Workshop 5.B

Per città più resilienti: progetto urbano per l'efficienza energetica e i cambiamenti climatici

—

Coordinatori: Massimo Angrilli, Corrado Zoppi
Discussants: Carmela Gargiulo, Carlo Gasparrini

La pubblicazione degli Atti della XIX Conferenza nazionale SIU
è il risultato di tutti i papers accettati alla conferenza.
Solo gli autori regolarmente iscritti alla conferenza sono stati
inseriti nella pubblicazione.
Ogni paper può essere citato come parte degli "Atti della XIX
Conferenza nazionale SIU, Cambiamenti. Responsabilità e strumenti
per l'urbanistica al servizio del paese, Catania 16-18 giugno 2016,
Planum Publisher, Roma-Milano 2017.

Planum Publisher

Roma-Milano
ISBN 9788899237080
Volume pubblicato digitalmente nel mese di marzo 2017
Pubblicazione disponibile su www.planum.net | Planum Publisher

PER CITTÀ PIÙ RESILIENTI: PROGETTO URBANO PER L'EFFICIENZA ENERGETICA E I CAMBIAMENTI CLIMATICI

Coordinatori: Massimo Angrilli, Corrado Zoppi
Discussants: Carmela Gargiulo, Carlo Gasparrini

La resilienza urbana implica la messa a punto di una forma progettuale diversa dal passato, più strategica, in grado di attraversare le scale e di considerare le molte variabili in gioco (non solo spaziali, ma anche sociali, ecologiche, economiche...). Perseguire un'idea di mitigazione e adattamento implica esplorare territori progettuali nuovi, dove l'azione si pregura come trasversale (capace di intercettare soggetti diversi), interscalare (dove anche l'azione sui piccoli spazi diventa rilevante e può incidere sul complessivo assetto urbano), dinamica e osmotica (potenzialmente mutevole nel tempo e capace di riverberare i propri effetti in diversi settori).
Questo workshop si propone di esplorare la dimensione progettuale della città resiliente attraverso la rilettura critica di esperienze di pianificazione e di progettazione dello spazio urbano, elaborate in ambito nazionale e internazionale, significative sia sul fronte della mitigazione che dell'adattamento, attraverso un repertorio di buone pratiche riferite a strumenti di pianicazione e progetti di spazi aperti nella duplice prospettiva della mitigazione ed adattamento ai cambiamenti climatici e all'efficienza energetica delle città. I grandi cambiamenti climatici e la ricerca per l'efficienza energetica, sono strettamente correlati e convergono con maggiore intensità nelle città dove, anche a seguito delle trasformazioni demograche e socioeconomiche, è necessaria la costruzione di nuovi scenari e modi per un progetto urbano resiliente. In particolare la sfida per l'effcienza energetica della città, che richiede di andare oltre la scala edilizia, obbliga ad uno sguardo olistico attento alla città come luogo dove integrare politiche di riduzione dei consumi energetici e di produzione di energia da fonti rinnovabili.
Obiettivo del workshop è quello di vericare questa impostazione indagando aspetti e pratiche di pianificazione e progetto che riguardano la mobilità, le infrastrutture verdi nonché forme di compensazione e di incentivazione che fanno leva sui meccanismi di mercato.

PAPER DISCUSSI

Fruibilità e resilienza delle aree urbane di margine. Permanenza e temporaneità negli interventi di rigenerazione
Francesco Alberti, Roberto Bologna

Il progetto urbano sostenibile per la rigenerazione del centro storico di Pieve di Cento
Maurizio Biolcati Rinaldi, Francesco Alberti, Lucio Gambetta

Il bacino termale. Progetto per la città pubblica sostenibile
Pasqualino Boschetto

La "sensibilità" degli spazi aperti come strumento di lettura per il progetto climate-proof. Il caso di Trieste
Valentina Crupi

Towards a smarter development: mitigation and adaptation strategies at the district level in Genoa
Ilaria Delponte

Berlino, the breathing city - la città che respira. L'Ecologia del Vento nel progetto di Città Sostenibile (WSUD)
Gioia Di Marzio

In difesa del suolo. Politiche, strumenti e tecniche per preservare il territorio
Isidoro Fasolino

