

Also PMS, approved in 2009, focuses on rail network, parking and modal interchange, cycle and walk mobility, and, finally, road safety and tariff integration. Yet importantly, PMS indicate goals, related actions, indicators and quantitative targets to achieve in 2015 (Table 4).

GOAL	ACTION	INDICATOR	UNIT OF MEASUREMENT	TARGET
Increase public transport use	MTB Mobility Consortium	Increase of ticket sales	number	30%
	Multimodal station	Decrease of station access time	min.	30%
	Capruzzi Terminal bus	Increase of quality extraurban bus transport	respondent synthetic judgment	50%
	Tram-rail	Increase of rail-served residents in the center of Bari	resident	40%
	Coastal tram	Reduction of passenger cars in coast highways	passenger car	-20%
Ensure sweet mobility	Cycling Network (bike-sharing included)	Increase bicycle paths	km/resident	40%
Reduce car emissions	Car-sharing	Increase of car sharing vehicles	users/veh.	20%
	Transition to hydrogen and electric vehicles	Reduction of high pollution vehicles	vehicles	-20%
Increase quality and traffic safety	Suburban road network	Reduction of travel time	min.	-20%
	Infomobility	Quality of mobility information	respondent synthetic judgment	50%

Tab. 4. Goals, measures, indicators and targets to 2015 – PMS BA2015

Remarkable was the effort made by the municipalities' administrations of the metropolitan area to enhance public transport, in full accordance with the provisions of PUM and PMS. In fact, in Figure 2 it can be seen that supply of public transport by bus, in 2007-2013 time reference, increased of almost 20%.

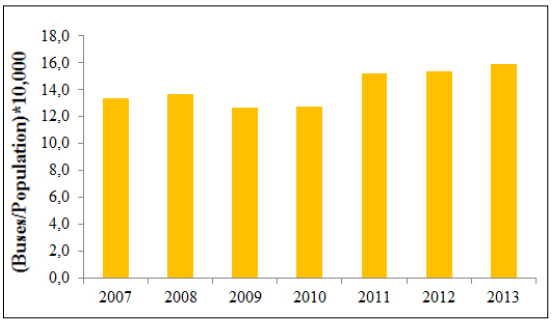

Fig. 2 Supply of public transport by bus

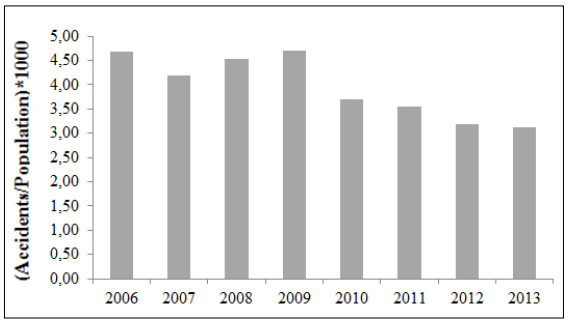

Fig. 3 Index of road accidents

Then we will analyze the trends of some sustainable mobility indicators over the years to evaluate the effectiveness of interventions suggested by plans and programs for the metropolitan area. According to a survey (Testa, 2013), between 2002 and 2013, the rate of motorization decreased by 15%, and in 2011 it is the lowest, after Genoa and Venice, among the 10 Italian metropolitan cities. Moreover Bari is the metropolitan city with the lowest percentage (36%) of ecological cars, followed by Naples (29%) and Reggio Calabria (32%). However, the growing trend of green cars (Figure 4) is probably due more to the replacement of old cars with new ones (Euro 4 or higher) than to the few traffic limitation actions in restricted traffic zones.

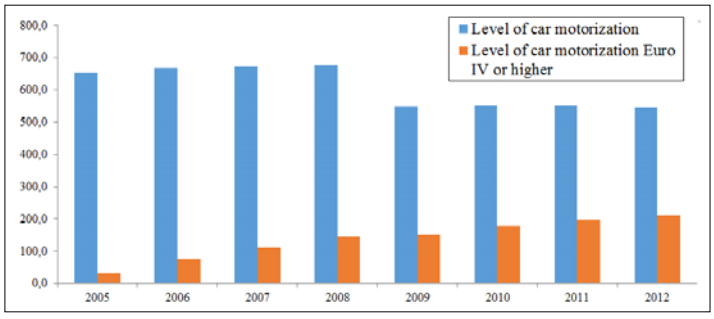

Fig. 4 Comparison between level of motorization and level of motorization Euro 4 or higher

Therefore, car use reduction can have affected on the decrease of road accidents' index; indeed, in the metropolitan area, between 2006 and 2013, accidents have decreased by nearly a third (Figure 3). Therefore, even if the trend towards sustainable mobility is positive there will be satisfactory results only when the planned measures will be implemented.

4.3 SUSTAINABLE MOBILITY MEASURES IN THE CITY OF BARI

Sustainable mobility measures implemented by the City of Bari since 2004 represent a good integration model for public transport and parking policies. This system has gradually reduced car flows within the city by promoting modal interchange (Gargiulo, 2014).

The main measures have been:

- the construction of 4 peripheral "park and ride" lots linked to the city centre by three bus lines served by electric shuttles;
- the implementation of an overall parking system through the development of an integration model which combines public transport and parking policies and the introduction of a parking pricing zones (ZSR);
- the introduction, in 2007, of restricted traffic zones (ZTL) in the city centre;
- the implementation since 2007 of bike sharing service. Today it counts 31 stations installed next to the main attractors.

Furthermore, in 2006 the Municipality of Bari adopted the Environmental Energy Plan; in 2010, the Municipality joined the Covenant of Mayors that entails the implementation of the Plan of Action for Sustainable Energy (PAES). This Plan sets targets to achieve in 2020 in terms of reduction of CO_2 emissions by 30% (328,698 tons CO_2), compared to 2002. The measures planned by the SEAP in the field of urban mobility were in particular:

- the increase of bike-sharing stations (1300 bikes in 2020);
- the expansion of the cycle paths network (90 km in 2020);
- the construction of new "park and ride" lots;
- the implementation of electric car sharing;
- the promotion of walk modes;
- the introduction of Zone 30, in which the vehicle's speed will be limited to 30 km/h;
- the enhancement of rail transport;
- the replacement of municipal vehicles with low-emission vehicles.

In the following part of this section, the evaluation of the effects of measures will be conducted through the construction of a set of control variables, which have been selected in order to understand whether measures have affected, and in which way, the sustainability of mobility. Istat databases (Indicators on urban transport) have been used for the selection of the indicators. Moreover, the time reference considered (2000-2011) is long enough to read the effects of practices on increasing sustainable mobility, particularly in reference to reducing vehicular congestion levels.

In Table 5, data referred to the control variables have been reported. Every column records data by year whilst the three last columns record the percentage variation of three time references:

- 2000-2005, before the implementation of measures, by the city administration, aimed at bringing benefit to circulation and livability of the city;
- 2006-2011, in which effects of technical solutions towards a more sustainable mobility can be registered;
- 2006-2011, in which the total variation is recorded.

CONTROL VARIABLE	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	VAR. % 2000-2005	VAR. % 2006-2011	VAR. % 2000-2011
Public Transport Demand (PT passengers per year per inhabitant)	56.2	57.8	61.1	58.5	57.6	53.5	55.1	64.9	70.0	76.1	79.2	61.5	-4.7	11.8	9.5
Density of bus networks (km per 100 sqm of municipal area)	234	234	234	234	234	234	234	225	238	251	242	242	0.0	3.3	3.3
Availability of buses (vehicles per 10,000 inhabitants)	6.5	6.7	7.1	6.9	5.4	5.2	4.4	5.5	6.6	7.3	7.3	7.3	-20.3	67.5	12.9
Places-km offered by buses (millions)	843	876	883	881	848	912	907	995	1001	1020	1017	1017	8.2	12.2	20.7
Density of bus stops	26.9	26.9	26.9	26.9	26.9	26.9	26.9	27.9	30.0	30.2	26.2	26.2	0.0	-2.4	-2.4
Availability of pedestrian areas (sqm per 100 inhabitants)	9.3	9.5	10.9	10.9	10.7	10.5	10.5	10.6	16.1	16.2	16.2	16.2	13.0	54.0	74.9
Parking lots with fee (for 1000 cars in use)	11.6	11.5	17.8	17.7	16.2	16.1	15.9	15.9	18.7	18.8	35.9	36.0	38.5	126.3	210.4
Density of cycle paths (km per 100 sqm of municipal area)	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	6.5	6.5	6.5	7.5	0.0	59.1	59.1
Level of car motorization (cars per 1.000 inhabitants)	536	556	577	580	555	549	557	561	564	566	566	565	2.4	1.5	5.4
Level of motorcycles' motorization (motorcycles per 1,000 inhabitants)	53.2	61.3	68.8	74.8	76.0	80.9	86.9	92.4	98.0	103.7	106.4	107.3	52.0	23.5	101.6
Vehicular density (vehicles per 1 sqm of municipal areae)	1874	1913	1951	1970	1932	1968	2002	2016	2032	2015	2022	2018	5.0	0.8	7.7

Tab. 5 Summary table of the control variables of sustainable mobility

Table 5 illustrates that in the first time reference, the demand for public transport (number of passengers who used the local public transport) had a decreasing trend (-4.7%), whereas since 2006, after the opening of the first park and ride lot, there was an increase of around + 12% with a peak in 2010. Consequently, also density of bus networks, which went up of +3.3% between 2006 and 2011, has been positively affected by measures, implemented by municipalities, to reduce vehicular congestion of central locations.

