
Preface

Modern cities require new and different codes, taking into account environmental and energy issues, pillars of contemporary urban development. The existing urban communities are highly energy consuming systems, strongly contributing to greenhouse gas emissions. Contemporary cities cannot be thought of and defined as static systems, as they were in the past, with a few urban functions. “The Church, the square and the court, the marketplace and the government palace were in the past the places where the urban functions were taking place” (Salzano 1998). Today, the reference frame has changed even due to the demographic increase more and more concentrated in the cities that are now large concentrations of streams of people with new needs.

New parameters must now be considered together to plan how to reach the desired urban *smartness* (energy, mobility, waste...).

The urban mobility, as an example, has a growing importance, since it directly and locally affects the quality of air; such as the issue of energy production, that strongly influences the planning approaches, and forces the cities administrations to guess new paths for the future development of urban settlements. Some cities in the world are getting closer to a new urban model (*smart* cities), where planning the urban functions must be carried out in an integrated manner.

In the Arabian desert new “zero emissions” cities are being built (Masdar) and in the old Europe the energy planning in cities is becoming a basic element of the urban development, with an increasing number of cities that envision their development while reducing the CO₂ emissions, increasing the energy efficiency and the production of energy from Renewable Energy Sources, as required by the EU in the “European Union climate and energy package 20-20-20.”

The scenarios delivered by cities are not always comparable and it is difficult for highly disadvantaged settlements to start a virtuous process especially in this moment of economic crisis. In Italy, some cities are setting sustainable actions for the development of the urban organization—green economy, sustainable mobility for the limitation of greenhouse gas emissions—while other cities in Italy as in other countries are not able to devise plans and, overwhelmed by emergencies, keep on thinking of city development in the traditional way.

Among the European cities some leading examples can be found. Copenhagen is the new Green Capital of Europe (2014); it is a city that has balanced

development and innovation, such as Stockholm (European Green Capital, 2010) and Amburg (European Green Capital, 2011).

The lesson learned from these examples is that cities should promote innovative mechanisms to design and manage the processes in order to improve the quality of living in the urban areas.

New rules and new codes are needed and new integrated functions and responsibilities in the city administration must be considered. Integrated plans must be devised for cities, where sectorial planning is disappearing to leave the floor to inter-disciplinary design.

Moreover, from the analysis of what exists, the cities of the future seem to be *smart* if their development plan follows the urban supply chain following a *bottom-up* approach. Energy is one of the most important elements of such chain, since it interacts with the production and consumption mechanisms of the city, influencing the choices of urban and buildings design. But not only. Soil, water, and materials consumption as well as recycling are crucial for the identification of the new functions of the city.

New rules will define the urban and building performance requirements unifying the design and building processes of cities (acoustic pollution control dir. 89/106/CEE; solar energy and energy saving dir. 89/106/CEE, 2002/91/CE, 2006/32/CE) considering also the other functions. A *bottom-up* approach to support a smart development of cities is the urban and building code.

At different scales, such rules will allow the definition of the not yet so clear boundaries between uses and functions, public and private, inherited by the contemporary urban vision. The integration of functions and the sharing at different levels in the use of urban spaces and services (public and private) should define the urban quality, in terms of measurable performance indices. Proposals and measures have been indeed till now separately formulated in different fields.

In the use of energy field, the project Address in the VII Framework Program, now at its end, has put together the largest energy distributors in Europe and has ideated a new actor of the energy market: the aggregator. The latter interfaces the small private customers with the distribution companies, creating a shared demand profile that allows to reach energy efficiency objectives for the electrical network. In the same way, in the field of urban mobility, car sharing and bike sharing are ways to share a collective transportation service, such as the use of recharging systems for electric vehicles. These systems if adequately controlled may offer regulation services to the energy distribution system (vehicle-to-grid, V2G), putting intelligently together, again, the private resources of many users.

All this motivates and gives substance to the new urban design of uses and functions for different services offered to citizens through Information and Communication Technology (ICT).

This design level allows the definition and management of the “active” urban quality. Other measures, concerning structural features, influence the so-called

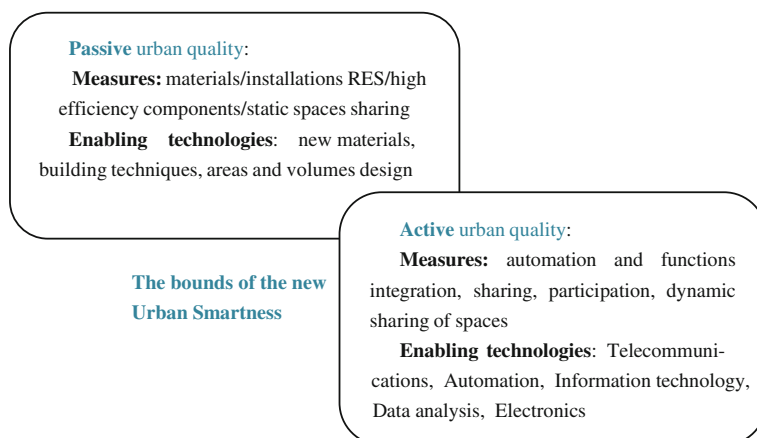


Fig. 1 The bounds of the new Urban Smartness

“passive” urban quality (materials, installations of RES based generation, etc., namely nonautomated components) (Fig. 1).