Smart ancient city. Nuove prospettive del progetto urbano per i centri storici
Elena Gigliarelli, Luciano Cessari, Bruna Di Palma

I crediti edilizi per la riqualificazione energetica degli edifici nel PRG di Trieste: un caso studio
Riccardo Laterza

The architecture of the periphery in Madrid: new ways of planning beyond the plans
Alona Martinez Perez

Atti della XIX Conferenza Nazionale SIU
CAMBIAMENTI. Responsabilità e strumenti per l'urbanistica al servizio del paese
Catania, 16-18 giugno 2016

Planum Publisher
ISBN 9788899237080

Towards a smarter development: mitigation and adaptation strategies at the district level in Genoa

Ilaria Delponte
Università degli Studi di Genova
DICCA - Dipartimento di Ingegneria Civile, Chimica e Ambientale
Email: *Ilaria.Delponte@unige.it*
Tel: 010.353.2088

Abstract
Controlling the environmental impact of energy production and consumption is currently a goal shared at a global level. It is therefore crucial to involve the institutions closest to citizens and stakeholders, beginning with municipalities, the basic unit of public administration in much of the world.
In this framework, the project TRANSFORM-TRANSFORMation Agenda for Low Carbon Cities purposed a transversal survey on integrated energy planning Europe-wide, considering experiences from all partners cities: Amsterdam (beneficiary), Copenhagen, Lyon, Hamburg, Vienna and Genoa. The partner city consider crucial the opportunity to experiment the planning strategy in the local context, for, after, evaluating successful aspects and lacking points, directly coming up from the implementation phase. This paper deals with the insertion of the TRANSFORM methodological approach within the European policies referring on energy, environmental and climate change, deepening the case study of Genoa (IT).
The TRANSFORM approach, which is trying to transfer ideas and design from the sustainability perspective to smartness one, is still, nowadays, only related to a mitigation strategy (energy consumption and air pollution reducing). Nothing is still referring to the adaptation one, even though a territory like that of Genoa absolutely needs it.

Parole chiave: planning, environment, smart city.

1 | Introduction

The issue of adaptation is gaining importance only recently: the EU Strategy on adaptation to climate change, adopted in 2013, clearly underlines that climate change mitigation must remain a priority for the global community. At the same time, to face future scenarios and favorite low emission approaches and actions to control and reduce greenhouse gas emissions connected with energy generation and consumption, at both global and local scales (Wilbanks and Kates, 1999; Mertens, 2011) notable intgertaed environmental policies have been implemented.
Thus, the measures for adaptation to climate change are receiving an increasing financial support and a growing number of European countries are building up national and urban adaptation strategies to deal with actual and potential climate change impacts (Birkmann, 2011). On parallel, the focus on adaptation stems from the growing and shared awareness that, despite the efforts to reduce GHG emissions, climate change is going to occur (Solomon et al., 2007) and its impacts will be particularly severe in urban areas, due to the concentration of people and assets.
Anyway, the transition from a principles and objectives statement to implementation of actions may be complex. It is therefore crucial to involve the institutions closest to citizens and stakeholders, beginning with municipalities, the basic unit of public administration in much of the world.
In this framework, the project TRANSFORM-TRANSFORMation Agenda for Low Carbon Cities purposes a transversal survey on integrated energy planning Europe-wide, considering experiences from

