

# Italian Smart Environment: the Contribution of the Evaluation

Angela Poletti

Politecnico di Milano, Department of Architecture and Urban Study, via Bonardi, 3, 20133 Milan, Italy  
[angela.poletti@polimi.it](mailto:angela.poletti@polimi.it)

The new phenomenon of the Smart Cities is spreading worldwide as a synonym of an innovative and new sustainable model of city. By focusing on the smart meaning and components of the smart city project we will identify the environmental advantage compared to a traditional design and produce a contribution to the assessment of the smart projects. The expected advantages and disadvantages are interpreted by the smartness and sustainability dual key. Considering that impact assessment is an essential tool for the purpose to ensure giving in consideration environmental and broader sustainability concerns in decision-making, we acknowledge the importance to reflect on the state of assessment practice during smart city age. We analyze crosswise smart projects and their assessment underlining institutional implementation issues, problems associated with practice, including participation, quality and effectiveness. The paper examines the Italian case with any matters the Mediterranean area in relationship to the possibility of exporting best practices and the contribution. The transition from the concept of 'smart cities' to that of 'smart territory' represents an element of territorial and institutional development recognizing the role of industrial innovation.

## 1. Introduction

The paradigm of the Smart Cities is spreading worldwide as a synonym of an innovative and new sustainable model of city invoked as a new management tool to meet the increased population and urban complexity. As it already happened in the recent past with the terms Sustainable or Ecological, Smart is the new need-to-use adjective. Whereas smart environment "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". .... [and are concerned] with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities" (Komninos, 2006), the final goal of developing a Smart City is none other than achieving an urban sustainable development.

To emphasize the need to create a bridge between interdisciplinary and shaded knowledge fields, recently adjectives smart and sustainable have been put together as attributes of the city. At its fifth meeting in June 2014, the FG-SSC [Focus Group on Smart Sustainable City of United Nation Agency International Telecommunication Union (ITU)] agreed on the definition of Smart Sustainable City which reads as follows: "A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects". This definition is taken as a reference in the present paper.

The environment in which the life of a Smart City takes place must also be smart. The city produces effects beyond its administrative boundaries on cities and settlements connected with it. This is true for large and very large city (megacity) but also for medium-sized cities for which is expected to grow significantly in the coming years (United Nations, 2014).

In the urban environments, citizens, companies and local governments experience specific needs and demands regarding key themes such as sustainable development, business creation and employment, healthcare, education, energy and the environment, safety, and public services. Increasingly, these domains are enabled and facilitated by broadband networks, Internet-based applications and open platforms

(Komninos et al., 2011). The opportunities of the Future Internet are being used for the socio-economic development of urban areas (Komninos et al., 2013).

The programming strategy and the choices of the projects are difficult when it is not clear the meaning and therefore the content of the smart city as a whole, but they are absolutely important especially in the current conditions of economic uncertainty and lack of resources.

The paper starts considering the criteria by which the smart projects were selected with particular reference to the Italian context, as a contribution to the identification of method and indicators aimed at smart project assessment and prioritization. Through the methodology of the case study by focusing on the smart component of the smart city projects, we will identify the environmental advantage compared to a traditional design. The expected advantages and disadvantages are interpreted by the smartness and sustainability dual key. In the second part, the paper analyzes progress towards urban sustainability through environmental assessment in its various forms developed over time. In this case, the expected positive and negative effects are interpreted even considering the lack or the presence of a smart components. Given the importance of the assessment process, we want to recognize the contribution of smart cities in the resolution of outstanding issues with regard to valuation procedures. The third part is devoted to a comparative synthesis of the previous parts highlighting how Italians successful cases might constitute good practice to be transferred in the Mediterranean area. The paper closes with a discussion on necessity to improve assessment area in smart city studies and recommendations for future research topics.

## 2. Methodology

Italians municipalities have given considerable importance to the smart city model despite the urban features, characterized by only 15 cities with more than 200,000 inhabitants, a widespread presence of medium-sized cities and 85% of the towns with less than 10,000 inhabitants (ISTAT, 2013). Ten case studies were chosen: Milan, Turin, Genoa, Bari and Florence among those of the first group; Brescia, Ferrara, Pordenone, Salsomaggiore Terme among medium sized ones, and Union of Municipalities of Romagna Faentina representing smaller municipalities including Brisighella, Casola Valsenio, Castelbolognese, Riolo Terme, Solarolo (small towns) with Faenza (medium size city). The criteria used for the selection of cases were: population size, maturity level represented by the membership of the National Smart City Observatory, geographical representativeness and features. The individual case studies were investigated using the guiding questions. In this paper we report the first results only focused on the following questions: What characteristics should have a project to be considered Smart (Sustainability and participation, Integration and system approach, Innovation and learning, Inclusiveness and openness)? What are the main actors needed to develop a Smart City project: public institutions, private companies, universities, research centers? Is a critical mass population needed for a Smart City Project to succeed? What is the challenge for Smart City Projects assessment (Indicators, data, type of assessment)?