Therefore, the trend analysis on the availability of public buses demonstrates the institutional interest in promoting the use of the collective modes of transport carried out since the middle of the first years of 2000 (+ 67.5%); by contrast in the previous years, it scored a sharp decline (-20.3%). It is also clear that public transport supply in the City of Bari, expressed in terms of seat-kilometers, grew up with reference to the bus service, with a restrained pattern in the 2000-2005 time reference (+ 8.2%) and a more significant one in 2006-2011 (+ 12.2%). By contrast, density of bus stops recorded, in the first stage, a steady pattern and then a drop (-2.4%), probably due to the pedestrianization of some areas of the city centre.

Overall, it can be said that the goal of reducing emissions related to vehicle traffic has resulted in a wide range of measures to discourage car use, such as creating pedestrian areas, fixing fees for some parking areas of the city center or designing cycle paths in order to rehabilitate degraded roads and increase the number of systematic travels by bike for commuters.

Furthermore, the introduction of restricted traffic zones (ZTL) and the promotion of walk modes has led to a 54% increase in the availability of pedestrian areas within the City of Bari, between 2006 and 2011. Meanwhile the introduction of parking pricing zones (ZSR) has produced a noticeable increase by 126.3% of the parking areas: the rate of parking spaces per 1,000 inhabitants rose up from about 12 in 2000 to 36 in 2011. Table 5 shows also that the kilometers of urban cycle paths have increased by about 60%, thanks to the implementation of bike sharing service. However, in the city of Bari, the creation of park and ride lots, the introduction of the ZSR and ZTL had no significant effect on reducing the rate of motorization that remains almost constant, registering a slight increase of 2.4% between 2000 and 2005 and of 1.5% between 2006 and 2011. By contrast, a growth in motorcycles per capita can be stated; they grew in the first time reference (+ 52%) and lowered in the second one (+ 23.5%). This may be linked to the introduction of some "green streets" within the urban center, where only mopeds, motorcycles and bicycles are allowed to circulate. Finally, with regard to the vehicular density pattern in the decade analyzed, the

relationship between the vehicles in circulation and the municipal area of Bari records a growth rate of + 5% until 2005 and of +0.8 % in the following five years.

After that, some of the variables analyzed have been standardized, according to the equation:

$$z = x_i = \frac{x - \bar{x}}{\sigma}$$

where $\bar{x}$ and σ are respectively the mean and standard deviation of the considered variable in 2001-2011 time reference.

First of all, by charting the standardized values of demand and supply of public transport in the city of Bari, it can be observed (Figure 5) that since 2000 to 2004, demand is greater than supply; since 2004 the public transport demand decreases until 2005 when it has a continuous and significant rise until 2010. With regard to public transport supply its rate considerably grows between 2004 and 2007, probably due to measures aimed at improving TPL service implemented by the municipality, and reaches a stable value over time since 2007 onwards.

Subsequently, by comparing the trends of the "positive" variables, pedestrian areas and density of cycle paths, with the "negative" one, which is the motorization rate, it can be said (Figure 6) that citizens of Bari since 2004 own substantially less cars than in the previous years and they probably make less use of private modes of transport. Since 2007, when ZTL was introduced and bike sharing was implemented, the amount of pedestrian areas and cycling routes, to be used to move within the city, has changed over time, starting with a medium-low trend until 2007 and having a considerable increase between 2007 and 2008.

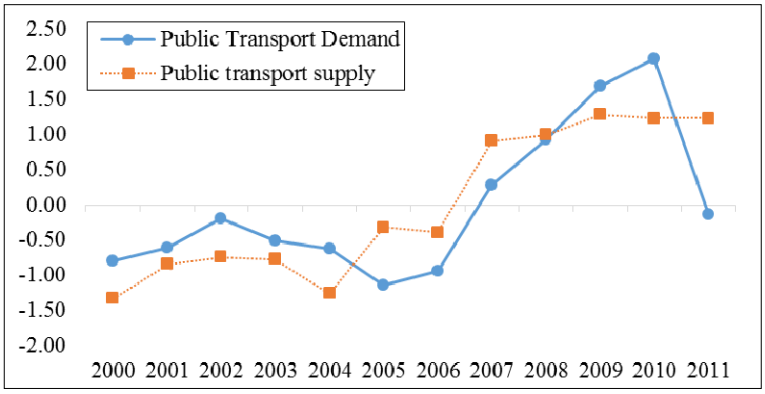

Fig. 5 Comparison between public transport

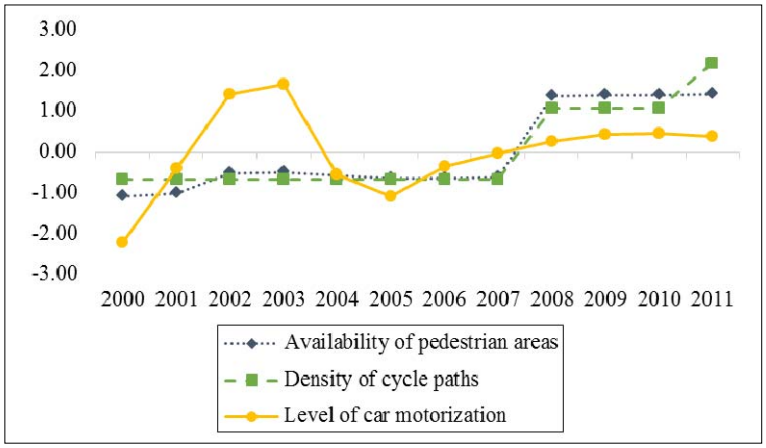

Fig. 6 Comparison between availability of demand and supply pedestrian areas, density of cycle paths and level of car motorization

Finally, by comparing two factors which help to understand some aspects about the evolution of the phenomenon of vehicular congestion, it can be seen that the trend of the supply of parking areas grows in the years 2000-2002, it is stable up to 2009, and, after the introduction of parking pricing zones (ZSR), it records a remarkable increase, between 2009 and 2011. Vehicular density, except for 2004, has a steady but significant rise until 2008, when it begins to decline (Fig. 7).

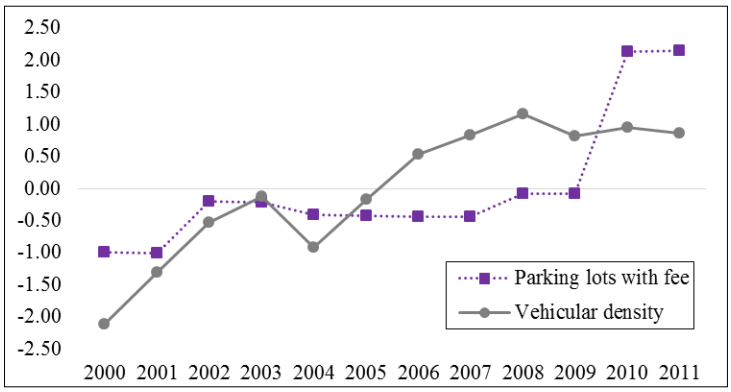

Fig. 7 Comparison between parking lots with fee and level vehicular density

To conclude, Bari instance shows that policies, which provide for measures aimed almost exclusively at implementing an overall parking strategy may promote behavioral changes for citizens, a more efficient use of the entire transport system, the reduction of traffic congestion and the gain of positive results in terms of environmental livability of urban spaces (Papa, De Caro 2009).

4.4 SMART MOBILITY SOLUTIONS IN THE CITY OF BARI

In recent years, the paradigm of sustainable mobility has gradually been linked to the most innovative smart mobility in the international debate. Smart mobility is part of the more general paradigm of Smart City, by which we mean the set of policies, plans and projects that aim at raising the quality of urban life by using ICT and forms of participatory governance (Papa, Niglio 2014). One of sectors of Smart City in which the city of Bari is more active is the Smart Mobility one.

By Smart Mobility (Manville et al., 2014) we mean ICT supported and integrated transport, which is also sustainable, safe, interconnected and multimodal. Smart can be considered a clean mobility, not motorized, supported by real-time information more accessible to users, in order to save time and improve commuting efficiency, save costs and reduce CO_2 emissions.

Moreover, smart mobility is able to give relevant information to the operators of transport networks as well as to users, who might also provide their own real-time data and contribute to long-term planning.

It is estimated that smart mobility technologies can increase energy efficiency by 20% and reduce vehicular congestion by 15% (TTS Italia, 2010).