all partners cities: Amsterdam (beneficiary), Copenhagen, Lyon, Hamburg, Vienna and Genoa. TRANSFORM improves the integrated energy policy and decision making process of cities, both at a strategic and operational level, by providing the cities with a framework based on overall planning experiences and on-the-field projects and qualitative and quantitative analysis support models. TRANSFORM will deliver a strategic energy Transformation Agenda (TA) for each of the participating cities, addressing main components that influence the chain of energy production and consumption, the potentials for efficiency, necessary stakeholder processes and a financial strategy.
This paper would like to deal about the insertion of the TRANSFORM methodological approach within the European policies referring on energy, environmental and climate change.
About that, the project purposes a common strategy of intervention, leaving cities free to implement it at the local level by means of a sample case (as a sort of pilot action), first of all in order to put in light the richness of diversity of urban approaches to planning, but also criticalities in applying EU directives among cities, considering the gap standing out between the approaches provided by institutional documents and the consequent implementation at the local level (Papa et al., 2014). The partner cities consider crucial the opportunity to experiment the planning strategy in the local context (Smart Urban Lab, SUL), for, after, evaluating successful aspects and lacking points, directly coming up from the implementation phase. This is why, one of the workpackages of the project is dedicated to the preparation of Implementation Plans (IP) by each cities, where energy saving actions are designed: refurbishment, retrofitting, renewable sources' plants, clean mobility, ICT improvements, .. are the most relevant ones.
The TRANSFORM approach, which is trying to transfer ideas and design from the sustainability perspective to smartness one, is still, nowadays, only related to a mitigation strategy (energy consumption and air pollution reducing). Nothing is still referring to the adaptation one, even though a territory like that of Genoa absolutely needs it.
What are the connections among urban smartness, sustainability and climate change?
How these implications can be developed at the district level?
Based on these premises, which can be the link between the Transformation Agenda and the IP, born for promoting a smarter growth in the European cities and the adaptation plans?
Regarding the TRANSFORM SUL initiative, what seems to be interesting is deepening the local "side" of the climate challenge. We know that the vulnerability of individuals and communities to climate change impacts is not simply determined by the location of their settlements, but also by how those settlements are serviced, how effective and capable their local governments are and to what extent communities are able to cope with climate change impacts (Laukkonen et al.,2009).

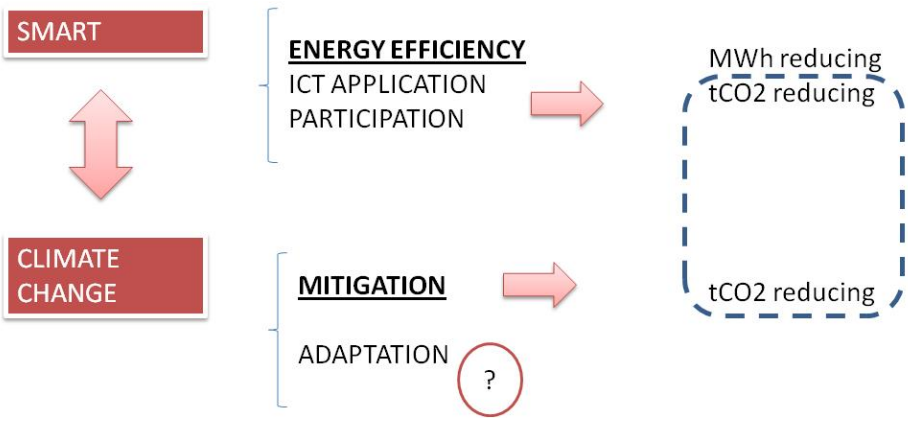

Figura 1 | The Smart and Climate Change initiatives.

2 | The TRANSFORM Project approach and mitigation measures on the district of Voltri

The EU considers cities to be environmental externality producers but, at the same time, protagonists of related improvement policies. It assigns cities a primary role in confronting GHG effects and the energy consumption surplus issue, attributing a substantial commitment and responsibility to public administrators and citizens. In other words, municipalities directly suffer pollution effects and climate changes, but may also be relevant as experimental places of innovative policies (Musco, 2012), with a focus on sustainability, adaptation, mitigation and resilience in a wider sense (Alberti and Marzluff, 2004;

