The urban planning tools as quality control device for sustainable projects

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**ABSTRACT:** The sustainability defines and invests concepts that only a variety and integration of knowledge can be able to govern, and raise different scales in which it can be researched and caught up. In this context, the conducted experience of the Municipality of Rome is inserted which marks a very important step in an initial stage of innovation and sensibilities of the new mode to conceive and manage building participants. At the threshold of a new season of social housing the quantity requirements are placed side by side with quality research which privileges many aspects of atmospheric and technological quality and characterizes both the interaction and natural atmosphere.

1 **INTRODUCTION**

In the last twenty years the City of Rome, like all other administrative bodies of big European metropolitan areas, has had to confront, in many historic moments, the problem of living conditions and the problem of a strong demand for social housing in response to the housing needs of many parts of the population in marginal social or economic conditions.

The City of Rome confronted these questions through the actualization of the Plans for Populate and Economic Buildings in which was determined the quantity of buildings to construct; in particular the 2nd PEEP promotion in 1985 was redefined and refinanced many times until 2005. At this point the City, due to indications of regulations oriented towards the reduction of “housing needs” (Law 8 febbraio 2001, n 21) deliberated a new series of measures to put into action a true and actual Plan for Emergency Housing. To carry out this plan the City individualized different initiatives through which it promoted the transformation of 36 internal areas of its territory. In these territories it promoted the operational town planning, the local urban planning - Zone Plans (Piani di Zona - PdZ) which is preliminary to the operative projection of the building interventions and necessary infrastructure for the realization of new residential installation and their services. On these occasions, a capitalization phase of quality definitions of planners that were ready to go onto the territory in a way that supplies the citizen with an offer of services and residence that doesn’t satisfy only a question of quantity character, but also responds to the major ambient quality of the housing aspects, was supported.

To have the ability to carry out this proposition the Administration proposed an addition to the traditional structure of actual urban planning the “Code of practice” as a guide to the projection of future installations to realize; the Code will gather and put at the disposition of the planners and promoters of future installations, all of the indications and tools for the definition of a integrated project strategy, to control the global quality of the operators. In this way from the traditional indications of relative technical regulations to the realization of residential buildings it is possible to add a system of best practices, innovative indications, ambient quality and the realization of the energetic and ambient management of the sites and the buildings, with the knowledgeable use of technological solutions orientated towards the complex bettering of the performance of the building and of the urban complex.
1.1 Needs of quantity and demand of quality. Strategies of qualification of the project of residence.

The housing market always reports a situation of emergency due to the gap between the supply and demands of housing, in particular the social housing market. Facing a requirement of social housing at a relevantly low cost, with the ability to generate new situations of poor and profound social marginality, the market of residential buildings is proposing at the medium and high level, with factors of growth very relevant, to look at the private market and at a set of requirements and questions however resolvable.

In both cases, that which faces the social requirement of quantity character and that which articulates more the demand of quality in the privat market, the market responds with one equalizing and logic definition on the very traditional technological definitions and with typical solutions blocked - also due to current regulations- offers as an added value of extra-supply of space or equipment. Facing this solid report between supply and demand for housing on the market it is possible to define that the needs of quantity spring from the perception of the inadequate quantity of the existing housing stock, while the demand of quality springs from the knowledge of the necessity to establish a new report with the acclimating neighborhood, on the scale of the building and the urban complex.

The quality is not an objective characteristic, neither is it the qualifying characteristic of a product, instead it is the response to the expression of a need. Therefore a new question of quality presupposes one that is non satisfactory to the users in comparison to the actual building stock; when speaking of the quality of an architectural or urban project it’s level of quality must be discussed and the level in which it responded to the need it generated.

It is possible to acknowledge two different levels of quality of a project: the definition quality and the realization quality.

The Community Administration intends to go exactly in this direction with the planning process for the included interventions in the new Zone Plans, where giving the guideline to better the project definition quality of the participants and the building quality level will create a more fine and complex control tool for the function of the expected performance. In this occasion all of the regulation indications up until today can also be made operative in an organic mode from the City with single measures and with the new regulations of the General Regulatory Plan with merit to acclimated sustainability of the building participants and also going over a certain traditional rigidity of the same urban tools with vigor.

