Sustainable architecture, a comprehensive approach: the case study of Villa Fastiggi’s neighbourhood, Italy

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ABSTRACT: The need for widespread diffusion of sustainable development principles in everyday building practice is a main E.U. target. Despite this theme has great importance in all major institutions, and despite increased consciousness by end users, its integration in “ordinary architecture” seems far from being achieved. This short article explains through a real case what can be done today in Italy and Europe, contributing to make sustainable architecture a common practice. It describes a sustainable project of a new 300 dwellings complex, located in a 15 ha area in Villa Fastiggi’s neighbourhood, Pesaro. This article also explains the difficult and stimulating process through which the project was born.

INTRODUCTION

Sustainable architecture is actually a promising subject but far from concrete realization. Fortunately the development of ecological conscience in users, nowadays confirmed by the interest of many local and international institutions, contributes to expand sustainable architecture toward the right direction. Moreover, the diffusion of sustainable practices in architecture and building trade is among European Union priorities.

This short article explains through a real case what can be done today in Italy and Europe, contributing to make sustainable architecture an everyday practice. It describes a sustainable project of a new 300 dwellings complex, located in a 15 ha area in Villa Fastiggi’s neighbourhood, Pesaro. This article also explains the difficult and stimulating process through which the project itself was born. Actually it would not be correct to speak about sustainable building if there was no communication about the planning stage and the building process.

The experience described below was born from Pesaro’s municipal administration desire to adopt sustainability as guide criteria for the construction of a considerable building complex, established by Villa Fastiggi planning scheme [1].

Afterwards the project was included into the “SHE” European program [2], and now it is one of its pilot project. The target of Villa Fastiggi’s experience, which is still in progress, is to reduce the gap between experimentation and practice, to test theoretical rules of sustainable building through comparison with market reality, authority and local agency’s restrictions, designers’ customs and answers by final users.

Last but not least, this has been an opportunity to test Pesaro’s district regulations on bioarchitecture, wrote with author contribution, to improve and adopt them within the year 2004. In coherence with a site driven approach, the new regulation tries to define “performance goals”, rather than to impose fixed structural models.

This professional experience is an example of how it is possible to face up to the complexity of a sustainable planning process. Probably the results would not be as impressive as experimental project ones, but sure they will be reproducible on a larger scale; for this reason, they can be more effective in term of environmental benefit and cultural growth. A new epoch for experimentation is born, where sustainable planning, building and living try to assert themselves as a standard.

TARGETS AND DESIGN COMPREHENSIVE APPROACH

The intervention on Villa Fastiggi’s neighbourhood pursues an alternative vision of planning, since it includes sustainability as essential condition. From a sustainable point of view, the new building complex has considerable interest: the neighbourhood typical urban identity and the deep-rooted traditions have to be preserved from potential negative impacts coming along with such a big intervention as the one foreseen by the town-planning scheme. For this reason the project tries to impact as less as possible on land and urban context, it strives to solve important problems and to maximize positive aspects.
Therefore this project aims to cross its own borders and to become a leading model for other interventions in the whole Villa Fastiggi’s area, resulting in a better quality of inhabitants life.

All project’s phases have been carried out with a multi-disciplinary and multi-scaled approach, according to the rules of participated design, which is a main concept of Agenda 21 [3]. The workgroup has started a dialogue with stakeholders, especially with municipal technicians and the district agency, in order to define a procedure to adapt sustainable building targets to local context.

The project first stage was the “site analysis”, which is the study of strengths and constrains offered by territory and the consistent definition of project specific targets regarding environmental protection and rational use of resources. The elements pointed out by site analysis and taken into account by project are: geological and hydrogeological characters (Villa Fastiggi’s area lies on an alluvial ground); acoustic and air pollution due to a wrongly handled traffic system and to industry; vegetation; hydrological and hydraulic physiographic characters; perceptive characters.

General objectives of the project are (Fig.1):

- to integrate the suburb to the east of Villa Fastiggi with agricultural countryside, urban area and a forming river park;
- to create a green area with cycle and pedestrian tracks to become a city park for Villa Fastiggi;
- area conversion and qualification for business activities instead of industrial and handcrafting ones;
- creation of a cycle and pedestrian route system aiming to improve Villa Fastiggi’s viability;
- to avoid that some dwellings cast shadows on others during coldest months, to correctly distribute internal environments in relation to sun-air impact;
- to consider water saving and reuse, elaborating a design strategy that takes into account all physiographic aspects, that guarantees from soil waterproofing and enhances a vegetation with low water needs, and that provides for installation of water saving systems;
- to reduce overall energy consumption by means of different strategies, including efficiency in production and distribution phases, use of renewable energy and water reuse.

