LOCAL SCENARIOS DEVELOPMENT FOR THE IMPLEMENTATION OF ENERGY-SMART STANDARDS IN NEW URBAN AREAS

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The achievement and maintenance of optimal energetic levels for the building sector is based on a regular assessment of the energetic performance and of the implementation if the buildings energetic efficiency.
The main results of a shred energetic approach can be expressed as local environment policy. New intervention strategies using an energetic scenarios approach for the reduction of energetic consumption and for the increase of renewable energies in the building sector was elaborated during the Strategic Environmental Assessment (SEA) of Town Plan Scheme in Faenza.
Up to now this approach has been used in Europe merely on macro-scale and the Faenza experience represents one of the first examples of urban-scale adaptation.
The scenarios are an alternative to the traditional bottom-up models that select only technological options, since they propose as a model that has to confront with the interaction of energy, society and economy in its realisation.
The scenarios characterisation occurs through the individualisation of the performance indicators: the numeric value given by the indicators is the reference to achieve.
The energetic scenarios Low and High built for Faenza represent the strategic horizon where the city will be able to choose its own consumption model and the related emissions.

Keywords: Energy smart standards, building sector, participatory scenarios, SEA directive, environmental design.

INTRODUCTION

The city of Faenza since '90s has developed a political strategy oriented to the environment and energy . The City Plan (1) has received in 1998 the ENEA the national award for sustainable urban planning.
The study of the SMART standards (2) performed in Faenza, wants to complete and give new inputs to the "Sustainable environmental and territorial Survey and Evaluation of the City Plan variant 14" (3) came out using the SEA[1] procedure.
The purpose is to provide a series of environmental standards and performance indicators that will make the new buildings conform to the best national and European standards of consumption, emissions and sustainable planning. To achieve these objects it was performed a series of extended studies and analyzed international, European and national excellence cases and experiences.
The determined standards will represent a real town-planning standard the not-reaching of which will make it impossible to build.
Throughout the selection of town-planning standards it is intended to get over the logic of environmental interventions connected to a mere environmental aspect. It is meant to implement the cultural transit from the environmental consistency of a singular building to the one of the entire city.
Scenarios is the model proposed so that the Administration could decide its own standards. The selection phase of the standards whose effects are simulated by the

[1] The Strategic Environmental Assessment (SEA) Directive is adopted, On 31 May 2001 EP and on 5 June 2001 the Council formally adopted the SEA Directive 2001/42/EC. The text of the directive was published in the Official Journal L197 of 21 July 2001, page 30.

scenarios, can be the objective of the entire local community participation.

THE ENVIRONMENTAL COMPONENTS TREATED

The environmental components came out from the study of the "Strategic Environmental Assessment (SEA) of Town Plan Scheme" in Faenza, object of new standards definition are:

A. Energy
B. Water
C. Permeability
D. Urban green areas, parks and ecologic Network

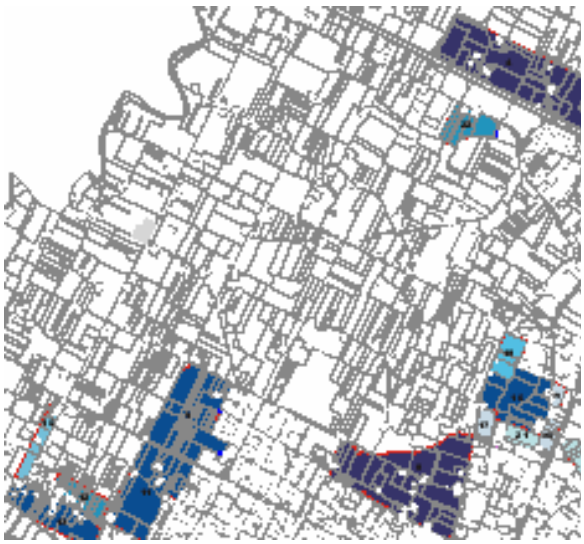

Figure 1: Faenza City Plan, Variant 14

For each of the analyzed components the task was organized as follows:

• Introduction: short general introduction about the examined theme together with a brief preface.