The “Code of Practice” is configured as a supporting tool and direction for the realization and control of sustainability for building constructions, in particular social housing, proposing a highly integrated approach to the planning. The Code faces the revision of the answers to the housing requirements in terms of economic, social, functional, acclimation and energetic sustainability. These schematic propositions of typical innovative useful aggregations to the creation of urban spaces are analyzed in terms of both the comfort of public spaces, and as a functional and social mix in a way that obviates to the phenomenon of social and economic segregation which is typical of metropolitan peripheries.

The Code also faces the appraisal of appropriate technological and proportionate solutions to the typical buildings to realize in a way that doesn’t make them different from the realized approach of the local promoters, asking a level of higher finalized technological performance for the acclimated support of the participants. The analysis of the innovative technological solutions for the realization of the residential buildings is studied deeply including the study of the construction materials to use in such a way as to orient in a knowledgeable way the choice of the constructive solutions and successive control in phases of realization through exercised management. With the same logic, the most appropriate system devices for efficiency in light of the indications of recent regulation matters of control and energetic management, were analyzed and valued. To support these indications the Code proposes an integrated model of analysis of the sites that are being intervened which comprehends all of the acclimated aspects and the characteristics of the single sites, to internally bring to the project and planning strategy, the indications coming from the natural and cultural characters of these places.
1.2 Modes of integrating the coded solutions in the design of the building.

The sustainability of a realization and the quality of the construction from the energetic point of view depends on various factors but for the most part how the building comes to be realized.

The reflections of the technological aspects of the building organism is reflected in the transformations, sometimes profound, to which it is assisted: the new material introduced in the market is added to conventional technology, the new and elevated performance levels asked for are confronted with the behavior and functional schemes to live contemporarily.

On one side is derived a performance of major operative clarity in the orientation the adoptable planning choices, and on the other side the importance of an explication of criteria that sub-tend the choice of the technological solution privileging an alternative in respect to the other. In particular, it is necessary to place particular attention on the definition of the superficial and border elements through the external and internal ambience outside building, which determine the requirement of the building and respond to the necessity of the users that will live there.

On this theme the most evident aspect is the emergence of acclimated and economic advantages that indicate not only the external ambience, but places first the user’s quality of life. The adoption of new rules and new prescribed performances will bring a reduction of energetic consumptions for heating and air conditioning therefore a sensible reduction of electric bills (installation of air conditioners, installation of hot water production for hygienic use, electric installation) in the course of the useful building life.

On the other hand the atmospheric advantages are a direct consequence of the bettering the efficiency of the building and its installed systems: less consumption of combustibles in fact transform into less emission of gas into the atmosphere and a smaller impact of usable materials in the atmosphere.

The theme of eco-efficiency will be attacked head on instead of just from the side through the technological quality that the technical solutions will be able to guaranty. The importance of management in a building evidenced through the objectives. The European advice of spring (OR. EN 7224/07 of March 8th 2007) is retaken by national (Legislative Decree 311/2006) and local regulations(Del. 48/2006 City of Rome)- underlining an ulterior element of reflection: the constantly growing role and weight of installations in the management of building stocks. Inserted in this discussion is the growing incident of necessary alternative installations to sustain buildings, looked at more from the point of view of initial costs than the dimensional impact of the same on area building objects.

The elevated requests to use renewable sources and the request to reduce energetic consumption and CO2 emissions into the atmosphere, translates mostly in the necessity of thinking towards the installation integration intended as a source to reduce the energetic demands of the country and of co-generation able to guaranty positive economic returns in the conduction of the buildings.

In this context, the existing ties between the installation systems and building wrapping systems assumes particular importance: every choice adapted in one of the systems weighs significantly on the projection and dimensions of the other.

The most evident aspect of evolution towards the regulatory picture to the government, is that of building activity and the beginning performance demand and of a virtuous behavior that can prime a “normal” practice of knowledgeable planning of sustainable energy and atmosphere.

This brings value not only for the immediate cost but also and overall for those projected in the future respect at any of the fundamental components such as health, efficiency, the length and maintenance that will continue to be valued case per case in single projects with merit to the urban context of the building.

The choice of the planner will definitely be that of finding the solution most adapted to the internal combination of many conditions, opportunities, and ties that are reference places to the climatic characteristics of the site in the evolution of the seasons during the course of the year, with a control of the external part of buildings in relation to their orientation and to the activity carried out in the internal part, which- in virtue of the errors of the past- attributes to the morphological quality of the buildings and the peculiar character that counter distinguishes the history of every place.