Smart initiatives started out publicly funded by European or National Funds. Most of the initiatives and projects were launched without a direction, so the results on the territory are mostly dispersed and did not produce the intended results. The project appraisal has not been made. The current downturn of public resources, particularly at the local level, is bringing out the need to improve the delivery of services and solve urban problems by smart and integrated use of technology, and to a greater value-added partnership with the private sector. Many mayors and city administrators want to find unreleased territorial government tools in technology in order to build a future of development for their city. In this case, the technology is interpreted as a foundational element of the smart city, the asset from which projects arise and develop.

## 3. The Italian geography of smart cities and territories

The major cities (Milan, Turin, Genoa, Bari, Florence) have defined a process for making smart-labeling system to existing and new projects. The governance process has been enlarged to include public entities (research, culture) and private sector. Action strategies have been handled by the local planning. The appraisal of the projects was made as to the definition of those with smart content.

### 3.1 The major cities smart process

Milan came to the determination of the smart projects applying all of the non-hierarchical following criteria: Aims and expected outcomes, Technology applied, Interaction with other projects or programs, Economic impact on the employment rate, Field of intervention, Innovation of governance models, Partnership, Degree of involvement of citizen, Meet a need, CO<sub>2</sub> reduction and cost savings. Turin has identified a series of actions by a feasibility pre-assessment (business model), and establishing a monitoring system using KPIs, which will support the first inclusive master plan for Torino smart city. The rationale is that sustainable development is

also smart as exemplified by Turin. The foundation 'Turin Smart City Sustainable Development' coordinates the management of Torino Smart City initiatives. Genoa ambitious goal is to build a city that knows how to exploit the potential of high technology, creating sustainable development, effective mobility and opportunities for all. Thanks to a series of meetings between representatives of all those who live and work in the city area, the Association Genoa Smart City has grouped in a decalogue aspects that characterize Genoa as a smart city. Genoa overlooking the Mediterranean, the cradle of civilization. City rich in beauty and architectural and artistic treasures, happily turn to the South, open to a dialogue with other cities, countries, cultures and the banks of the Mare Nostrum. These features enrich and connote a different approach to smart city initiatives than even the most advanced in northern Europe that are located in areas radically different and offering solutions that are not suited to the Genoese context.

The City of Bari has not defined its tools for monitoring and measuring the impact of the project, but uses the tool "Equitable and Sustainable Wellness" (ESW), a work in progress dataset consisting of 12 domains of well-being through 134 indicators produced by the National Council for Economy and Labour (CNEL) and the Institute of National Statistics (Istat) (Istat, 2014).

Florence did not start with interventions integrated planning, but a series of sectoral programs based on innovative policies in the field of mobility, economic development, technological resources, school sports and more. Centralized in the conception and funding, implementation programs are been integrated in the functional areas.

### **3.2 Medium sized cities smart project**

A significant number of municipalities (mainly medium-sized), realizing projects on specific areas (sustainable mobility, e-government, energy efficiency, promotion of cultural heritage, integrated data management) starts integrating other areas. We consider Brescia, Ferrara, Pordenone, Salsomaggiore Terme as functional to present unusual elements within smartness and sustainability.

Brescia is a medium-sized city, but with a large metropolitan area and a very extensive province, which presents problems of land management affecting at different levels of the government and the entrepreneurial system. The evolution in smart city covers both planning exploitation environmental resources, and the need to build a driver that intercepts, trains and addresses, investments towards a rebirth and / or upgrading of the productive system. The evaluative aspect is dealt with both ordinary tools (Strategic Environmental Assessment - SEA for the Local Plan) and using the Equitable and Sustainable Wellness (ESW) tool mentioned above.

Ferrara has redefined its policies starting from homeland security after the earthquake, focusing on the use of thousands of data generated by the operations during the emergency and reconstruction according to new approaches for knowledge and information capitalization.