• Methodological approach: way of dealing with each of the selected environmental components.

• Normative: collection and examination of the international Agreements and Directives and of the main regional, national and European reference set of laws.

• Current Scenario: selection of the data about environmental resources consumption and exploitation averages concerning the treated themes. This research is performed through the achievement of data related to the European, national, regional and local averages in order to provide knowledge about the current trends. The current scenario formulation makes it possible to parameterize and compare the averages of Faenza with the current trends of the examined contexts.

• Excellence Standards: selection of the international, European and national standards employed for the reaching of the environmental objectives of the different environmental components treated, that represent excellence and reference cases.

• Strategic Scenarios for Faenza: reference and programming tool for planning the approach to the environmental themes treated in the new built areas. The scenarios are set to make it easier the comparison with the current scenario and to be a strategic support for the Administration's programmatic choices. The definition of the attainable purposes for each environmental theme is related to specific performance indicators. According to the collected data, two strategic scenarios were set:

A. Low Scenario: it determines the most reachable short-term environmental objectives, this scenario prefigures a framework for the environmental policy realization mainly aimed to the adjustment of the Faenza Current Scenario to the European standards and parameters.

B. High Scenario: it determines the medium/ long-term environmental objective consequent to the acceptance of European excellence and environmental high-quality standards.

• Simulation Scenarios: enforced to the PRG variant 14, they represent the simulation of the High and Low Scenarios applied to building transformations previewed by the submitted to Valsat variant.

• Practicability Forms: display the measures that make it possible to reach the Co2 avoided standards.

The scenarios realization provides for the monitoring through the adoption of specific indicators selected for each examined component:

• ***Indicators***: list of the performance indicators that can be used for the theme and

selection of the useful indicators for the Faenza case. The indicators give a precise summary of the current situation and are critical for the monitoring of the actual realization of the proposal: without an adequate check it will be impossible to identify the accomplishment of the prefixed objectives. The environmental indicators employ make it easier to describe the environmental performances because it allows to convert the raw data into easy to understand information for the public. Therefore, the organizations can easily quantify and report data about the environmental performances and manage their environmental aspects and impacts. Moreover, the interest about the environmental performances is rising in the agencies that supply commercial information or in the financial consulting companies.
The solutions practicability for activating the scenarios depends also upon the existence of examples and good practices used as reference:
• *Good Practices*: collection and analysis of some of the best practices already applied in Europe and in Italy to determine the modalities of organically answering to the activation of the Strategic Scenarios, to the environmental standards and to the selected performance indicators. This section means to confirm, once more, that what proposed is not an utopia, but a reality that can be performed in many cities.
In the strategic scenarios selection it will need to allow for the environmental but also political context, asking some basic questions:
- What are the main environmental aspects and impacts to intervene on?
- In which sectors can the best results be attained?
- In which sectors can the costs be reduced thanks to the environmental improvements?

The selected Scenarios must be conform to the principal political priorities about environment that will have to be set off:
- How and how much is it possible to influence the environmental local or regional conditions?
- What are the main environmental problems in the current political debate?
- How much do the requirements external to the Administration and the market requirements influence the choices?

Figure 2: Location of the territorial context

The Administration choices must affect the environmental management courses. The objectives that do not concretely contribute to the changing and to the management and will not be included into the current management, will have a scarce influence on the performances improvement.
Only the standards that will be pursued allowing monitored through specific indicators verifications will represent a real step forward from the current situation.