More concretely, smart mobility solutions, underway and/or planned in Bari area, consist principally in technological innovative products and research projects, promoted by local authorities and municipal companies and implemented thanks to the technical and scientific support provided by local excellence companies. They are:

- SEMINA (Evolved Systems for Intelligent Mobility in Agile Networks), a research project aimed at developing an information system for the management of sustainable mobility in urban areas, provided through web portal, apps for smartphones and tablets, information panels and social network. Thanks to SEMINA, users can monitor the arrival time at the bus stops, technicians may reprogram the service, car users are able to control the traffic situation, municipal police can detect level of congestion and, finally, Mobility Office might manage actual and updated plans for urban mobility;

- Get Easy Bike, an experimental research project dedicated to the development of a new generation of bike sharing that allows a community of cyclists to share bikes, own or collective. By using Get Easy Bike people can move within a given urban area without the constraints (and the costs) generated by the presence of picking and release stations which characterize the traditional systems of bike sharing. Get Easy Bike represents a new model of user generated, virtual and interactive bike sharing. It is based on the balance of three distinct but linked components: technological innovation, mobility analysis and public participation;
- Bari Digital, a mobile ticketing system for public transport which allows to pay parking fees directly from your smartphone;
- Bari Smart, an app that provides a geo-location function, which is useful for orientation and to find the nearest bus stops. It also makes possible to consult timetables and bus lines;
- Project Summit - Sustainable Urban Mobility, a project that aims at creating a network among Apulian and Greek port cities. It also attempts to rise accessibility to urban centers through the introduction of innovative solutions for sustainable mobility;
- CiELo – City-port Eco Logistics, a project that aims at enhancing the accessibility of the city center of Bari, through the introduction of innovative solutions for mobility;
- BariMo, a car sharing service which is still in a pilot stage. It will provide electric, hybrid, LPG and CNG shared cars, available 24 hours a day.

Another important thing that needs to be taken into account is the installation, which has still not been completed, of infrastructures for recharging electric cars which can be used through prepaid cards.

According to the study "Mapping Smart Cities in the EU", published in 2014 (European Parliament's Committee on Industry, Research and Energy) (Manville et al., 2014), evaluating factors that contribute to the successful deployment of smart solutions are:

- a clear *vision* which sets high level principles and ensures measureable targets (*Vision*);
- participation of both relevant stakeholders and citizens. The first one ensures a high degree of coordination, the access to relevant information and the potential to influence processes and decisions on this issue while the second one means more opportunity for people to participate directly (*People*);
- an effective and successful process management of all the phases (information, guidance, practical support, evaluation and measurement of targets) provided for the implementation of solutions (*Process*).

In the following part of this section, we will focus on the described smart solutions to identify the potential or effective success by assigning different emphases, such as strong (+), average (o) and no emphases (-).

SOLUTION	SUCCESS FACTORS		
	VISION	PEOPLE	PROCESS
SEMINA	+	+	+
Get Easy Bike	+	0	+
Bari Digitale	+	+	0
Bari Smart	0	+	0
Progetto Summit	0	+	-
Cielo	0	0	-
Barimo	+	+	+

Tab. 6 Overview of success factors for the smart solutions implemented in Bari

Overall, it can be said that in Bari a business model, which includes the active involvement of citizens and all relevant stakeholders (governments, institutions, researchers, companies, professionals), has been put in place in order to test integrated systems of technologies and innovative methodologies to support smart mobility paradigm.
Although the case studies demonstrate that it is still early days for truly smart solutions, it is clear that some solutions, such as SEMINA, Get Easy Bike, Bari Digitale e BariMo, have considerable potential for success. This may be attributed to clear, shared and well defined objectives. Meanwhile other projects (Bari Smart, Project Summit, CiELo) appear to have less emphasis due to a low level of implementation of single process steps, to the reduced scale of reference, for the lack of financial instruments or to low level of technological and social innovation.

5 SUSTAINABLE URBAN MOBILITY TOWARDS SMART MOBILITY

The review of strategies, programs and measures aimed at improving the sustainable mobility of the case-study area, together with a short report of smart mobility solutions, shows a comforting picture. It is focused on matching the local strategies to European programs.
Regional policies, despite the uncertainty on funding perspectives, consider sustainable mobility as a priority area for measures, to be developed in all the different sectors of the transport system. At the metropolitan scale, the approval of two government instruments for mobility, such as PUM and PMS, has been the starting point for the transformation of Bari metropolitan area towards sustainability. Their first positive effects can be revealed by the analysis of recent years' trends for some relevant mobility indicators. The example of Bari shows how measures, aimed at reorganizing the transport system, may encourage behavioral changes for users, a more efficient use of the whole mobility system, and, finally, a reduction of traffic congestion. Yet it may positively affect both environmental protection and quality of life in urban areas. Moreover, smart solutions show that the use of high-technology devices for traffic control, to implement forms of share mobility and to provide info-mobility and mobile-ticketing, may represent a typical measure. Even though smart solutions have not yet measurable effects, they may trigger behavioral changes towards a smarter mobility.
Response times of "self-organized complex systems", to which contemporary cities may certainly be assimilated, do not allow to make scientifically recognized and above all stable considerations, in a too short time reference as that concerned in this work. However, by a preliminary qualitative and quantitative assessment, we can say that shared and coordinated strategies, as part of a global policy framework, seem to achieve significant improvements towards the sustainability of mobility, especially if they are pursued with determination and without interruption.
Conversely, we cannot say the same about "smart mobility" solutions. In most cases, they represent isolated initiatives, without indispensable scientific and disciplinary quality criteria. They seem to be promoted for "making headlines" rather than to find stable solutions in a coordinated framework of measures linked to programs and/or plans for urban mobility.
Even more worrying is the spread of the use of high-tech devices. They need sophisticated management systems and have operating costs which seem to be not comparable with the ephemeral benefits that they provide for. Undoubtedly, it is difficult to measure the real effectiveness of these solutions, if not in terms of the consensus achieved by the local authorities and in budget increase of sellers companies. However, smart mobility solutions may represent a valid support for sustainable mobility planning strategies only if they are coordinated and integrated with the urban transformation governance. Furthermore, they should be used as instrumental support to "traditional" strategies that so far have been developed and tested in the technical-scientific and professional background.

However, by the results of this work it can be said that the actual positive trends certainly represent a starting point for the next phases of the transition process toward a more sustainable mobility. This process ought to include:

- short, medium and long-term measures within mobility plans, with particular attention to land use-transport integration;
- the monitoring of positive and negative effects of choices in the transportation system on environment, safety, economic development, livability, equity and social acceptance;
- an efficient management of the mobility demand which takes into account change modal shares, in the short and long term;
- the development of policies promoting the use of public transport (Transit Oriented Development)
- the promotion of electric and hybrid cars through, for istance, the realization of preferential lanes and infrastructures for recharging electric cars;
- the use of information technologies, including info-mobility in order to maximize urban road network capacity.

The inclusion and integration of measures, which are already in place or still to be programmed, within general, achievable and assessable projects, may represent a valid response to manage mobility strategic priorities. From this perspective it is certainly desirable to introduce a central technical structure for sharing knowledge and monitoring results that also make an efficient use of European funds (Marletto, 2006; FCF, 2013).

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IMAGE SOURCES

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REVIEW PAGES

CITIES, ENERGY AND BUILT ENVIRONMENT

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

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

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

author: Gennaro Angiello
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05_NEWS & 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
有关土地使用、交通和环境的杂志

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评述页

城市、能源和建築環境

TeMA从城市规划和流动性管理之间的关系入手，将涉及的论题逐步展开，并始终保持科学严谨的态度进行深入分析。在过去两年中，智能城市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 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。因此，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
The web report offers the readers web pages which are directly connected with the issue theme.

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

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

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

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05_NEWS & 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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01

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: WEB RESOURCES

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In this number
TOWARDS ENERGY EFFICIENCY OF BUILT ENVIRONMENT

The world is becoming increasingly urbanized. In 1950, only 30% of the world's population lived in urban areas; currently the proportion is almost 50% and by 2030, it will reach 70%.
Moreover, net population growth of the next few decades will nearly all accrue in the urban centers of developing countries. With urban and industrial development comes growing demands for energy and rising expectations of material goods.
The built environment is where most human activity takes place, where most energy services are used, and where many of the advantages and disadvantages of energy use arise. It includes the buildings in which people live and work, and the spaces and infrastructure in cities, towns, and villages (Wilkinson et al., 2007).
Managing built environment and its complex and interconnected systems requires an understanding of technology, financial planning, and even human behavior to create solutions that conserve resources, reduce energy and waste, save money and satisfy users. Many programs dealing with human behavior are being implemented all over the world in the form of pilots, because they rely on the assumption that humans act rationally and that they are willing to change their consumption habits (Salvati et al., 2013).
Implementing more building efficiency requires overcoming some critical barriers: lack of information and awareness for more efficiency; lack of technical knowledge to evaluate different options; uncertainty about how to measure or understand the energy efficiency performance; an inability to meet financial criteria (return on investment rates) (http://www.wri.org/).
In this issue, three websites are presented; they provide practical resources to help cities succeed with policies, technologies, and innovative investment strategies to deliver better buildings, cleaner air, and more efficient urban development.
The first website analyzed is the Sustainable Facility Tool: an online resource helps users understand and select environmentally preferable solutions for renovations, alterations and leases.
The second website proposed is that of Institute for Building Efficiency (IBE). It provides research on policies, high performance buildings and smart energy systems around the world.
In the end, the third and last website indicated is that of the Center for the Built Environment (CBE) of the University of California, Berkeley. CBE's mission is to improve the design, operation, and environmental quality of buildings by providing timely, unbiased information on building technologies and design techniques.