Pordenone designed the smart city strategic plan along with a series of local planning instruments (Urban Planning, Sustainable mobility planning, local Energy Plan and plans for social and health area) using required assessment tools (SEA).

Salsomaggiore started a participation project in 2010 by developing a project of e-democracy that grows an initiative of Agenda 21, a process of active participation than in past years has involved more than fifty associations in the drafting of proposals and ideas for the future of the city.

### **3.3 The small town smart opportunity**

Some small towns have taken the opportunity to join the National Observatory of Smart cities to improve structural lack tied to recycling or energy saving drawing on the experience of other cities.

The transition from the concept of 'smart cities' to that of 'smart territory' represents an element of territorial and institutional development, contextualized by the Development of Institutional Organizational Plan. A significant role in governance is played by Faenza technological park, whose activity is divided along two main axes: support the study and development of industrial applications of innovative materials such as metals and alloys, advanced polymers, ceramics, composites and hybrid nanotechnology; strengthen its role as a link between the world of business and research, in order to analyze and develop industrial applications of innovative materials, foster innovation process, support the prototyping activities. With regard to the type of project in this case it is carried out an Environmental Impact Assessment (EIA).

## **4. Assessing and Measuring Smartness and Sustainability**

The importance of measurement and how do comes from the fact that 'what you measure' influences 'what you do'. With the 'Istanbul Declaration' adopted by major international organizations in June 2007 a first international consensus on the need to undertake the measurement of societal progress going beyond

conventional economic measures such as GDP per capita has reached. Measuring well-being through more articulated and supported by society indicators implies, therefore, possible changes of policy and strives to achieve a better functioning of democracy.

It was also reaffirmed 'a shift of emphasis from a production-oriented measurement system to one focused on the well-being of current and future generations, and conceptualisation of 'well-being' as being multidimensional (Stiglitz-Sen-Fitoussi, 2009). The concept of well-being changes according to times, places and cultures, and therefore can not be uniquely defined, but only through a process that involves different social actors. The definition of the framework brings with it, therefore, a process of democratic legitimacy that is the essential element in the selection of the qualifying aspects of the individual and social well-being (Hall et al., 2010). International and national benchmarking are based on multi-dimensional indicators. To improve the ability to predict the effects, mitigate the negative impacts and enhance programs, plans and projects from the seventies have spread out, and in some countries made compulsory assessment procedures. The forms of foreseen impact are linked to the type of assessment that have been developed over time (Environmental Impact Assessment, Social Impact Assessment, Health Impact Assessment, Strategic Environmental Assessment and Policy Assessment). Considering that impact assessment is an essential tool for the purpose of ensuring giving in consideration environmental and broader sustainability concerns in decision-making, we recognise the importance to reflect on the state of practice during smart city age.

#### **4.1 Strengths**

The generally availability of procedural guidance both in building smart city strategy and in targeted indicators are resources usable for the assessment stage. The impact assessment is required for access to funding and though it might be limited it is essential. All actors indicate monitoring as a key stage to evaluate the results, or better, an ongoing assessment in order to implement the necessary adjustments. If this is done will represent a significant step forward compared to the tradition that sees a paucity of ex post assessment.

Some smart projects are aimed at the creation, structuring and sharing data (big data, open data projects) (Arribas\_Bel, 2014). They can help improve the quality of the assessment itself, namely to improve valuation processes at the local scale. Policies reducing vehicle travel, buildings standard reducing the need for heating and cooling encouraging the use of alternatives energy sources have a role to play in mitigating greenhouse gas emissions (Blanco et al., 2009). Technological adaptations to climate change can be a product of smart city and they require evaluation criteria, principles or processes for evaluating them.

The common factor is the breakup of the logic 'local content' that still dominate the interventions at the local level of individual municipalities or public bodies, which instead should be designed at least at the level of a smart territory. This is detectable by both the municipalities awareness to systematize their experiences and knowledge and by some typical example in which the smallest municipalities have joined together to identify a shared strategy and a project.

#### **4.2 Weaknesses**

A first general observation stems from the fact that the emphasis placed on the smartness and sustainability of the process of smart city seems to come before the need to assess in advance the real effectiveness and efficiency in achieving the set targets. Referring to the 'how to assess' the choices are different according with the fact that impact assessment practice is highly variable depending upon context (Pope et al., 2013). As the projects are managed at the municipal level the mandatory assessment procedures is limited to the SEA if the smart city strategic program is being undertaken within the local plans. The indicators should be derived from a combination of local expertise and the consolidation of assessment practices and processes of public debate with citizens and stakeholders. The tools of local programming as Agenda 21 does not always have deployed their full potential, except in very few cases. Revitalize the processes of Local Agenda XXI means to increase access to community participation that may not be automatically incurred by accessibility to digital recourses.