THE SMART STANDARDS

The tool used in this study to reach the energetic-save and production objectivess through renewable energetic sources, will be based on the definitions of standards that will be called “smart standards”, consisted of physical regulations.
With the smart standards introduction the objective is setting an energy consumption limit and reaching alternative energy production sources. The value to be reached is esteemed from international courses, the main European, international and national reference set of laws, the market opportunities, the best practices and the excellence cases. Administration will choose the standards and the adoption programming timing.
If, for example, it is established that a 50% of the used energy will have to come from

renewable sources, the Administration will be able to decide if improve, in the short and medium term, a source instead of another (solar thermic, photovoltaic, biomasses…), if privilege a technology or a combination of the various alternatives and, in this case, if a percentage of each must be defined.

LOW SCENARIO

The Energetic Low Scenario provides for Faenza the consumption control and the energetic effectiveness in the new building improvement, with reference to the normative application. Respect to the current scenario the low scenario leans to determine consumption limits that can be translated into town-planning standards.

The average **energy consumption** in Faenza for residential sector is currently higher than the national average. The low scenario provides a substantial reduction of this value, object anyway accessible because connected to the new town-planning.
In the following chart (Figure 3) are reported the energetic per capita consumption data in kWh/sqm per year for Italy, Emilia Romagna and Faenza; in purple the Italian law (10/91) and the standards already adopted in France, Germany and Sweden.

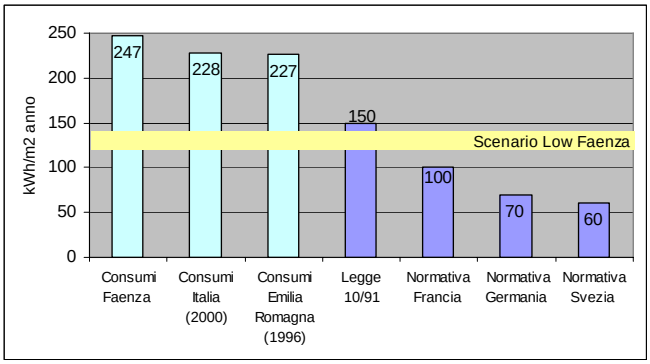

Figure 3: Energy consumption - low scenario

The target to reach is 120-140kWh/sqm per year. This value, whether introduced into a low scenario, involves anyway a substantial tendency inversion and a reduction of about 50% respect to the conventional Faenza buildings average.

For the energy production through **renewable energy sources** Low scenario definition (figure 4) it was made a reference to the limit values provided by the White Book, by the normative 77 of 2001, by the BEI and the German normative; in blue the current situation in Italy.

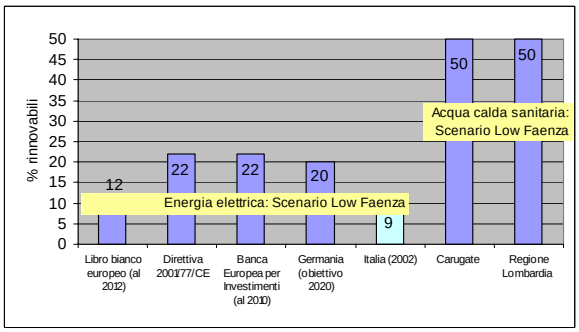

Figure 4: Renewable energy sources - low scenario

The determined standards mainly involve the sanitary hot water production with usable technologies that by now preview short time return of the investments. The electricity production provides the realization of measures that will bring the city near to the UE White Book indication.
Briefly, the percentages to be reached for the implementation of this scenario are:
- Sanitary hot water production: guarantee the covering of the annual needs of sanitary use hot water not below the 30%
- Electric energy production: electric energy produced by alternative sources not below 10%

HIGH SCENARIO

The high scenario provides a substantial adjustment to the excellence national and European standards, for which there are good practices of reference.
For as concern the **energy consumption** it is to move into a national and international framework having as reference the set of rules of Bolzano, Hamburg and the most advanced objectives detected by Austria and in some districts of Friburg, Hannover, Ludwigshafen.
Inside the high scenario (figure 5) dominate not only the objective to answer to the most

updated normative on energy-saving, but also the objective to align to the standards of low energetic consumption buildings.