SUSTAINABLE FACILITIES TOOL
https://sftool.gov/

U.S. government officials and industry executives are under pressure to reduce energy consumption in an effort to save money and preserve the environment. For this reason, the U.S. General Services Administration (GSA) created in 2011 the GSA Sustainable Facilities Tool (SF Tool), a free web-based application that empowers any government or private sector user to identify and prioritize cost-effective green building and procurement strategies to improve environmental performance. The Sustainable Facilities Tool can be used for small projects or for larger remodels. The homepage of Sustainable Facilities Tool website provides an overview of all the opportunities offered by the tool, including green building best practices, guidelines to select sustainable materials, training materials, case studies, references and regulations. Thanks to a clear graphics, homepage takes users straight to the topics that interest them the most. The website consists of six sections: *learn*, *plan*, *explore*, *procure*, *practice*, *share* and by checking out summaries of each section users can start exploring.

Beyond a brief and general presentation about the sustainability topic and building CO2 emissions, the *learn* section offers a list of quick links to learn about the most relevant sustainability topics, from water efficiency to energy management systems. Users can click through annotated legislation, like Executive Order 13653, and understand the impact of policy on sustainability. Moreover, for each topic a related case study is described and the opportunity of sharing examples of successes and struggles is offered to user community. The *plan* section features strategies for building green or turning an existing space into a healthier environment. Users can choose among three groups of strategies: 1) Overall Strategies, 2) Project Types and 3) Plan for the Future. In the first one you can learn key strategies applicable to all planning activities, such as Integrative Design Process and Lifecycle Approach. In the second one, you can review strategies for specific project types through information about sustainable materials, furniture, space reconfiguration projects, building systems upgrades and building operations and maintenance. In the third one, you can learn strategies related to Net Zero Energy and Climate Adaptation topics. Many key references/resources are provided at the bottom of each page. In *explore* section users can explore interior office workspaces and learn about sustainable design best practices by comparing materials. For any room of the office: some green tips and design strategies, the opportunity to compare furniture/Furnishings options and some legal requirements are provided. In this way users can see how their role helps a team reduce costs and increase environmental sustainability. In *procure* section there is a list of all the products and services described into the website and for each of them a fact sheet, reporting the related legal requirements, principals and guidance, is given. The *practice* section features the "Green the Building" game that exposes the complex world of sustainable design, construction, and operations in a succinct and simplified context that allows you to grasp the whole system, learn technical concepts, and try out building strategies in a risk-free environment. It places user in the role of Team Lead, charged with greening buildings through strategic energy, waste, water, and occupant satisfaction improvements given a limited budget. The aim is to encourage moving beyond professional minimum compliance standards towards discovery of actions you can take to improve performance and address challenges.

Finally, the *share* page includes the social content tied to green building best practices. Here users can interact with us on Twitter, Facebook and Pinterest and can discover relevant sustainability news. SF Tool has a very easy to navigate user interface and it is currently being used by facility managers, real estate professionals, project managers from government agencies and private sector developers.

INSTITUTE FOR BUILDING EFFICIENCY
http://www.institutebe.com/

The Institute for Building Efficiency is an initiative of Johnson Controls and World Resources Institute. The first one is a global leader in providing building efficiency solutions while the second one is an excellence research organization in the field of sustainable natural resource management. In October 2014 they joined into a partnership for the launch of a Building Efficiency Initiative.

The goal of IBE is to provide information and analysis of technologies, policies and practices for efficient, high performing buildings and smart energy systems around the world.

Moreover, its aim is to build market awareness and action on:

- local benchmarking and sustainable building certification and labeling approaches;
- innovative financing to support efficiency investments;
- distributed energy systems at the building and community scale.

Seven are the main sections of the website. In *Building Energy Retrofits* users can find more than fifteen articles about energy saving and energy performance contracting. Indeed the IBE comprehensive approach enables building owners to implement whole building retrofits and significantly lower energy consumption and operating costs. Moreover, this section provides also videos, recordings, academic papers, fact sheets and presentations focused on building efficiency.

Energy Efficiency Indicator section is dedicated to a survey about attitudes, priorities and concerns of people at the front lines of energy management in commercial buildings throughout the world. Here the results of the annual Energy Efficiency Indicator (EEI) global studies are presented. The surveys analyze energy efficiency and renewable energy plans, practices and investments among executive-level decision-makers responsible for energy and facility management in buildings.

The third section, *Building Performance Management*, addresses the opportunity to bring people and technology together to improve building performance. Effectively, a number of best practices and case studies to inspire, engage and promote energy efficiency are listed.

In *Smart Grids & Smart Buildings* users can find resources about energy grids, energy districts, intelligent buildings and demand response programs.

The *Clean Energy Finance* section includes many practical reports and documents that investigate the topic of Property Assessed Clean Energy (PACE) financing as a tool to add value to commercial buildings, in rental premiums, higher occupancy and lower operating cost.

Energy & Climate Policy section represents an important source of articles about three interlinked policy approaches: 1) energy policy that favors energy efficiency and distributed renewable energy sources, 2) climate policy that recognizes and internalizes the cost of carbon pollution; and 3) standards and performance criteria for the building envelope and the building components.

The last section of the website offers a series of issue briefs on net zero energy buildings covering definitions and case studies, opportunity and drivers, net zero for existing buildings, and net zero communities. Furthermore, some reports underline the benefits of building efficiency renovation projects on real market traction, particularly for Europe's economy recover.

In general, a collection of key resources and tools from a variety of sources can be found in IBE website. These videos, issue briefs, presentations, and tools shine the spotlight on need-to-know issues, provide big-picture perspective, and offer advice on how to develop winning strategies for establishing clean energy building systems and cutting carbon emissions.

CENTER FOR THE BUILT ENVIRONMENT
http://www.cbe.berkeley.edu/

The Center for the Built Environment was founded in 1997 under the National Science Foundation (NSF) Industry/University Cooperative Research Center (I/UCRC) program. Their mission is to improve the environmental quality and energy efficiency of buildings by providing timely, unbiased information on building technologies and design and operation techniques. Two are the broad program areas:

- tools for improving building performance, designed to serve those who manage buildings, as well as assist those who plan and design buildings;
- new technologies that make buildings more environmentally friendly, more productive to work in, and more economical to operate. These technologies are designed to help develop and target new product offerings, and allow facility management and designers to select and apply state of the art technologies effectively.

Both program areas are supported by fundamental research into human physiology, indoor airflow, thermal performance of building systems, and an extensive occupant-survey program. They participate in standards and guides for ASHRAE and USGBC in order to remove barriers to effective building technologies, and to speed their implementation. They also develop software for design, operation, and research.

CBE website has four main sections: *About us*; *Research*; *Membership*; *What's new*. But in the homepage users can get also quick links to some relevant information such as their industry partners, research staff, research portfolio, publications and membership information. Moreover, a guided browsing based on the user's profile (prospective partners, prospective students, visiting scholars, job seekers) is available. In *About us* section primary objectives and organizational structure are described. *Research* section shows an overview of research programs divided into five general topics: indoor environmental quality (IEQ), building HVAC systems, building envelope systems, human interactions, sustainability, whole building energy, and other topics. For each general topic you can get a link to a page including a list of all the research projects related to the topic. Hence, by picking one of the research project titles you will find a summary page in which the objective, the significance to industry, the research approach, the related publications and some project resources, such as the status of implementation, the funding sources and the primary contacts, are provided. In this collection there are 372 publications, published between 1980 and 2015. In *Membership* section you will find information on how you can get involved with CBE. *What's new* section includes up to date events about like new joint CBE partners, news about recently awarded grants and about the periodical issue of "centerline", the CBE semi-annual magazine focused on their research activity. The Center aims at being a place where a holistic and far-sighted research on buildings is addressed.

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IMAGE SOURCES

The images are from: https://sftool.gov/; http://www.institutebe.com/; http://www.cbe.berkeley.edu/.

02

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: BOOKS

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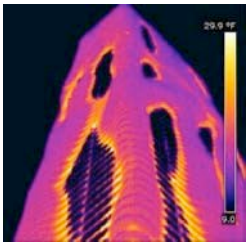


In this number

ENERGY EFFICIENCY AND LOW CARBON TECHNOLOGIES

The crisis of urban unlimited growth, that characterized the societies in the last two centuries, has forced to reconsider also the model of development based on a strong dependence of the use of fossil fuels. This cultural evolution has been an important aspect at the base of the new concept of "smart city". For the European States, this new model has been introduced also through the legislative and programmatic actions of the European authority, that defined the new terms for the access at the funding from 2015 to 2020 (EC, 2011). So EU puts at the center of European policies the "smart city" with actions to improve the urban environment and reduce the energy consumption (Gargiulo et al., 2013).