These goals have been achieved with a set of integrated design choices, each one producing multiple effects.

Figure 1: Scheme of the project objectives arisen by the site analysis.
Green, bicycle and pedestrian circulation system

The green, bicycle and pedestrian system is one of the project characterizing elements. There is a core idea, which is the realization of a city park in Villa Fastiggi. Then it could be said that the building system arises as natural result from the green project.

As the first step ended, the park is now object of a participated planning process, that brings together neighbourhood denizens, municipal administration, interested institutions and designers. Common objectives are: protection and requalification of site conditions; it cleans and oxygenates air; it is an element of socialization and participation during design activity.

The cross-shaped green system is a connective element for the project area and it has multiple functions: it is the starting point for cycle and pedestrian tracks; it connects the different project areas; it integrates the new building complex with city and agricultural countryside; it regulates microclimatic conditions; it cleans and oxygenates air; it is an element of socialization and participation during design, maintenance and management phases.

Water was a relevant aspect during park design. In fact, pre-existent ditches were recovered and brought out, the most important of which flows into an artificial basin that offers a special landscape value.

Inside the park there are relax and playing zones, but also in assuring their quality: space has expected; elements of furniture and minimum equipment where expected.

The project, acquiring the town-planning scheme forecast on road traffic, provides for two settling section each one with independent access. Two north accesses will be realized subsequently to the realization of a connection outside the built-up area, so they will relieve other accesses of vehicular traffic.

Cycle and pedestrian tracks are shaded and divided from car traffic by tree-lines. Tracks have been diversified, creating a main system that quickly connects houses and admittances to the park with work places, schools and main services. The project provides for extending protected tracks to the outer subdivision, granting an easier mobility to Villa Fastiggi's inhabitants.

The buildings and square system

Too frequently evident inconsistencies arise due to project division between settlement scale and architectural scale. Beside other reasons, there is negligence in leading the delicate scale change, which can be caused by designers indifference towards buildings important role in urban qualification: design phase cannot be resolved with a self-referring aesthetic and functional vision.

Design Team is trying to handle this crucial phase using planning tools with the best proficiency, and focusing attention on defining functions and services of each settling system element. In this way arose the idea to define "external environments". For every external environment, technical rules describe: involved external space; public function or use of space; guide lines assumed for space design; natural and environmental emergencies to be kept and set off; the kind of soil; treelike and shrub species expected; elements of furniture and minimum equipment where expected.

Through the description of the external environment there is also an attempt to design the urban function that each element (building, square, garden, etc.) has to perform, even if designed and realized by different people in different times. The external environment, together with the most traditional definition of fixed lines, heights and other general rules, is essential to give quality to urban space.

With regard to external environment, particular care has been taken not only in placing public squares, but also in assuring their quality: space has to be suitably bordered, recognizable, protected, and strongly characterized by bounding buildings.

In buildings planimetry and altimetry distribution, it was taken care to assure solar lighting to all houses, through brought shadows control, good exposition and the integration of the new settlement with eastern countryside.

Car routes

The project, acquiring the town-planning scheme forecast on road traffic, provides for two settling section each one with independent access. Two north accesses will be realized subsequently to the realization of a connection outside the built-up area, so they will relieve other accesses of vehicular traffic.

Internal roads, totally separated from cycle and pedestrian tracks, are designed to allow speed limit of about 30 km/h.

Deciduous-leaved trees cast shade on roads and on near public parking lots, while private car parks are buried. A meaningful reduction of urban works produces ecological benefits and can free resources for the realization of a bicycle and pedestrian route system.

The local intervention is part of a requalification project involving the overall Villa Fastiggi's road system, aiming to organize the neighbourhood as an
organic system of alternative ways to the use of car tracks.

Requalification and reconversion of the industrial existing area

The proposal, made by Design Team, to modify the town-planning scheme changing the marketing destination of the southern area, at the moment used as industrial area, has particular planning importance.