As to the effectiveness of the assessment, having the municipalities, in addition to addressing the strategic planning of the smart city (which needs a vision) also handle everyday issues, may happen that they take ICT applications as solutions to problems. Here a less formalized assessment is more accepted. A lack of integrated consideration of broader sustainability issues within impact assessment of smart projects could be due to increasing specialisation. As a result, there may be even a poor ability to assess the cumulative effects in the case of formalized assessment procedure.

## 5. Italian case synthesis

Acknowledged the great wealth of initiatives, projects and strategic plans aimed at a smart city vision and multiplicity of cities in relationship to their size, geographical location and features, the Italian situation intervenes entirely on existing cities with comprehensive strategy but selecting a few domains of areas that need to improve urgently because of limited available resources. The characteristics of the historic urban area in the Italian city do not always fit easily to new technologies (e.g. the redevelopment of the historic fabric in energy-efficient and sustainable key has, by definition, unpredictable costs).

From all of the experiences examined one can infer that the large-scale application of ICT can not be used to hide the absence of effective public policies. Actually when this occurred the positive effects were limited; must overcome the illusion that technologies alone can generate wealth and prosperity, if they are not placed at the service of a specific idea of the city that knows how to bring out the distinctive vocation.

Decision making were almost everywhere open to the citizens, but practically never this has led to stronger and faster decisions. We need to change the manner of involvement or propose more engaging actions.

Cities need to implement the level of services offered (because of the different possibilities offered to citizens by the technologies) and decreased spending power pushes them to seek ways of making it possible to meet demand at the lowest cost.

The relationship between supply (market potential and capacity) and demand for innovation (government) has changed: we are now in the system integration time. We need new figures that can help the government to govern the supply.

Integration and system approach should be crosscutting among verticals areas of governance, combining knowledge, capacities and competences horizontally towards the objectives defined by the sustainability framework. A Smart City Project should help the creation of interconnected systems in which flows of materials, energy and information are managed coherently [e.g. the smart grid concept, which takes a sole focus on the electricity sector vs. smart energy systems including the entire energy system in its approach to identifying suitable energy infrastructure designs and operation strategies (Lund et al., 2014)]. In this context, we are seeing even within the public administration to a paradigm shift with respect the concept of innovation. It is no longer considered in terms of sectors (e.g. headed exclusively to a single department such as computer services, as frequently happened in the past), but it has become a transversal conception of innovation, understood as a process that involves and engages all sectors and a multitude of actors at different levels.

A Smart City Project should also improve dialogue between institutional representatives and citizens and it should increase the horizontal relationship inside the municipality and the interchange with other institutional and civil society entities. The sector includes companies that develop and/or integrate ICT can make the factories more 'intelligent' in terms of production more efficient and flexible, sustainability of production systems, reducing emissions and improving the safety and comfort of work environments. Being 'Smart Factory' today is a fundamental aspect for companies (especially SMEs) that want to increase their competitiveness and adapt flexibly to the challenge of a global manufacturing sector.

It is not yet possible start in a city transfer, re-use, optimization of resources, sharing of tools and technological solutions practice.

## 6. Conclusions

This work can be considered a first step contribution in order to obtain a deeper understanding of Italian smart city. The progressive smart city needs seek to balance economic growth with sustainability (Hollands, 2008). Smart infrastructure, or the use of information and communication technologies (ICT) to better manage complex systems ranging from traffic patterns to the electric grid, is a related field that plays a central role in (eco)city development. A key component is the integration of wireless sensors, which can collect and transmit information from almost any object, including utility lines, water pipes, roads, and buildings. Using sensors, advanced computer software interpret raw data to 'monitor and optimize' these kinds of complex systems. In this way, computers will 'become intelligent instruments of control, linking them to data-generating sensors throughout the planet's infrastructure,' resulting in enormous reductions in greenhouse gas emissions and wasted natural resources (Alusi et al., 2011).

The contribution of the assessment has been widely underused in the pioneer stage of familiarization with projects and smart applications in Italian cities. It actually was limited to the application of the mandatory assessment procedures aimed at achieving environmental sustainability of plans, programs and projects. Indicators for benchmarking of smart cities were developed in Italy (in the wake of European and international experience). They seem, however, limited in to allow assessment of the integration of the system recognized as one of the key processes of smart growth of the territories.