This focus on cities is certainly due to the awareness that large urban areas are complex organisms with a high degree of entropy. Therefore, the urban areas are among the most responsible for the greenhouse effect, or the warming of the atmosphere, caused by the excessive release of the carbon dioxide (EP, 2011). The first results of these initiatives have been the competition between cities for nomination as Smart City, with membership of the Covenant of Mayors that sustains and supports the efforts of the local authorities of the European Union, and the subsequent drafting and implementation of the Action Plans Sustainable Energy (PAES), tools with which the city defines the goals of reducing emissions and how to reach them (Barresi and Pultrone, 2013). The energy efficiency presents a huge growth potential, but its characteristics and the market structure require the introduction of new business models – together with adequate policies and the development of new skills and competences – in order to achieve the impending targets.

The buildings was characterized by continuous growth of energy consumption in past decades. They account for about 40% of total final energy consumption and around 55% of electricity consumption in the EU-28 in 2012. The buildings are the largest end-use sector, followed by transport (32%), industry (26%) and agriculture (2%).

For this reason there are interesting opportunities to improve energy use and control demand. Despite this, several barriers have played a part in delaying the dissemination of energy-efficiency measures: the lack of resources for public buildings, the relatively low energy expenses in the services sector (if compared with total expenses), the minimal awareness and knowledge of the problem in the residential sector and in general. According to these brief considerations, this section proposes three documents that help to better understand the issue of this number: The Guidelines for the government of urban transformation and reducing energy consumption; The Energy Efficiency Trends and Policies in the Household and Tertiary Sectors; The Energy Efficiency in the building sector: skills, business models and public private partnerships.

Title: Governo delle trasformazioni urbane e riduzione dei consumi energetici
Linee Guida
Author/editor: Giovanni Dispoto, Carmela Gargiulo
Publisher: CLEAN Edizioni
Download: http://smartenergymaster.unina.it/disseminazione/disseminazione/strumenti/linee-guida/download-linee-guida/
Publication year: 2015
ISBN code: 978-88-8497-523-2

The Smart Energy Master (SEM) Project for the energy management of the territory funded within the integrated action for sustainable development "Energy Efficiency and Low Carbon Technologies" PON the Smart Cities and Communities 04a2_E proposes best practices and governance solutions oriented towards energy savings that connect the characteristics of the city, the activities that take place and the behavior of the inhabitants. Among the main results of the project: the definition and dissemination of guidelines for the reduction of energy consumption by adapting behaviors of the different categories of users and improve efficiency energy efficiency of public facilities, infrastructure and networks of the city.

In this volume are collected the best practices of some European cities that are implementing projects on "smart building", sustainable mobility and smart grids with considerable EU and national funding. To make a city "smart", it means organizing through a coordinated set of interventions. That aim to make them more sustainable in terms of energy and environmental efficiency, the services offered to citizens.

These guidelines aimed to reduce energy consumption, contain the leanings and action criteria, to improve both the legal and technical instruments, at national and regional level, and the administrative and regulatory instruments, at the urban scale and/or neighbourhood.

The Guidelines identify a number of "leanings" that are particularly significant for sustainable urban planning at various levels (urban scale and / or neighbourhood) and the correct application of which the instruments of government of land use. That can increase the integration between the urban planning and the energy planning, through the introduction of energy aspects in the urban planning tools and the urban planning aspects in the energy instruments.

The "leanings" are divided into "action criteria", which starting from the general address, allow to apply concrete actions for reducing energy consumption, at different planning tools. For every "action criteria" is proposed a table, identified by an ID, which illustrates for each action criteria the possible measures that can be implemented at the different reference scales.

The collection and analysis of case studies, consisting in experience of planning and design made in Europe and ascribed to the category of so-called smart city. These case studies formed the starting point to define leanings and action criteria useful for preparing Guidelines. These are examples of the urban sustainability of the best practices, expression of the urban culture and territorial government, are aware of the limited natural resources of the planet.

To help the reading and understanding of the terms used, there is a synthetic glossary. It's useful to explore some issues if the user deems it necessary, complete the guidelines constitute an additional tool facilitating.

The guidelines may be used, for example, to help the technical designers in the selection at the reference scale of the design and the type of planning instrument to improve the energy efficiency. The technical can find a range of predefined leanings, easy to read, calibrated relative to the scale and type of instrument considered.

Thanks to the identification of leanings and action criteria, was built a matrix based on the instrumentation and technical regulations in force at national and regional level. So to frame and report the addresses and criteria defined in relation to instruments of government land at different scales. The matrix shows the scale of reference, the instrument of government of urban transformation in question, the guidelines and the action criteria concerned instrument.

Title: Energy Efficiency Trends and Policies in the Household and Tertiary Sectors
Author/editor: ODYSSEE-MURE project
Publisher: EU
Download: http://www.odyssee-mure.eu/publications/br/energy-efficiency-in-buildings.html
Publication year: 2015
ISBN code: n.d.

This study analyses energy efficiency in the household and tertiary sectors. The report summarises recent policies implemented to promote energy efficiency and renewable energy in buildings and pinpoints the most successful measures. The EU Member States have submitted their third National Energy Efficiency Action Plans (NEEAPs) in April 2014 and measures reported in them discussed.

The report analyses the trends since 2000 in energy use and energy efficiency and the use of renewable energy in buildings based on ODYSSEE data, with a separate analysis for residential buildings and non-residential buildings.

The ODYSSEE database contains data on energy efficiency indicators, energy consumption, activity indicators and energy-related CO2 emissions. It includes the following types of indicators in buildings: Specific energy consumption; Energy efficiency index to evaluate energy efficiency progress at sector level; Energy savings measuring the energy saved through energy efficiency improvements; Adjusted indicators to improve the comparisons of indicators across countries; Diffusion indicators to monitor the market penetration of energy-efficient technologies. Currently, energy efficiency data are available from the year 1990 to 2012.

This report analyses the theme of renewable energy in buildings. In particular, the Renewable Energy Directive establishes numerous requirements concerning the use of renewable energy buildings. However, there is still a need for national initiatives to promote local energy production and to remove the barriers to their large diffusion, which remain considerable.

In addition, to renewable energy policy, the report discusses some other specific themes such as behavioural change of consumers, the role of the public sector, city planning and co-benefits of energy efficiency and renewable energy. Some other policies and measures touched upon, but not with such a specific focus, are the use of smart meters and feedback programmes and resilience policies.

Consumer behaviour and measures addressing it get special attention. In addition to the traditional campaigns and energy advice, new energy services are empowering consumers.

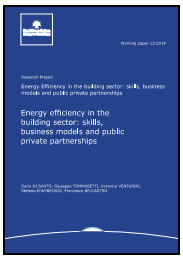
The exemplary role of the public sector receives some extra focus in the report. Its role is underpinned by EU legislation but there are also various voluntary measures and networks supporting sustainable development, particularly in the municipalities.

Good spatial planning is in the foundation of sustainability, including energy efficiency and use of renewable energies. This is also linked to growing digitalization, which, however, is not yet very visible in the measures loaded to the MURE (Mesures d'Utilisation Rationnelle de l'Energie) database.

The MURE database provides information on energy efficiency policies and measures that have been carried out in the EU Member States. The database is structured by end-use sector (household, tertiary, transport, industry) and allows browsing energy efficiency measures by sector. The database also contains information on general energy efficiency programmes and on general cross-cutting measures.

Recently, the co-benefits of energy efficiency have raised increasing attention, partly driven by recent work by the International Energy Agency on multiple benefits. The energy efficiency and renewable energy measures in the MURE database have been scanned for direct references to co-benefits.

In the report are collected many case studies from various countries are given based on information from the MURE database.



Title: Energy Efficiency in the building sector: skills,business models and public private partnerships
Author/editor: Dario Di Santo, Giuseppe Tommasetti, Veronica Venturini, Stefano D'ambrosio and Francesco Belcastro
Publisher: Enel Foundation Working
Download: http://www.enel.com/it-IT/enel_foundation/library/working_papers/2014
Publication year: 2014
ISSN code: 2282-7412

The Enel Foundation periodically publishes reports, working papers and articles with the objective to exploit and disseminate the results of own research projects.
This working paper is the 13th of the 2014 and was published with the support of Italian Federation for the Rational use of Energy (FIRE).
The FIRE, in recent years, has collaborated with most associations that bear interest in energy efficiency at the Italian level and has conducted numerous studies regarding end-use energy efficiency, including incentive policies, existing barriers, the building sector, ESCOs, and third- party financing.
This study has aims to analyse innovative solutions, business models, and public support to promote energy efficiency in the public building sector, linking up with the development of an industrial policy in line with the Green Growth Strategy, also through the development of the energy service company model. In particular, the analyses concentrates on the Italian situation and is presented as a study structured in ten chapters, gathering interesting suggestions and solutions, even from major European countries.
The degree of integration of available technologies, the skills asked for and the skills necessary to manage this integration, and the interaction between the various players and the public and private parties concerned. The financial, administrative and legal barriers that are obstacles to the massive dissemination of efficient construction-industry technologies on a larger scale, and that impede an integrated and holistic approach. The actual implementation of innovative and successful business models to improve energy efficiency in the public building.
Based on experiences and analyses acquired from the above activities, the study proposes a series of recommendations for political decision makers and certain market operators, also suggesting possible solutions to accelerate and simplify the existing dynamics. The study also illustrates the best experiences and best practices with the public and private parties concerned and sets out to provide solutions to promote networking, associations, and partnerships for energy efficiency among the parties concerned n the building sector.