Derissen et al., 2011). National governments in all OCSE countries increased city autonomy so much that local entities are now facing difficult political decisions and are pressed by conflicting sides.
For these reasons, TRANSFORM tries to improve the integrated energy policy and decision making process of cities, both at a strategic and operational level, in order to make valuable and performing the efforts made by municipalities during these last years. The TRANSFORM cities have a proven record of efforts to reduce energy consumption and increase sustainability. That includes ambitious targets and action plans, and political support for execution. They have experienced the limits of the current ways of planning and seen the need of integrative planning to tackle the challenge of the 20-20-20 targets.
Therefore, the project has the overall objective to draw up a TRANSFORMation Agenda which may be useful to address, firstly the partners and secondly the other interested urban contexts, in the process of transition towards a smarter way in planning, designing and living cities. The particular focus, in this case, regards the energy sector as a qualifier of the smart paradigm. To meet the 2020 and 2050 targets, a strategic TRANSFORMation Agenda is needed for the city as a whole.
The TRANSFORMation Agenda will be brought to the operational level in the form of an Implementation Plan, which will be drawn up for specific city districts. These districts are selected for this project under the name of 'Smart Urban Labs'. Evidently, morphology, urban density functional mix, demographic aspects, (energy-) infrastructures vary from district to district.
This project represents an opportunity to develop a long-term integrated concept for an energy- optimized city district using appropriate technologies, products, and solutions in a realworld infrastructure. Recent studies and Project Calls pointed out the need for overcoming the sectorial approach which has for long characterized transport planning and policies. At present, grounding on integrated approaches, new ideas and practices are arising, driving towards a closer relation between transport planning, buildings, energy supply and land use planning at different scales (Galderisi, 2007).
This requires more specific Implementation Plans to take them into account to find an optimal mix in terms of production of energy, storage, reduction and exchange, supported by feasible business plans. This integration of all elements will create win-win business models for stakeholders with initially different interests.
The districts where the Smart Urban Labs are located are TRANSFORMation areas undergoing redevelopment at the moment. This means the Smart Urban Labs can provide direct impact in the ongoing development processes through the implementation plan. Thus, each Implementation Plan is a product made in a joint effort by all relevant local stakeholders and includes for example renovation of the building stock, heating and cooling possibilities, use of intelligence on both electric and thermal networks, the potentials of existing water systems, innovative (electrical) transportation possibilities and urban green.
The climate and energy approaches of European cities adopted so far have not all proven to be successful in their implementation and link to the city budget, stakeholders' budgets and aspects of time through respective investment agendas. At the same time, the implementation of measures (e.g. heating and cooling, energy storage, electric mobility, water purification, waste collection) at the district or project level has been disconnected from city scale strategies. Therefore, the project intended to make a step further in this field, by providing a replicable and tested framework for the production of a strategic TRANSFORMation Agenda for the city as a whole, combined with district Implementation Plans.
What about the experimentation district in Voltri, the Genoa Smart Urban Lab?
A few remaining residences as well as a building devoted to commercial activities and motorised mobility assistance, the local police force barracks, a hotel and car park, several sports facilities, a shipyard, several clubs and sports associations, bathing establishments and shops, and port activities. The road that connects Voltri to the city centre separates the coastal strip from the historic area that lies behind, characterized by residential typology. Here, some stakeholders groups interrogated themselves around what is essential for e real urban regeneration: the outputs which came up are renewable energies, improvement in mobility public services (a metropolitan system of the railway will have an important gate in Voltri) and safeguard of the Mediterranean characteristics of the building stocks.
The neighborhood of Voltri is located in the innermost point of the Gulf of Liguria and on the far western suburbs (Municipio VII Ponente) of Genoa, about 17 km from the city centre.
The Voltri area has strong historical and cultural identity and in the past they have played a significant role in the local economy. In 1926, Voltri's autonomy was removed by incorporating it in the city of Genoa the economic structure axis rotated and the networks of relationships have focused mainly on the coastal axis resulting imbalance of the ancient links with the city center.

The west area of Genoa has been affected in recent years, on one hand, from the disposal of industrial activities. and on the other by the TRANSFORMation of the infrastructure system with the construction of new commercial port of Voltri, the rail connection with the lines of the pass, the connection to the motorway network.
The new Porto has given a different connotation of the entire area by strengthening the economic structure and a consequent rebalancing of the relationship employee /active.
The territory of Voltri presents also different small and medium enterprises realities, sometimes limited by weak transport infrastructures. There are numerous cases of unused buildings and whose state of abandonment has determined, in some cases, situations of deterioration and decay of the associated buildings.
It appears quite clear that the economic recovery is related to infrastructure interventions to be started under a careful use of public resources.

Figura 2 | The Smart Urban Lab area in Voltri (Genoa).