The scarce construction of comparative scenarios and forecasts, by parties who are called to give technical support to policy makers that the political turnover leads to questioning at the stop of the initiatives undertaken. Municipal statistical offices represent, in this direction, a wealth of information and skills that, almost unanimous in the opinion of the experts, is not fully exploited for the planning of urban policies. Data, their management, their interpretation, their sharing and reuse becomes one of the core issues for urban systems. Information and knowledge become the raw material and the cities can be qualified in way in which information and knowledge are produced, collected and shared to produce innovation.

## References

- Alusi A., Eccles R.G., Edmondson A.C., Zuzul T., 2011, Sustainable Cities: Oxymoron or the Shape of the Future?, Harvard Business School Working Paper 11-062, <[hbswk.hbs.edu/item/6609.html](http://hbswk.hbs.edu/item/6609.html)>, accessed 01.12.2014.
- Arribas-Bel D., Accidental, open and everywhere: Emerging data sources for the understanding of cities, *Applied Geography*, 49, 45-53.
- Blanco H., Alberti M., Forsyth A., Krizek K.J., Rodriguez D.A., Talen E., Ellis C., 2009, Hot, congested and diverse: Emerging research agendas in planning, *Progress in Planning*, 71, 153-205, DOI: 10.1016/j.progress.2009.03.001.
- Darabnia B., Demichela M., 2013, Maintenance an Opportunity for Energy Saving, *Chemical Engineering Transactions*, 32, 259-264, DOI: 10.3303/CET1332044.
- Hall J., Giovannini E., Morrone A., Ranuzzi G., 2010, A Framework to Measure the Progress of Societies, OECD, Statistics Directorate, Working Paper n.34, 1-26, <[www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=std/doc\(2010\)5&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=std/doc(2010)5&docLanguage=En)>, accessed 10.10.2014
- Hollands R. G., 2008, Will the real smart city please stand up?, *City: analysis of urban trends, culture, theory, policy, action*, 12:3, 303-320, DOI: 10.1080/13604810802479126
- Komninos N., 2006. Intelligent by Design: Technology and intelligent cities in Saudi Arabia, *Think: Global Issues in Perspective*, 9, 6-13.
- Komninos N., Pallot M., Schaffers H., 2011. Developing a Policy Roadmap for Smart Cities and the Future Internet, *Developing a policy roadmap for Smart Cities and the Future Internet, Proceedings of the e-Challenges 2011 Conference, 24-26 October 2011, Florence, Italy*, 1-8.
- Komninos N., Pallot M., Schaffers H., 2013. Special Issue on Smart Cities and the Future Internet in Europe, *Journal of the Knowledge Economy*, 4(2), 119-134.
- Lund H., Vad Mathiesen B., Connolly D., Østergaard P.A., 2014. Renewable Energy Systems - A Smart Energy Systems Approach to the Choice and Modelling of 100 % Renewable Solutions, *Chemical Engineering Transactions*, 39, 1-6, DOI: 10.3303/CET1439001.
- National Institute of Statistics (Istituto Nazionale di Statistica – ISTAT), 2013, National Demographic Balance, <[www.istat.it/it/archivio/125731](http://www.istat.it/it/archivio/125731)>, accessed 20.10.2014.
- National Institute of Statistics (Istituto Nazionale di Statistica – ISTAT), 2014, Equitable and Sustainable Wellness (ESW) Report 2013 - Rapporto Benessere Equo e Solidale (BES) 2013 <[www.istat.it/it/archivio/84348](http://www.istat.it/it/archivio/84348)>, accessed 20.10.2014.
- Pope J., Bond A., Morrison-Saunders A., Retief F., 2013, Advancing the theory and practice of impact assessment: Setting the research agenda, *Environmental Impact Assessment Review*, 41, 1-9, DOI: 10.1016/j.eiar.2013.01.008.
- Stiglitz E., Sen A., Fitoussi J.-P., 2009, Report by the Commission on the Measurement of Economic Performance and Social Progress, CMEPSP, <[www.stiglitz-sen-fitoussi.fr](http://www.stiglitz-sen-fitoussi.fr)>, accessed 25.11.2014.
- United Nations, Department of Economic and Social Affairs (DESA), 2014, *World Urbanization Prospects*, ISBN 978-92-1-151517-6.