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03

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: LAWS

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In this issue

EUROPEAN AND ITALIAN STRATEGY FOR ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT

Two possible solutions can effectively make the use of energy more sustainable: saving energy or using it more efficiently. Both solutions can be developed in the three economic sectors – buildings, transportation, industry – in order to achieve positive results, but the buildings sector, which is the largest end-use energy consumer in the industrialized countries (IEA, 2010), has the highest potentials for energy savings (Fig. 2).
Some data can help illustrating the phenomenon: the primary energy consumption of buildings on the global scale is almost 19 millions barrels of oil per day as much as the total OPEC production for a day (Santamouris, 2011) and 21% of greenhouse gas emissions come from this sector. The European Commission has calculated that by improving the energy efficiency of buildings it is possible to reduce total EU energy consumption by 5% to 6% and lower CO_2 emission by about 5%, as well as decreasing gas imports by 2.6% for every 1% improvement in energy efficiency.
For these reasons, in the last ten years, the European Commission has focus its attention on this issue and has promoted the reduction of energy consumption of buildings by adopting two fundamental Directives: the 2010 Energy Performance of Buildings Directive (2010/31/EU) and the 2012 Energy Efficiency Directive (2012/27/EU). These two documents are described in the following pages, together with the description of the Italian adoption texts. Indeed, each EU country has implemented the two Directives based on its social, economic and geographical context.

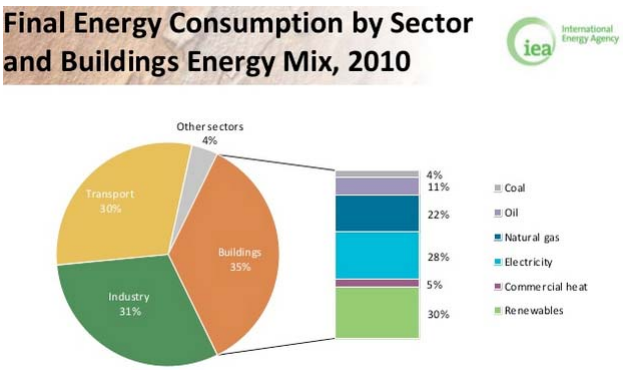


Fig. 2 Final Energy Consumption by sector (IEA, 2010)

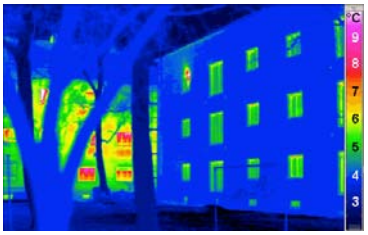
Moreover, the EU Commission has introduced several practical support initiatives – Concerted Action EPDB, BUILD UP Skills, BUILD UP Portal – in order to help EU Member States properly adopt both Directives. These policies aim to achieve the energy efficiency targets the EU has set itself for 2020 (-20%) and 2030 (-27%). Although last year it was calculated that the EU will miss the 2020 target by 1-2%, the implementation of all the measures contained in the legislation on energy efficiency could guarantee the achievement of these goals without additional actions.

The European commitment has already generated several important advantages in the last decades (www.ec.europa.eu/energy):

- the energy consumption of new buildings has decreased by about 50% compared to the 80s;
- in 1995 the number of A classes and above refrigerators was lower than 5%, while in 2010 was higher than 90%;
- EU countries have committed themselves to rolling out close to 200 million smart meters for electricity and 45 million for gas by 2020, leading to greater substantial benefits for consumers.

The great efforts all European Member States are making in order to develop a more sustainable urban environment represent an important commitment towards future generations because they have positive impacts on the ability of the urban system to adapt to climate change (Galderisi, 2012), and at the same time, they also represent an opportunity of economic growth: by investing in energy efficiency, indeed, it is possible to provide business opportunities for constructions firms and manufacturers of energy-using equipment, as well as encourage the creation of new jobs in several sectors that invest in energy efficiency.

In this context, Italy is doing its best even though it is lagging behind the best performing countries.



NEARLY-ZERO ENERGY BUILDINGS – EUROPEAN AND ITALIAN FRAMEWORK

The promotion of energy efficiency in the built environment represents one of the most important key strategies the EU Agenda is promoting because of the saving opportunities achievable in this sector as it accounts for a great amount of energy consumption.

Both existing and new buildings are the priorities of 2010/31/EU Directive, which "promotes the improvement of the energy performance of buildings within the Union, taking into account outdoor climatic and local conditions, as well as indoor climate requirement and cost-effectiveness".

According to 2010/31/EU Directive, all new public body's buildings have to be nearly zero-energy buildings (NZEB) by 31 December 2018, as well as all new buildings have to be NZEB by 31 December 2020. The definition of zero-energy buildings is provided within Article n.2: "nearly zero-energy buildings means a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby".

Furthermore, the Directive has also introduced the energy performance certificate (EPC) – "a certificate recognised by a Member State or by a legal person designed by it, which indicates the energy performance of a building or building unit" – that must be included in all advertisements for selling or renting a building unit, and the *cost-optimal methodology* for calculating the minimum energy performance requirement for new buildings, the major renovation of buildings and for the replacement or retrofit of building elements. This calculation takes into account the benefits and costs of energy efficiency initiatives during the building's

expected life-cycle with the goal of stressing the importance of balancing the investment involved and the energy costs saved.

At national level, EU Member States have transposed and implemented the Directive based on their specific context. In Italy, 2010/31/EU has been adopted with 2013/90 Law that sets the new criteria for achieving the EU targets in a nearly energy-zero building perspective. The very high number of buildings in Italy – more than thirteen millions, 51.000 of which school buildings – certifies the importance of investing in the efficiency of this sector (Mazzeo, 2014), which accounts for more than 36% of national energy demand and in recent years it has recorded a constant increase in consumption, as reported by the National Energy Balance 2011.

In numbers, Italy's goal is to save 20 Mtep of primary energy and 15 Mtep of final energy per year by 2020, with a reduction of CO_2 emissions of 55 million tonnes.

These ambitious targets can represent a profit-making opportunities for both the country and individual consumers because the promotion of energy efficiency can positively affect production and employment and it can be a driver of innovation and research in the medium and long term, which in turn has a positive impact on growth.

COM(2012) 27 – DIRECTIVE 2012/27/EU FOR ENERGY EFFICIENCY AND THE ITALIAN ADOPTION

The 2012/27/EU Directive has established a common framework of measures for the promotion of energy efficiency within the EU in order to achieve the 20% energy efficiency target in 2020 and to inspire further energy efficiency improvements beyond that date.

Although the EU Directive emphasizes the critical role of the public bodies' buildings, which can represent the leading factor to encourage the transformation towards more efficient constructions, also the private sectors – industry and services – have been included within the actions provided for by Directive 2012/27.

These leanings significantly emerge also in the Italian adoption Decree, adopted in 2014, which has introduced important innovations, especially regarding the government's buildings sector. Strategies for the renovation of national public administration's building stocks have been developed, in agreement with the EU Directive which states that "each Member State shall ensure that, as from 1 January 2014, 3 % of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements that it has set in application of Article 4 of Directive 2010/31/EU". The Ministry of Economic Development has signed a memorandum of understanding with the State Property Agency whose first objective will be the drafting of an inventory of buildings occupied by the central government, including floor area and energy data, a key step towards developing a comprehensive strategy for the upgrading of public buildings.

Moreover, the restriction for public bodies to purchase products and services with high energy efficiency standard has been consolidated.

The main measure regarding the industrial sector establishes that, as from 5 December 2015, large corporations and energy intensive businesses will be obliged to regularly carry out energy audits, which are useful for identifying the most effective interventions to reduce energy consumption. Moreover, in order to promote the development of energy efficiency projects based on the results of those audits, the Decree includes a further strengthening of the role of *white certificates*, also known as "Energy Efficiency

Securities", which certify the achievement of end-use energy saving through energy efficiency improvements initiatives and projects. Companies wishing to build new plants for the production of electricity or thermal energy, with power exceeding 20 MW, as well as new district heating grids, will have to perform a cost benefit analysis. At the same time, an analysis on the national territory to choose the best areas for the development of district heating will be carried out in order to better invest and simplify authorization procedures. Amongst the tools promoted by the EU Directive and also adopted by the Italian government, the "National Fund for Energy Efficiency" is one of the most innovative; it represents an important financial support system for the rehabilitation of public bodies' buildings and for the reduction of energy consumption in industry and services. A specific section of the Fund will support investment in district heating and cooling. The Italian Fund will be supplied with approximately 70 million euro per year in the period 2014-2020.