In this scenario, Italy, as other countries, is going through a deep change at local administration level: the recent experiences confirm the importance of understanding what is happening in contemporary society more and more culturally oriented towards “sharing” through the new media and what the technical and industrial communities can offer as a solution to cope with the new requirements of sustainability.

In this manuscript, a methodological approach to devise a new and *smart* urban/building code for local administrations is proposed. The study analyzes what exists and tries to set out a methodology, taking into account the regulatory framework and the economic feasibility of the proposed measures taking as case study a large Mediterranean city in Italy. Such economic feasibility is evaluated using the existing European regulatory framework (directives and technical norms). In this study, Italy is taken as a paradigm of the evolution of modern cities between historical heritage and bureaucracy.

The perspective in writing this contribution is that of a city overlooking the Mediterranean Sea in Italy, where cultural obstacles are posed by individualism at all levels against the concept of sharing resources and of attaining common goals.

Nonetheless, many local administrations in Italy have indeed already taken some steps in the direction of modifying *towards sustainability* the existing building and urban codes. It is interesting to underline how in Italy, year by year, is growing, not only the number of local administrations (+42,3 % as compared to 2010 and +80 % as compared to 2009), but also the number of different relevant issues dealt with. And nowadays, such new *smart* building and urban codes are formulated and adopted in almost all the areas of Italy, with at least one innovative building or urban code per Italian region.

The interest around a new ruling system for buildings and urban organization at local level resides in the fact that codes are fundamental for cities' development, since within codes technical and procedural aspects get merged with economic interests, social impacts, and technical competences at national, regional, and municipal levels.

The formulation of measures to improve urban quality and a way to numerically evaluate their performance are also issues to be studied.

In this manuscript two classes of measures are analyzed, those affecting the buildings and the urban settlement *passively* and those affecting them *actively*. The definition of these *active measures* is well described in the work "Smart cities of the future" (Batty et al. 2012). The aim of such measures is *to Relate the Infrastructure of Smart Cities to their Operational functioning and planning Through Management, Control and Optimisation*. In the same study, some technological tools to devise monitoring and control actions over the urban system, described as a network of services, are analyzed. Such active and passive measures are already considered in the European regulatory framework and should be organically integrated into the local building/urban codes according to the local specificity of climate, society, and existing national regulatory framework.

Since 10 years, the European Union is one of the main actors in this path to sustainable development of cities with *bottom-up* measures for the building sector, with the aim of increasing the contribution of the building sector to greenhouse gas emissions reduction and to RES-based generation support. In this context, the challenge of European directives is that to fix for the member states objectives and methodological approaches through suitable Technical norms. As prescribed by the directive 2010/31/UE (the new EPBD, Energy Performance in Buildings Directive, also called EPBD recast), since January 1, 2021, it will be only possible to build neutral buildings in terms of Energy consumption, called Near Zero Energy Buildings (NZEB), showing a very high energy performance. The nearly zero or very low amount of energy required should to a very significant extent be covered by energy from renewable sources, including renewable energy produced on-site or nearby. Another important change brought by the directive concerns the objectives proposed, that are now defined in terms of numerical performances. This means that, in cities, buildings will have to be thought of, designed, and built to reach precise and measurable objectives in terms of energy efficiency for heating and cooling, that can be reached using different available measures (active or passive) that best appraise the RES-based supply within the considered urban context. The change is enormous as compared to the habit of many existing local administrations, for which the gap filling will require educational support and an attentive communication strategy, as well as an adequate coding system, to accompany the growth of new competences, the experimentation, and the definition of protocols and rules (Report ON-RE 2012).

In the design of new coding systems, it is fundamental the economic feasibility of measures and the cost-benefits analysis to which the codes refer.

Such evaluation is particularly interesting when the increase of energy efficiency is attained through Building Automation technology. The recent directive 2012/27/UE has been issued as a compromise between the business world producing components for Building Automation and the public administrations structurally in economic shortage. This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020, 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date. According to the cited directive, the member states must elaborate an *action plan* with precise commitments in relation to the objectives of the directive. Each member state guarantees that since January 1, 2014, the 3 % of the covered surface of the heated/cooled public buildings, except the already cited NZEB, is restructured every year to reach the numerical requisites of energy efficiency imposed by the directive 2010/31/UE.

Notwithstanding the constraints set forth by the limitation to the public indebtedness (further to the principles of “stable prices, sound public finances and monetary conditions and a sustainable balance of payments” of Article 119 of the Treaty on European Union and the Treaty on the Functioning of the European Union) and the financial and economic crisis, the Italian legislator has implemented some measures to support public and private entities in the development of smart cities, including the smart (i.e., efficient) use of energy. However, nowadays, it is still difficult to turn energy efficiency actions, which at the end entails a saving, into cash flows, which can be financed and can guarantee the loans granted by the lenders. Furthermore, the credit crunch and the lack of knowledge on the side of the public and private entities (who should promote the energy efficiency interventions) and on the side of the lenders hinder the funding of energy efficiency initiatives.

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