One of the two greatest challenges here is energy saving in buildings. Given the location of the area along the coastline, one of the most promising options being proposed and investigated by the TRANSFORM project is to improve efficiency and to achieve significant energy (and probably also cost) savings for final consumers by replacing the presently adopted heating systems using fossil fuel boilers (mostly natural gas) by installing and adopting sea-water coupled heat-pump systems. This action will however need to involve citizens and local stakeholders as well as to identify possible financial solutions to promote investments.
The second important challenge is the retrofitting of public/social buildings throughout the area (swimming pool, medical practices, library, schools, etc.).
Specifically, the basic idea behind this proposal is to exploit the nearby sea as an enormous heat-source for space heating and any other low-temperature heating purpose (e.g. domestic hot water etc.) as well as for cooling in summer.
About mobility, the most relevant infrastructural intervention in Voltri will regard the railway "metro" station which will connect the western outskirt of Genoa directly to the centre thanks to a frequent service of small trains, similar to a metro system. A node with public transport terminal bus will be realised nearby the new railway station. Moreover the urban mobility plan foresees the realisation of an interchanging parking.
The main Smart Grids measures that can be planned in SUL are Electricity Grids preparation and empowerment and Active Demand/Smart Info. Moreover, throughout the City of Genoa there are 17 Electric Vehicles recharging infrastructures that are managed and controlled by an ICT application so called Electric Mobility Management System (EMMS).
For assessing the interventions thought for Voltri on the selected themes, we considered Co2 reducing as a key-target for mitigation: the results were about -1900 tCo2 saved.

But how Voltri is so meaningful city-wide, also for the extreme events and the climate change concern?
In Autumn 2014 we had two serious flooding happenings in Genoa and Voltri was damaged, too.
So, it is an interesting scene where we can confront and link the results of the methodological smart approach and the consideration of the environmental priorities, in order to track other further scenarios for a better jointly treatment of the two topics (smartness and climate change) in a wider perspective for the city.

3 | Strategy: mitigation and adaptation

What it came up from the IP is a photograph of different colours: from one hand the work already done permit to take into account the complexity of the case; from the other, such kind of awareness makes the Municipality and the other involved actors conscious of the limits and the gaps of the process so far.

For instance, one of the main issue coming up by the work has been the need of an Energy Atlas. These kinds of tools try to bring the answers to a series of interesting questions: How much energy is consumed in my neighborhood? How much energy is used by that enterprise? Where are the opportunities for solar energy? Where for wind energy?

For the programming activity, Genoa formerly considers as an opportunity the usage of a mapping tool with the characteristics of a Decision Support System, although Municipality knows very well that availability of data is not a trivial matter and the involvement of all the actors in the process is a preliminary governance step which is crucial for the implementation of the technical instruments.

We can see how difficult is to envisage a quantitative result at the neighbourhood scale, lacking a tool where scenarios can be analysed in a territorial way (localisation characterized by geographical features, energy potentials, binding urban planning instruments,...). For this reason, it seems to be worthwhile to adopt an Energy Atlas or similar, in order to better forecast impacts and implement mitigation measures, basically due to the energy consumption reducing, directly related (only) to mitigation.

Nevertheless, we can say that, although cities are considered as pivotal both to mitigation and adaptation issues, the European cities that have drawn up an adaptation plan are still few and mainly located in North-Central Europe (UK, Finland and Germany). A recent study highlights that, on a sample of 200 large and medium sized cities located in 11 European countries, the "35 % of European cities studied have no dedicated mitigation plan and 72 % have no adaptation plan. No city has an adaptation plan without a mitigation plan. One quarter of the cities has both an adaptation and a mitigation plan and set quantitative GHG reduction targets, but those vary extensively in scope and ambition" (Reckien et al., 2013).

The obstacles to an effective climate change adaptation at city level are numerous and heterogeneous: models difficult to be downscaled at city level, heterogeneous impacts of climate change in itself, the scarce availability of a reliable risk assessment, the lack of coordination across different sectors and monitoring methodologies which have still hardly been developed (Adger et al., 2009; Bulkeley et al. 2009; Corfee-Morlot et al. 2011). First of all, it is worth underlining that adaptation has to be conceived not as a one-time effort but as a process articulated in different interrelated phases (Hennessy et al., 2007).

But, a further challenge for Genoa derives from the recent flooding events that made the rivers in the area overflow their banks and cover streets with mud.