Further actions have been formulated in favor of energy end-users to raise their awareness of energy consumption through the promotion of individual measurement systems and more accurate billing, based on real consumption.

New important standards for the dissemination of information, as well as for the training of companies, public administrations, citizens and students have also been introduced by the Decree: a three-year program for training and information will be launched soon, counting on a sum up to one million euro per year.

The total financial resources for the implementation of the measures amount to over 800 million euro.

The 2012/27/EU Directive and its Italian adoption Decree formalize the exemplary role of energy efficiency to face a great number of challenges our planet has to deal with, such as the reduction of greenhouse gas emissions, the consequences of climate change, the need to boost economic growth and create new jobs. In this context, the construction industry represents a critical area of interest, especially that of public bodies'.

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Fig. 2: http://www.slideshare.net/internationalenergyagency/webinar-27-june-2013-launch-event-final
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04

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: URBAN PRACTICES

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In this number

SUSTAINABLE ENERGY ACTION PLANS: THREE CASE STUDIES

The challenges imposed by the changing climate and the energy-driven development have been traditionally addressed from international and national initiatives such as the United Nations Framework Convention on Climate Change and the Kyoto Protocol. However, in the last decade, there has been a considerable effort to reframe this debate towards the local scale and focus on local causes of climate change and local strategies to reduce C02 emission and energy consumption.

Indeed, since the growing recognition of the contribution of municipal areas to global environmental change (Santamouris, 2013), important initiatives and programs for the reallocation of planning actions from the global to the local scale took place, following the principle of "think globally and act locally" highlighted by the Agenda 21, the Global Action Plan for Sustainable Development for the 21st Century.

In the EU, the Covenant of Mayors represents the most important initiative in this direction. It is the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and the use of renewable energy sources on their territories in order to reduce C02 emission and contribute to the achievement of energy and climate targets set at the European scale. By signing the Covenant of Mayors, local authorities engage to reach - or even exceed - the EU 20% CO2 reduction objective. Covenant of Mayors Signatories pledge to submit a Sustainable Energy Action Plan (SEAP) outlining how they will reach their targets.

The Covenant of Mayors now includes 6.450 signatory cities, which benefit from the help of numerous Covenant Coordinators, Supporters and Associated Partners. Through SEAPs cities can implement measures in a structured and integrated way, allowing them to systematically monitor their efforts in going beyond national legislation in these fields. A SEAP is also an instrument for cities to communicate to stakeholders – both locally and beyond – the importance of energy and climate protection, and to encourage citizens and other relevant actors to take a part in the city's ambitions.

In this section, I analyze three relevant case studies of European cities that has recently (2015) submit a SEAP to the European Commission's Joint Research Centre:

- Gent, Belgium ;
- Glasgow, United Kingdom;
- Gothenburg, Sweden.

GENT

Gent, the capital of the East Flanders province, is the second largest municipality of Belgium with an urban population of approximately 250,000 inhabitants. With the country's highest share of young people and a strong presence of institutions for higher education, Ghent is an important centre of knowledge and innovation.

In January 2009, the city of Gent was the first Flemish city to sign the Covenant of Mayors. With it, the city committed to a reduction of local CO2 emissions by 20 percent by 2020 compared to 2007. This commitment was in line with the Belgian National Climate Strategy aimed to reduce national greenhouse gas emissions by 15 percent by 2020 (compared to 2005) and to achieve a share of energy from renewable sources of 13 percent. In 2014, when about half of this reduction was already accomplished, the city adopted a new Climate Plan. The plan contains actions intended to help achieve the remaining 10% of CO2 reduction by 2019 while establishing a roadmap towards carbon neutrality in 2050. This document has been submitted to European Commission as the city' SEAP in 2014 and approved by the EU Covenant of Mayor one year later. Actions in the Climate Plan are organized around five main themes.

Residential sector. Energy consumption in Gent households accounts for about 25 percent of total CO2 emissions. As for the majority of Belgian municipalities, the exiting residential buildings stock in Gent is relatively energy inefficient, especially if compared with that in neighbourhood countries. At the same time the refurbishment rate of existing residential building is currently very slow. In order to fulfil the climate target, the plan supports energy-saving refurbishments through several actions including awareness raising, incentives for energy-saving projects, knowledge building, and good examples. According to the plan, Gent inhabitants can benefit of a wide range of tools such as on-line tailored support for drawing up energy-efficiency assessments, finding and contacting contractors or comparing quotations. Furthermore, depending on income, they may have access to a range of premiums up to 1,500 or 2,500 Euros for energy-efficient refurbishments. For the new buildings, the city will provide additionally incentive for energy efficiency, beyond those provided by The Flemish government. Finally, as the owner of many terrains and promoter of social-housing projects, the City will impose loftier ambitions relating to energy performance and renewable energy.

Role Model. The initiatives that fall within this theme are mainly target to reduce energy consumption of municipal-owned buildings, public lighting, sport infrastructure, city employee's commuting and city's vehicle fleet. To this aim, an energy performance contract will be concluded with an Energy Saving Company for a number of city buildings, public lighting and sport infrastructures. Finally, the city will draw up a sustainable company transportation plan for its employee while the whole municipal vehicle fleet will be gradually replaced by electric vehicles.

Service sector. The City of Ghent wishes to accelerate green economic growth in the city by increasing the share of sustainable entrepreneurs who handle energy efficiently. In this context, the City of Ghent will create a local framework to structurally anchor sustainability in the companies' operation in order to gives entrepreneurs the necessary legal security and incentives to handle energy rationally.

Renewable Energy. In addition to a reduction in the demand for energy, the city intend to achieve its climate objectives trough sustainable energy production. In this sense, the plan support several actions aimed to achieve a 15% of (green) domestic energy production in 2019. Action in this theme are target to new wind turbines, developing a district heating strategy, pushing urban development projects towards climate

neutrality, raise awareness among citizens and companies and support them in their investments in renewable energy.

Mobility. Mobility is responsible for about the 30 percent of total C02 emission. In order to reduce the environmental footprint of mobility the city is working on the following strategies: ensuring proximity, lowering the number of required kilometres, enhancing steps, stairs, and public transportation, and greening modes of transportation.

GLASGOW

Glasgow is the largest city in Scotland, and the third largest in the United Kingdom. It has a total urban population of 1,750,000. The city has experienced economic growth and development in recent years, bolstered by careful planning, a growing and young population and a business growth in high-tech, service and export orientated manufacturing sectors.

In 2015, the City Council approved the Energy & Carbon Masterplan (ECM). This plan is an enhanced SEAP for Glasgow which builds on the first SEAP produced by Glasgow City Council and approved by the EU Covenant of Mayors in November 2010. The ECM provides a single, coordinated strategy and plan of actions and projects across the city to meet a target of reducing Glasgow's C02 emissions by 30 percent by 2020 from 2006 levels. The plan contributes to the objectives defined in the Scottish Climate Act aimed to reduce Scottish greenhouse gas emissions by 42 percent by 2020 (compared to 1990). The ECM also sets out a vision of a transformed energy economy for Glasgow that is based on low carbon and increasingly decentralized energy sources that are better able to meet Glasgow's energy needs and help Glasgow tackle climate change. The plan contains a panel of actions grouped around four main themes..

Buildings. The initiatives that fall within this theme are target to both private and municipality-owned buildings. In this regards, strictly energy standards, based on the LEED rating system (www.usgbc.org), have been set, differentiated according to building use and ownership. For the municipal properties, internal energy audits will be conducted in order to identify those that will benefit most from energy efficiency measures and projects. For private properties, the coordination and enhancement of existing energy schemes will be target to improve energy efficiency and reduce energy consumption and fuel poverty in social housing.

Transport. Action in this domain are target to encourage a reduction in personal motorized transport and an increase in the use of public transport, walking, and cycling. In order to meet these objectives, the plan supports the formation of Quality Partnerships with bus and train operators and with regional authorities. These partnerships are target to make public transport provision more efficient in terms of operational costs and more attractive for citizens, in particular for car users. Furthermore, in order to encourage active travel Glasgow City Council is increasing provision of cycling infrastructures.

Local Energy Production. Given the small amount of local electricity generation in Glasgow, promoting decentralised generation is a key issue in the city plan. The four generators currently operational in and around the Glasgow city boundary only account for a minor part of the total energy supply. Furthermore only wind and solar energy production has been developed so far. Thus, the plan recognizes the need to increase renewable energy production and diversify the sources of energy supply. For this reason, the plan contains a panel of measures aimed at promoting local production of renewable electricity through city-led

projects that bring a return on investment. Beyond this city-led initiatives, also bottom-up approaches are encouraged. In particular, the city promotes local production of renewable electricity through community-based projects.

Local Heat/Cold Production. The provision of district heating is another key policy issue. In this regard, the plan contains actions that promote the installation of district heating infrastructure, targeted at areas of fuel poverty. These projects will be carried out in tandem with building renovations allowing for improvements in energy efficiency to be achieved at the same time.

GOTHENBURG

Gothenburg is the second-largest city in Sweden and the fifth-largest in the Nordic countries. It has a total urban population of 543,045. Due to the Gothenburg's advantageous location in the centre of Scandinavia, industry, trade and shipping have always played a major role in the city's economy.