The idea was born observing that after its realization the new residential settlement would turn out incompatible with current activities: they produce acoustic and air pollution, directly and also indirectly, through the induced weighting traffic. A conversion of the marketing area would have multiple positive effects: it would move the marketing barycentre to the east, to more accessible zone, relieving some traffic of the middle zone and taking up the traffic produced by the new settlement urban traffic. The air quality should improve and the risk of pollution dump into existent ditches should be avoided. When the future commercial centre will be realized, it will overlook on the park, making a connection between new and old buildings. The requalification and reconversion of the area are considered in a positive way by the municipal administration; a feasibility study, made by the author, is now in progress and it will be an element for future town planning.

Water resources

During planning phase particular attention was paid to water conservation and reuse. The project was born also from the evaluation of environmental and physiographic context, beginning with the analysis of primary and secondary water shades that define the hydrographical basins, and with the analysis of minor grid characterized by ditches under earth, and by the presence of a spring and two wells.

Project strategies are provided for different intervention scales. At settlement scale it was considered the course of some ditches in the area, their partial conservation and valorisation, and it was put attention on soil permeability, favouring a low water consumption green system. At the building scale, installation of water save systems and predisposition for meteoric water recover from the roof was provided for; a dual water adduction and distribution net inside and outside the buildings will be installed on purpose of water reuse. There is also a specific study about feasibility for water save and reuse: it represents an element of discussion for a possible development of project solutions about water cycle, which will bring to a concrete project definition, shared between public administration, managements and Settlement Plan makers [4].

ARCHITECTURAL DESIGN

The buildings project is conditioned and guided by technical rules previously defined. Therefore it is possible and necessary, for the building designer, to develop coherent control strategies of “sun-air impact”.

Later on this short article is going to describe a building designed by the author [5] and project strategies founded on elaboration of a “building-plant” system: that is a building organism in which there is a strong integration among architectural, structural and plant-engineering functions, because each technological element has multiple roles and it is integrated with other elements.

Placed in the south part of western section, the building was composed of terraced houses, changed under customer’s request into ten houses with independent accesses. The smaller space issue (deriving from the request of the customer) was resolved with a clear division of functional spaces: to the north the garages, the entrances, the services and the additional spaces; to the south all living spaces, such as living rooms, kitchens and bedrooms. In this way the building coherently develops the urban scheme plan, that provides car roads to the north, as well as gardens and the city park to the south.

The additional and service zones serve as a filter for acoustic and air pollution, and protect the living zone by the cold winter. In the western end there are two flats, one on top of the other, conceived to dialog with public space (one of the “external environments” described by technical rules). Therefore a third main front has been created (to the west), besides the one overlooking the car road and the one overlooking the city park (Fig. 5-6).

The project has been developed and verified considering sun-air impact on buildings. For this purpose the entrance, the screening and the roof protrusion were measured, bearing walls peculiarities (strong thermal inertia, widespread isolation and steam permeability) and windows different exposition (Fig. 3) were recognized. The hygrothermal behaviour of the building has been designed to reduce energy needs in every season: in winter the system “building-plant” combines “passive” aspects with the heating effect of low temperature radiating panels under the floor. These panels are fed with low consumption condensation boiler, integrated with solar panels (which produce warm water for domestic use); in summer the envelope thermal inertia, the protection from direct solar radiation, the natural ventilation of ceilings and rooms favour natural cooling.

The energy efficiency of the building is further improved by specific planning and technical measures such as the realization of wood balconies on south side, completely auto-supporting and detached from south wall, eliminating thermal bridges (Fig. 4).

All described strategies will be simulated during the following design phases, in order to check results with “SHE Project” goals. At this moment no results are available.

In south gardens deciduous-leaved trees will be planted, to protect buildings from summer excessive thermal loads.

Indoor natural lighting, which is necessary for human comfort, will be carefully designed and verified with simulation and calculation tools. To improve passive acoustic protection of building, great attention
will be paid to materials choice, and other technical strategies will be adopted in order to mitigate the transmission of air-borne and impact noises. To improve air quality, non-toxic natural materials will be used, which, together with natural ventilation, will grant indoor air quality. Moreover, technologies and materials will be chosen on their life cycle basis.

At last, as defence from electromagnetic fields, the entire electrical plant, still under observation, will be designed to create weak field emission through a correct distribution of the plant itself and adoption of particular technologies.

With regard to effectiveness of the previously described concepts, actual behaviour of buildings and of settlement will be monitored during lifetime.

**CONCLUSION**

The described project has the objective to renew into contents and methodology the approach and the rules concerning building design: it tries to bring sustainability to everyday building thinking (not only experimentation), together with the principles of co-participation.