Floods have caused the greatest economic losses in Europe in the last years; as known, most European cities are already committed to address flood risk issues, even though the types of flooding they have to face are heterogeneous, from flash floods to urban drainage floods or to coastal floods, occurring during storm surges when there are temporary increases in sea levels above the normal tidal range. At the same time, from recent studies (Boscacci et al., 2014; Shapiro, 2006) the interest on the environment characteristics of a smart city is lower than others features: for urban attractiveness the quality of life and economic The smart city future is above all the necessity of a rethinking of models of socio-economic development, but all agree that this is particularly related to territorial liveability and social inclusion (Bencardino, Greco, 2014).

Therefore, the implementation of a smart alert system (for risk management) is of primary importance in Municipality's priorities' list, probably in connection with smart lampposts. This latter issue brings us directly to another key-point of urban measures for adaptation.

According to Corfee-Morlot et al. (2009), adaptation strategies could be important for reducing "vulnerability to current and future hazards such as floods, water shortage or heat waves, even though cities should also consider incremental or gradual changes in climate that affect government operations or community life in less immediate and visible ways than conventional disasters". Moreover, Hallegatte et al. (2011) emphasize that land use decisions and zoning may exacerbate or limit the vulnerability of urban dwellers and of infrastructures to the growing threat of climate change.

It is worth underlining that the selected experiences do not seem to fully benefit either by the significant results already achieved in the field of risk analysis or by the significant opportunities arising from the current debate on smart cities. As for the first point, despite the numerous projects funded by the European Community and addressed to promote the building up of a shared knowledge and common methodologies among the scholars working in the field of natural hazards and the scholars involved in

studies and research on climate change, a difficulty in transferring concepts, methods and results from one field to the other still persists.

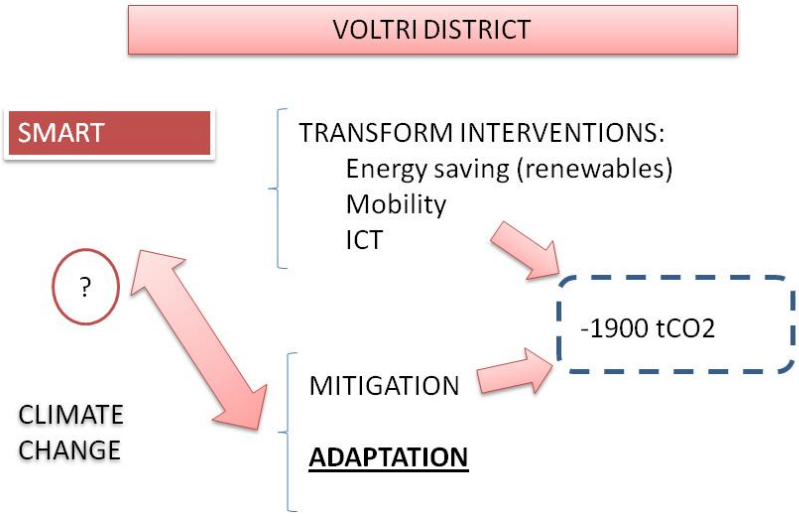

Figura 3 | Voltri results: upcoming issues.