The problems of invested sustainability in fact is that more disciplinary ranges reserve and pretend that it is considered their interdependent reproach.
In light of the last consideration, atmospheric and technological requirements of the government as well as the answer to the same are both indivisible objectives which are attached in respect of coded architectural language and expressed to the single culture.

Within the innumerable contemplated aspects in the concept of project sustainability, the aspects that relate to the different needs of every country (town) is not diminished. This theme which in the past was in part hidden, lead those which were problematic so that the actual recovery activity of the buildings, tries in a diffused manner to overwhelm.

The monotony, the repetition and still the absence of attraction of the buildings in the recent past, as much in Italy as in other European countries, are the evident results of an approach to the extirpated project of the text in which it was inserted.

In prospective of this “virtuous” planning orientation in the residential buildings, new realization is assisted by research of coverings which are characterized by innovative forms under both the technological and formal aspects that push the planners towards an attentive analysis and flexibility experiment in concepts of both research of new rules for the coded distribution of flexibility concepts and in research of the coded distribution of habitable spaces, lastly importing often constructive techniques of other types of buildings.

The technological transfer of some solutions coming from analogous building sectors is conducted from an increment of its repertoire and the performance of the systems that are offered, to the introduction of material that is more or less sophisticated and has the ability to satisfy the performance levels with a minor impact on it’s environment but not always easy to control in time.

In this historic period, it is renown in fact that there is an industry of construction with the ability to always offer new products which gives the planner many choices from a catalogue of elements which are more or less complex.

Following this last consideration derives the fact that the more the components become complex the more they are composed of single layers, or sub-elements; on the other side it is stabilized so that as much more of the technical element performance is the sum of the layers single performance and this will be mostly important to control the final technological quality. It will also be necessary to verify an analytic method, which will be the performance which responds better to both the need and actions that define the needed picture of the residence, and the priorities with which computably design the objects of the effective sustainable plan.

This is then observed as the external wrapping of one of the appointed principle places to respond to the building project’s sustainability. At the same time the elements that compose it are called to satisfy in a coherent manner all of the aspects that are of volumetric and spatial composition of the building was not able to respond.

The research of the wrapping elements has therefore conducted, at a moment of reflection and analysis, the morphological characteristics and the specific performances of the significant and adoptable thought solution.

Due to the large variety and complexity of the systems and elements it is believed effective the internal predisposition of the “Code of Practice” as a tool of complex-methodological guide and support for the choices to carry out, through which individualize and at last prefer the thought solution which is most adapted to the internal technology actually available.

The new manner to think of technological sustainability is looked for in the acknowledgement process of the values of architecture and in the adoption of a new planning method appropriate to the transformation of the natural environment in man-made environment turned to a new more knowledgeable community.

A similar approach modifies the projection of the technical elements, which must be thought of not only as a connection and or separation from the other elements of the building system, but also effectively “integrated” thanks to an interdisciplinary involvement of various specialists involved in the planning process.

1.3 Construction materials. Product and process innovation for residential buildings.

The “Code of Practice” for the Zone Planes of the city of Rome previews a reasoned appraisal of construction materials to employ in the realization of the participant; the appraisal criteria doesn’t aim to construct an abacus of it’s materials or suggest less use for these buildings, but intends to supply tools to the person who will plan and realize these buildings and to chose the
material and the constructive solutions in a way to give an answer to a system of technical individualized requirements as determined for the effectiveness and the sustainability of the proposed solution. The choices to use less of a determined product comes accompanied through a few different criteria for selection which are defined to satisfy the necessity to obtain good performance of the physical-technical type but at the same time guarantee a low impact on the atmosphere.

The parameters of the proposed appraisals are constituted in part by measurable elements, comparable to the quantity level, and in part derive from the comparison given numeric consideration of quality character.

The appraisal is computed on materials able to guarantee performance of good thermal and acoustic isolation; the materials are entrusted and capable of creating comfortable atmospheric conditions in the internal habitation space at a perceptive and sensorial level. In particular, the choice proceeds through three successive levels.

The first level is through the reading of numeric value of thermal conductivity preferring material of low value of thermal conductivity which obtains technological solutions with greater insulator capacity.