This kind of designer practice is oriented to define objectives and operative methodologies shared by all involved actors. It has an evident value in addressing issues regarding the making of a social, equal and sustainable ecosystem.

In the case of Villa Fastiggi, the participation has been an opportunity to compare and sometimes to disagree on both cultural level and individual interests and needs.

Despite resistances and difficulties, it has also been an opportunity to experiment a different approach to workgroup project process, putting eco-sustainability among project priorities, revolutionizing designers’ value system and work method (usually reduced to few specialized interventions, not communicating each other). This new approach requires to organize environmental, social and economic aspects, and it attaches importance to group coordinator role, that can bring to the definition of common objectives and language.

It is clear that the project, in relation with the context, represents a balance point between society, environment and economy.

For this reason, only a conscious and active participation jointly with the sharing of project strategies, can make possible to create effective choices addressed to sustainable architecture.
REFERENCES AND NOTES

[1] The Plan Rule 6.1- Villa Fastiggi has been divided into two sections (“A” and “B”), even if a unitary planning was kept. Section “A” was object of a location Plan (the housing cooperative are: Coop. Murri, consorzio Copes, Istituto autonomo Case Popolari, Cooperativa Endas and the municipal district of Pesaro), section “B” the Settlement Plan (made by Consorzio of Villa Fastiggi-Pesaro). The workgroup of section “A”, guided and coordinated by Ph.D. eng. Angelo Mingozzi, is composed by Arch. Alberto Iaccarino, Arch. Pierino Mei, Arch. Michele Pietropaolo, Dr. eng. Paolo Biondi and Dr. eng. Augusto Londei, and it has been helped by some specialists: arch. Francesca Pierini and Dr. Francesca Gambini (landscape); Dr. Enrico Gennari and dr. Patrizia Rondoni (soil); Ph.D. eng. Angelo Mingozzi and Dr. eng. Sergio Bottiglioni (bioclimatic architecture); Dr. Enrico Gennari, Dr. eng. Giacomo Furlani (water cycle); TPS bureau (traffic and mobility).

Since the beginning of planning, starting from the definition of the general purposes, the area and the district of Pesaro have been involved, particularly architects Nardo Goffi, Maurizio Giannotti and Annarita Santilli, working in town planning sector. Section “B” was planned by “Ricerca & Progetto, Galassi, Mingozzi e associati” in Bologna and particularly by Ph.D. eng. Angelo Mingozzi and Arch. Marco Bughi, developing the set up already used in section “A”.

[2] The aims of the project “SHE: Sustainable Housing in Europe”, funded under the EC V FP (years 2003-2007 - contract n. EVK4-CT-2002-00104 – coordinator: Federabitazione, Italy) are: to develop, integrate and demonstrate methodologies and instruments to improve the evaluation and the statements of good administrative praxis; to allow citizens and associations direct participation to land government activities and construction-reconstruction on urban scale activities; to define an integrated approach aimed to close natural resources cycles, to minimize the use of natural resources (especially not renewable resources), waste production (reusing and recycling where possible), air, soil and water pollution and to develop relationship between natural areas and biodiversity in towns. During design stage, the project requires to verify energy savings and comfort objectives through simulation tools. Moreover, monitoring will start after construction and commissioning. This phase will concern both energy/environmental and social aspects. The author has the role of scientific responsible of horizontal activities concerning: site analyses, acoustic, daylighting and LCA procedures.

[3] Among the constitutive and peculiar elements of the eco-sustainable planning should be reminded: attention posed to the place; continuity of eco-sustainability evaluation throughout time; interdisciplinary activities; organization of environmental, social and economical subjects; checking activity on planning choices, considering buildings whole lifecycle, in relation with the eco-sustainable project specific purposes.

[4] The carrying out of a coherent whole of further works inherent in water is subordinated to the possibility to find, in Public Administration and in water services manager, motivated interlocutors willing to evaluate economical and managerial feasibility, following not only a point of view based upon economical cost-benefits analysis. Until now actors dealing with waters management have shown a negative attitude.

[5] The building has been commissioned by Housing Cooperative “COPES” of Pesaro, and the architectural project by “Ricerca & Progetto, Galassi, Mingozzi e associati” in Bologna and particularly by Ph.D. eng. Angelo Mingozzi and Arch. Marco Bughi.

Figure 6: Building model view from the south-west side and typical plan: on the south the living spaces and on the north other different functions. The external walls are differentiated according to the different solar exposition and room functions: south and west walls are foreseen with a greater mass and thermal inertia.