In January 2014, the City Council approved the Strategic Climate Programme. With it, the city committed to a reduction of local CO2 emissions by 21 percent through to 2020, using 1990 as the base year. The plan contributes to the objectives defined in the Swedish Climate Strategy aimed to reduce Swedish greenhouse gas emissions by 20 percent by 2020 (compared to 2008). The Climate Programme embodies Gothenburg's long-term climate work, which includes not only the municipal organisation but also industry and the people of the city. It also establishes a roadmap towards carbon neutrality in 2050. The actions contained in the plan are grouped in four main themes.

Climate Smart Citizen. The initiatives that fall within this theme are aimed to support citizens to reduce their climate impact through a change in social behaviour and greater awareness. To this aim, the plan provides a set of tool including energy and climate advices to private individuals, organisations and small and medium-sized enterprises; campaigns, events and communication with various target groups and contribute and technical assistance.

Resource-Efficient Urban Planning. The basic idea behind this strategy is the creation of a resource-efficient social structure through densification and planning for more people in the same area and with a reduced need for transport. The location of new construction and new infrastructure will be oriented in a way to make it easier and obvious to walk, cycle or use public transport. Finally, by creating conditions for efficient forms of energy and promoting energy-efficient construction, the urban planning will have a strong contribution in the optimization of the energy supply system.

Efficient Energy Use and Conversion to Renewables. Actions grouped in this theme are aimed at increasing resource efficiency in district heating This strategy can be implemented in a variety of ways, including the creation of new district heating sources by means of a comprehensive, efficient and regionally optimised district heating system, utilising more surplus heat and adapting the grid to achieve as much residual heat as possible. In this theme also fall those strategies aimed at improving the energy efficiency of Gothenburg's privately owned and municipal-owned property holdings. Other actions include the promotion of energy efficiency in industry.

Reduced Climate Stress from Travel and Transport. Gothenburg is also a transport-intensive metropolitan area and is facing major challenges to reduce greenhouse gas emissions resulting from transport. The plan provides a complete set of measure to be implemented in order to invert this trend. They include: prioritise and invest in the travel modes walking, cycling and public transport, working towards a more energy-

efficient vehicle fleet and promote the use of fuels with low climate impact, becoming a world leader in climate-smart cargo handling, encourage shipping that is energy efficient and fossil free.

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05

CITIES, ENERGY AND BUILT ENVIRONMENT

REVIEW PAGES: NEWS AND EVENTS

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In this number

SUSTAINABLE BUILD ENVIRONMENT: THE RISK OF TOWN CRAMMING

A large share (40%) of European CO_2 emissions are produced in order to heat and service buildings. Even though newly built homes and buildings are achieving increasingly high levels of energy standards, many older and historical buildings do not yet meet modern energy requirements. If we consider that today the new buildings represent a small fraction compared to the totality of the building interventions (less than 1%), it is therefore clear that only a common intervention on the existing could guarantee the possibility of having, on a large scale, significant results in relation to the control of energy consumption. However, in these economically tumultuous times, it is not always easy for cities to face with this challenge; they are actively looking for effective, efficient and proactive new solutions and methods that can help them improve the energy performance of their building stock.

In this context, one of the main topic is that related to the management of energy and environmental resources in urban centers characterized by a growing densification; it is the phenomenon common to many centers of contemporary cities: the town cramming. A building density, mismanaged, can have a negative impact on the urban environment and the living comfort (Hall, 2001): a poor access to natural lighting and solar radiation in the home, the lack of green spaces and the thermal energy storage effect are just some of the effects of this phenomenon. For this reason, higher density developments require a careful attention to design quality, in respect of both individual buildings and the layout of developments. A proper planning should guarantee that homes meet modern standards and expectations for internal space, private and public open space, natural light and ventilation.

In the debate on how to govern properly the transformation of the cities to ensure the maximum advantage for the citizens, the "smart" revolution brought new tools for managing the urban complexity so much that many experts consider smartness and urban sustainability as running on the same track.

This scenario calls for a more conscious awareness to the issues of the territorial government and requires a multi-scale and cross-sectorial approach (Bourdic & Salat, 2012) as well as innovative forms of governance and financing models: from the building's efficiency to the urban morphology, from the individual behaviors of citizens to good practices in public administration.

That's why the international debate on energy issues at urban scale is increasingly less sectorial; it is not a case if the *leitmotiv* of the conferences discussed in this contribution lies in the intention of pooling experiences and skills of different disciplines broadening the debate to the civil society.

UPPD - ANNUAL INTERNATIONAL CONFERENCE ON URBAN PLANNING AND PROPERTY DEVELOPMENT

Where: Bologna - Italy
When: 5 - 6 October 2015
http://www.urban-ppd.org/

The Annual International Conference on Urban Planning and Property Development (UPPD), deals with the subject of building environment on a large scale and mainly from the point of view of urban and regional planning. It serves as a platform for academics, researchers, scientists, consultants and policy makers to share experiences and explore science, methods, tools, analysis as applied to different aspects of the cities in order to improve urban planning and property development and to enhance the lifestyle of the community. The main topics are related to the field of urban planning, urban design, real estate and property development but also to energy use and its implications.

UPADSD - URBAN PLANNING AND ARCHITECTURAL DESIGN FOR SUSTAINABLE DEVELOPMENT

Where: Lecce – Italy
When: 14-16 October 2015
http://www.ierek.com/events/urban-planning-architecture-design-sustainable-development/

The aim of "Urban Planning and Architecture Design for Sustainable Development Conference" is to create a table of discussion and debate around the sustainable development especially in terms of resource consumption. The conference deals with all aspects of development and planning and brings together scientists and other stakeholders from across the globe to discuss the latest advances in the field aiming to highlight developments in managerial strategies and assessment tools for policy and decision makers. There are certain topics related to architectural and urban design with the aim to identify the principles of proper and efficient design to address sustainable and energetic cities. The main topics strictly connected with the energy and build environment issues are the following:

- Planning Approaches for Sustainable Development.
- Energy and the environment.
- Building Physics and Technology.
- Sustainable design and configuration of sustainable cities.

SASBE2015 - SMART AND SUSTAINABLE BUILD ENVIRONMENT

Where: Pretoria – South Africa
When: 9 -11 December 2015
http://sasbe2015.com/

The smart revolution opens other fields of investigation to face with energy challenges connected with build environment thanks to the recent development of advanced smart systems for efficient use of resources. The conference provides the forum to define and test instruments and strategies of this technological revolution starting from the assumption that limited timeframes and resources need smarter ways of rapidly improving sustainability performance of the built environment. On this premise several subthemes branch:

- Smart, sustainable and resilient cities
- Smart and sustainable urban planning, design and management
- Responsive, regenerative and net positive design
- Biodiversity, landscaping and productive environments
- Intelligent buildings and smart technologies
- Smart and sustainable materials, technologies and techniques
- Productive and healthy working and living environments
- Smart and sustainable estate and facilities management
- Smart and sustainable energy, water, waste, transport and communications systems
- Performance assessment tools, indices and rating systems
- Strategies, systems, regulations, procedures, structures and community engagement for smart and sustainable transformation

SBE 16 - INTERNATIONAL CONFERENCE ON SUSTAINABLE BUILT ENVIRONMENT

Where: Hamburg – Germany
When: 8-11 March 2016
http://www.sbe16hamburg.org/

Strategies, stakeholder and success factor are the keywords of this conference. It means that it is now widely acknowledged that a real change for the urban sustainable development comes through a multi-sectorial approach that first involves citizens. The conference main topics are focused on issues connecting building environment, new as well as existing, and sustainability, both on a global and on a regional level but also on building and product level, in terms of strategies and legislation at the local level as zero emission, water management, mobility and environment, organizational efforts. The energy is one of the most important issues of the conference although it is tackled more on the implementation and integration of renewable energies in the urban environment, than on strategies for the reduction of energy consumption. One of the strengths of the conference lies on the location: the hosting city of Hamburg offers the opportunity to discuss the topics close to a number of best-practice buildings and urban-planning concepts developed in the last years with high-energy efficiency standards.

INTEP - INTERNATIONAL "SUSTAINABLE BUILT ENVIRONMENT REGIONAL CONFERENCE 2016"

Where: Zurich – Switzerland
When: 13-16 June 2016
http://www.intep.com/Aktuelles-236.html

The title of the conference, part of the "Sustainable Built Environment" series, confirms the trend line of the last years which identifies in the Systemic vision the main way to face with sustainable challenges related to the urban areas development: "Expanding Boundaries: System Thinking in the Built Environment". It offers a platform for exchange between researchers and practitioners from the construction sector to promote system thinking in sustainable building. The main topics related with energy issues are the following:

- integral approaches for energy and resource efficiency,
- decentralized energy supply and infrastructure for buildings and cities,
- life-cycle oriented buildings and construction materials.

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IMAGE SOURCES

The image shown in the first page is taken from: http://fineartamerica.com/featured/urban-crowding-john-chehak.html

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