This is our stage: the TRANSFORM approach, and its IP can be considered as separated by the climate change debate or, in other words, does the interest on adaptation diverge from the smartness philosophy?
Numerous scholars have pointed out the key role of local factors in modifying climate change impacts on urban areas (McCarthy et al., 2010; Nguyen Xuan, 2011), even though up to now the features of urbanized areas have received little attention in climate model projections.
Nevertheless, it is largely recognized that cities may experience different impacts in respect to surrounding regions, due to heterogeneous factors: for example, a high degree of surface sealing may impair rainwater drainage, reinforcing the urban heat island effect (Magee et al., 1999; Müller, 2012; Lehmann et al., 2012); the prevalence of built-up areas on natural spaces creates a peculiar microclimate in cities, which may affect air temperature, wind direction and precipitation patterns. Moreover, the growing concentration and the ageing of urban population may exacerbate exposure and vulnerability of cities to climate-related phenomena. Finally, since cities are strongly dependent on their hinterland, namely for food and water supply, they are also significantly vulnerable to climate change impacts occurring in the surrounding areas (Hunt and Watkiss, 2011; McEvoy et al., 2010).
How can Genoa cope with that?
The commitment of Genoa concerning this point is quite recent but significantly strong.
In a future perspective, the Municipality would like to guarantee a better level of safety and security inside the urban area, so the environmental topics about climate change, are thought as an unique overall strategy (Papa et al., 2014), together with other priority objectives but participating all to the same goal.
The Municipality puts at the centre of its thematic axis of financings the improvement of the ICT system connected to the general development of the Digital Agenda. This is one of the three main issue coming from the Operational Program provided by cities that have access to metropolitan areas funds in Italy. They received financings from the State (about 7 million euros in the case of Genoa) and, then, they assign them to the winners beneficiaries of priority-axis calls.
The energy saving objectives will be financed jointly with the hydrological safeguard items. Why jointly?
Because in order to set a virtuous process, the Municipality organized, together with the Regional government (FESR Funds, about the "Promoting the climate change adaptation and environmental risks' prevention"), a coverage for those interventions that are devoted to this topic. It deals with a technological infrastructure (cloud and big data analytics) to be conceived for different uses: alert system for water inundation, traffic data management, monitoring of just-in-time public energy consumptions.
So, four urban policy milestones are now more focused: Energy, Mobility, Buildings and Safety&Security.
The conception of this general framework is based on the future internet strategy, where Interoperability, Internet of Services and Things and UltraBroadBand are connected.
According to some scholars, a city can be defined smart when investments in human/social capital and IT infrastructure fuel sustainable growth and enhance a quality of life, through participatory governance

(Papa et al., 2013). The application of ICTs in the adaptation processes could play a key role in each phase of the process (Delponte, 2014). The realization of a technological system at the whole-city level tries to score the fundamental target of the Administration: to improve the general resilience of the city, particularly related to the territorial safeguard due to the geomorphological features of the entire metropolitan area. Surely, such complex vulnerabilitie require comprehensive responses that link climate change adaptation and mitigation efforts to the sustainable development of these communities enhancing their adaptive capacity, acted for example at the district scale (Laukkonen et al.,2009). This not only by means of ICT tools, but developing a strategic all-encompassing framework in a long-term perspective seems to be the distinctive characterization of a smart city: equilibrium, resilience, adaptation, openness. Surely, it can happen thanks to innovative way of planning, e. g. through Living Labs that have been experimenting a lot nowadays (De Bonis et al., 2014; Marsh, 2008).
In this sense, the TRANSFORM results are quite evidently a basis for further reasoning that the Administration is now conceiving, all over the city, not only in Voltri, that, of course, after being the frontrunner, can benefit by it.
Genoa found its path to smartness and environmental protection thanks to good opportunities (financings, EU projects, cooperation among entities and objectives and so on), but also through negative happenings which, on the contrary increases its own awareness about criticalities and potentialities.

Riferimenti bibliografici

Adger W. et al., eds., (2009), *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge University Press, Cambridge.

Alberti M. et al., (2003), "Integrating Humans intoEcology: Opportunities and Challenges for Studying Urban Ecosystems", *BioScience*, 53(12), pp. 1169-1179.

Bencardino M., Greco I. (2014), "Smart Communities. Social innovation at the service of the smart cities", *TeMA Journal of Land Use Mobility and Environment*, Special Issue.

Birkmann J. (2011), "First- and second-order adaptation to natural hazards and extreme events in the context of climate change", *Natural Hazards*, 58, pp. 811-840. http://www.bonn-dialogues.com/file/get/10626.pdf

Boscacci F., et al. (2014), "Smartness and Italian cities. A cluster analysis", *TeMA Journal of Land Use Mobility and Environment*, Special Issue.

Bulkeley H. et al. (2009), *Cities and Climate Change: The role of institutions, governance and urban planning. Report prepared for the World Bank Urban Symposium on Climate Change*, Durham, Oxford. Retrived from: http://www.eci.ox.ac.uk/publications/downloads/bulkeley-schroeder-janda09.pdf

Corfee-Morlot J. et al. (2011), "Multilevel risk governance and urban adaptation policy", *Climate Change,* 104, pp. 169-197.

Corfee-Morlot J. et al. (2009), "Cities, Climate Change and Multilevel Governance", *OECD Environmental Working Papers* N° 14.