The second level examines the volume mass of the material. In the climatic conditions of Rome, a high amount a mass guarantees comfortable internal living conditions contributing to the happiness of energetic consumptions, supporting and in certain cases rendering superfluous systems for cooling the atmosphere.

The third level of evaluation is based on LCA (Life Cycle Analysis) and the PEC value primary energy consumption. Through the LCA the complete life cycle of the material is valued, from the supply of the first materials to the realization of the concluded document manuscript; to value the LCA of a material multiple aspects are examined, some of which can’t be directly measured and confronted. In particular, the force of primary energy (PEI) offers a partial value of the product’s like cycle. This constitutes an ulterior parameter of comparison; it is always preferable, when possible to use a material that is able to develop a low consumption of energy in productive phases, because of the total minor impact in the surrounding atmosphere. Some synthetic insulators for example even having a good level of performance of thermal isolation are characterized by a high consumption of primary energy: in their place should be preferred insulators of natural (fiber glass) or vegetable (wood fibers) minerals.

1.4 Systems of integrated sustainability

The “Code of Practice” for the Zone Plans of the city of Rome previews a reasoned appraisal. A good architect depends on the knowledgeable energetic choices. The role of the architect, in this
optical, has to necessarily make itself larger towards the planning of integrated type, even if the specific object of the projection is the planning of the city or the scale of the industrial design. Underlining the importance until the end of a logic planning in terms of analysis and requirements, request appraisals, optimization of performances is to considered incoherent anything in architectonic participation that doesn’t look for an equilibration between the building system and the atmospheric system in which and on which it burdens.

**Figure 1.** Climate evaluation diagram in Rome. The multi-parameter analysis of the factors represents the correct interpretation of the climatic phenomena and the synergies between each other.

**Figure 2.** Example of punctual application. Analysis shows on polar solar diagram the direct influence among the point of analysis and the urban context represented by the surrounding buildings, translated in terms of factor of shadowing. Software used for the realization of the shadowing masks: Ecotect.
The experience of the “Code of Practice” for the Zone Plans of Rome explicitly inserts into this logic: organized sequence of work phases in which every option either punctual or systematic is a consequence of the analysis of the climatic variables and their possible synergic interaction in key projects. Parameters, climates, typical models, confirmed technical solutions, requirements, technical norms, synergy and compatibility matrices all assume a wide internal value of this research, in full coherence with the objectives of the program.

In specific themes of methodology, as revealed with the climatic analysis, the use of Ecotect software is placed side by side (with much attention of the Weather Tool module) with the traditional bibliographic research.

The idea on which the entire study of the “Code of Practice” is structured is the following: analyze the potential of an ambient building system, individualize the eventual compatibility or critical with the technical possibilities present on the market. A fundamental role therefore is to assume the same concept of compatibility, intended in its own wide sense, technical, economical and destination of use which is relatively and normatively tied. To delineate a process in this sense imposes inevitably a preliminary survey in merit of the characteristics of the urban climate, but implicitly signifies also to inquire the technical performance of the functional models of wrapping buildings successively defined as compatible.

The objective is to draw from the valid project indications on both a scale of the neighborhood and the scale of the single building: which is not limited to one vision with the phenomenon in general and quality keys, but to suggest, actually impose a specific deepening where it is verified the conditions of particular attention. These intentions are translated into concrete; by means of punctual appraisal the adoption of methods that verify and consolidate for what that prevalently concerns the solar radiation. It is a merited choice to deepen that climatic parameter in other regions: in the first place the solar radiation is configured on a scale of the whole building, as major significance in relation to passive performance of closure packets and to the potential in terms of unduly influenced solar systems. In support of this position it is necessary to underline the analysis of climate data already on the urban scale, for example, the code has concurred from the beginning to exclude an approach on the theme of energetic optimization in keys of exploitation of Aeolic systems; the reviewed data clearly show that the Aeolic phenomenon are substantially negligible for what concerns intensity and frequency in the City of Rome. The analysis of solar radiation at a complex urban level gives quality indications of external spaces for buildings of divided public spaces of the project.

The promotion of an integrated approach to the sustainable projection is translated therefore in the suggestion of multi-level intervention strategies that take into consideration the possible projection interactions between all of the elements of the interaction between the urban and natural atmosphere.

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