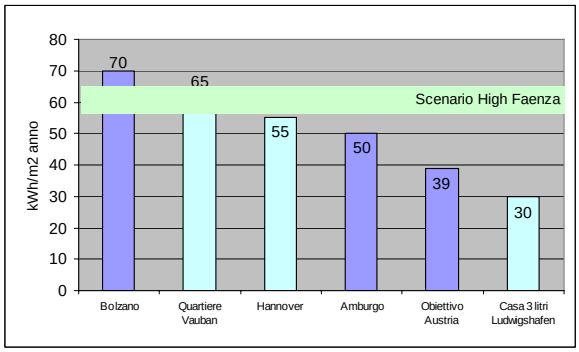

Figure 5: Energy consumption - high scenario

According to what previously outlined, this object is 55-56 kWh/sqm per year.
This value, whether far from the most advanced references (20-15 kWh/sqm per year) set by the passive house of the international Energy Agency, is currently an ambitious object to point at for Faenza, because it involves a strong consumption reduction respect to the conventional buildings average in the town: actually a 75% reduction.
For the **renewable energy production** (figure 6) the percentage of renewable energies to be used for the electric energy production is distinguished from that of the sanitary hot water. In the first case it is showed the object of IEA and the value reached by Varese Ligure also reported as good practice; for the ACS it was referred to the set of rules already adopted by Lombardy region, by towns like Barcelona, but also by small towns like Carugate.

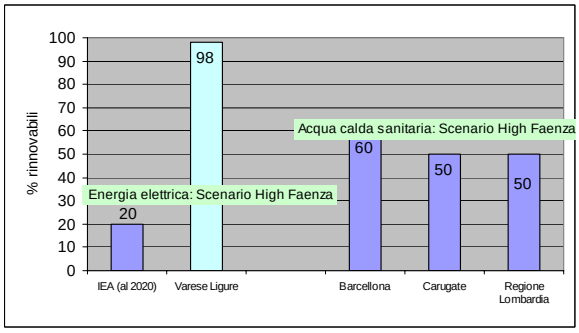

Figure 6: Renewable energy sources - high scenario

According to the reference data listed in the previous sections:

- Sanitary hot water production: guarantee the covering of the annual needs of sanitary use hot water at least of 60%
- Electric energy produced by alternative sources at least of 30%

The realization of the strategic scenarios kept as reference the activation of the town-planning interventions related to the areas provided by PRG variant 14 realization. In the Survey and Evaluation studies it was realized some evaluations to calculate the consumption that would be had in each area according to the city average consumption.

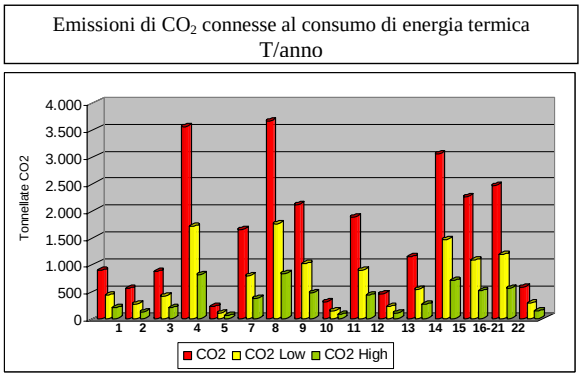

Figure 7: CO_2 emission for thermal energy consumption

It was considered the per capita natural gas consumption per year of 1.800 mc/inhabitant/year in the residential sector, 1.500 mc/employment/year for the productive sector and an electric energy of 1.133 kwh/inhabitant/year. The CO_2 evaluated emission connected to the scenarios, are for the thermal use 25.789 ton in the conventional scenario, 12.353 ton and 5.906 ton for the high scenario. As shown, the application of the smart standards could promote a drastically reduction of the consumption and of the related emission in the building sector.

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