Delponte I. (2014), "Transport, ICT and the city. why are cities interested in ICT?" Selected Paper in R. Papa, *Towards Smart City. A scientific approach*,.Aracne Ed., ISBN 9788854870246, pp. 17-26.

Derissen S. et al., 2009. "The relationship between resilience and sustainable development of ecological-economic systems," *Working Paper Series in Economics 1*46, University of Lüneburg, Institute of Economics.

De Bonis et al., (2014), "Co-creative, re-generative smart cities. Smart cities and planning in a living lab", *TeMA Journal of Land Use Mobility and Environment*, Special Issue.

Hallegatte S. et al., (2011), "The economics of climate change impacts and policy benefits at city scale: a conceptual frame work", *Climatic Change* 104, pp. 51–87.

Hennessy, K. Et al., (2007), *Australia and New Zealand. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, pp. 507-540.

Hunt A., Watkiss, P. (2011), "Climate change impacts and adaptation in cities: a review of the literature", *Climatic Change,* 104, pp. 13–49.

Laukkonen, J. et al., (2009), "Combining climate change adaptation and mitigation measures at the local level", *Habitat International*, *33*, pp. 287–292.

Lehmann P. et al., (2012), Understanding Barriers and Opportunities for Adaptation Planning in Cities, Discussion Paper, Helmholtz-Zentrum für Umweltforschung GmbH – UFZ. Retrived from:

http://www.ufz.de/export/data/global/45989_19 2012 Lehmann et al_ Urban Adaptation_internet_gesamt.pdf.

Magee N. et al., (1999), "The urban heat island effect at Fairbanks, Alaska", *Theoretical and Applied Climatology* 64, pp. 39-47.

Marsh J. (2008), "Living Llabs and territorial innovation", in Cunningham P., Cunningham M, (eds.), *Collaboration and the knowledge economy: issues, applications, case studies*, IOS Press, Amsterdam.

McCarthy M. P. et al., (2010), Climate change in cities due to global warming and urban effects, *Geophys. Res. Lett.*, 37, L09705, doi:10.1029/ 2010GL042845.

McEvoy D. et al., (2010), "Framing Adaptation to Climate- related Extreme Events." *Mitigation and Adaptation Strategies for Global Change* 15, pp. 779-795.

Mertens K. R., (2011), "Developments of EU Environmental Policy and Law", *Journal for European Environmental & Planning Law 8*, pp. 293-298. Retrived from: www.brill.com/journal-european-environmental-planning-law

Müller A. (2012), *Areas at Risk - Concept and Methods for Urban Flood Risk Assessment. A case study of Santiago de Chile*. Franz Steiner Verlag, Stuttgart.

Musco, F. (2012), "I piani clima, nuovi strumenti per la pianificazione locale: dalla mitigazione all'adattamento", in S. Verones & B. Zanon (Eds.), *Energia e Pianificazione Urbanistica. Verso una integrazione delle politiche urbane*, Franco Angeli, Milano, 58-79.

Nguyen Xuan A. (2011), "Cambiamento climatico, adattamento, vulnerabilità e resilienza: orizzonti per la pianificazione"in *Abitare l'Italia - Territori, Economie, Disuguaglianze,* XIV Conferenza SIU – 24/25/26 marzo 2011.

Papa, R. et al. (2013), "Towards an urban planners' perspective on smart city", *TeMA Journal of Land Use Mobility and Environment*, 6(1), 5-17.

Papa R., Gargiulo C., Zucaro F. (2014), "Climate change and energy sustainability. Which innovations in european strategies and plans", *TeMA Journal of Land Use Mobility and Environment*, 7(1).

Reckien D. et al., (2013), "Climate change response in Europe: what's the reality? Analysis of adaptation and mitigation plans from 200 urban areas in 11 countries", *Climatic Change* DOI 10.1007/s10584-013-0989-8, Springer Science+Business Media Dordrecht.

Shapiro, J.M. (2006), "Smart cities: quality of life, productivity, and the growth effects of human capital", *The Review of Economics and Statistics*, 88(2), pp. 324-335.

Solomon, S. et al., (2007), *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK.

Wilbanks, J., Kates, R.W. (1999), "Global changes in local places: How scale matters", *Climatic Change* 43, pp. 601–28, Retrived from: link.springer.com/article/10.1023/A:1005418924748.