ECOPOLIS

Conceptualising and Defining Sustainable Design

Edited by Dimitra Babalis





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CONTENTS

CONSIDERING SUSTAINABLE ARCHITECTURAL DESIGN IN CENTRAL URBAN AREAS

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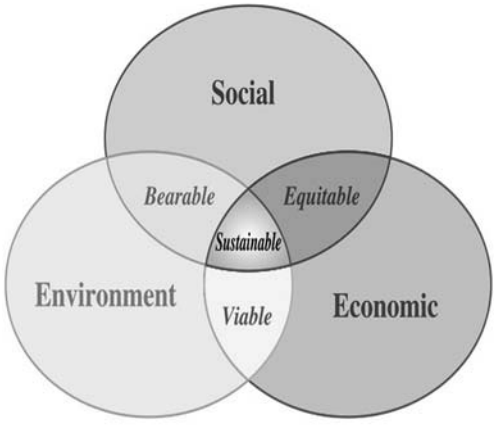
Central Urban Areas

Continuous and rapid growth of urban regions that characterized the development of European cities in the second half of the twentieth century, has led the modern cities to an asphyxiating impasse after almost the total of all the land-planning possibilities for further growth have been exhausted . This impasse has been intensified in most of the urban regions by geographic factors that make any planning for the extension of cities limits exclusionary and often lead to extreme solutions, even to the creation of new artificial landscapes.

These processes have focused the interest of Urban Planning in a sum of areas that are scattered in the interior of cities in central points, as well as in their limits and have remained unexploited for a long time. Economic and social changes that have taken place the last years as well as the swift pace by which the urban grain has developed have enclave significant areas that have been turned into big urban voids by the changes of the needs of modern cities and the use of surrounding land. Those inactive areas apart from the potential for exploitation that they offer, can even create malfunctions to the operation of cities with their current state of use, by causing discontinuities in multiple levels of infrastructures, connections, transport networks and ground uses and at the same time they often constitute hearths of annoyance and pollution that impacts in the abutting regions. Such examples of brownfields are former railway stations, factories, military camps, craft-based regions, athletic fields that do not correspond to the current needs and storehouses. Other examples include stations of supply and repairs in harbours and coastal regions (marine but also navigable rivers) as well as an abundance of similar places of all the range of scales. The plethora of these places as well as the potential that they offer for exploitation have positioned the re-designing of these regions and via this the re-establishment of the continuity and the cohesion of cities around them, in the center of modern reflection of Urban Planning

Sustainable Development

The creation of the above mentioned situation was the result of a period of reconstruction and thoughtless growth whose main characteristics were predominantly quantitative. During this era the efforts to cover the basic accommodation needs of large demographic groups as a result of internal and exterior immigration, due to the wars of the first half of the twentieth century and the mass urbanisation that followed, along with the creation of basic infrastructures. However, although justified,



this growth was characterized by the lack of a central direction that would place the foundation for its continuation, leading in this way to an impasse. The passage into the twentieth first century, having satisfied to a large extent most basic needs, was characterized by a shift in more qualitative characteristics, seeking ways to improve the life in the cities and set the basis for a smooth continuity for further development. In this context, the effort to define the basic direction that will determine oncoming developments, lead to the principle of Sustainable Development that has been defined inter alias as "development that needs to meet the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The principle of Sustainable Development accomplished, in few years, to be established as the sovereign tendency in most sectors, from politics and economy up to planning and industry. Its importance as well as the wide acceptance of the parameters that constitute it leads in conceiving it as an essential principle that should condition each designing process including Urban Design.

Sustainable Architectural Design

It is important to stress that contrary to various approaches that had been earlier proposed as Bioclimatic or Ecological Design, Sustainable Design is not and should not be treated as a distinctive and particular category of planning among other tendencies or approaches. Its principles do not dictate definitive practices which simply characterize the final product of design but as it emerges from its definition, they can be implicated in every process and stage of design. The applications of its principles are so broad and can be connected to so many different fields that each designing proposal should be finally checked to determine whether it is sustainable because in any other case the proposal's viability is undermined by itself. Respectively, the application of the principle of Sustainable Development and its methods is important to condition vertically each stage and scale of planning. It is substantially an idea that should characterize the total as well as every component of each proposal because otherwise it will be cancelled by some of its own components.

Those directions have also found an important field of application in the area of Architectural Design. Seen in the aforementioned context they should be faced as synthetic tools that are placed in the disposal of the designer and adapted to his intentions. The synthetic ideas and their final expression are not determined by a concrete vocabulary that univocally produces a single result, but via different approaches that are accordingly developed. In the case of planning in the central urban areas that are being studied, the application of principles of Sustainable Design in order to fulfil the demands mentioned, are implemented at two main levels. The initial level at the analysis and the design of regulating drawings of a masterplan and the level of planning of buildings and surroundings that shapes the total design. Trying to identify some of those basic principles we can conclude to a sum of guidelines that has to be taken under consideration each time we come to design a new project in central urban areas which can be marked as followed:

Souto de Moura, House in Matosinhos

Jean Nouvel, Branly Museum

Shigeru Ban, Paper House

Á) Designing a masterplan

Natural environment

- Analysis and adaptation of the specific *climate conditions* of the sites' wider area in order to calculate solutions that will perform in the best possible way. The *microclimate* of each area plays also an important role and varies according to a number of factors (heights of the surroundings buildings, prevailing winds, vegetation etc.) and have to be considered before proceed to proposals.
- Careful choice of the most proper *site orientation* in order to place in each area functions that perform better and take advantage of the use of natural lighting and ventilation.
- Tracing of the sites' *natural elements* such as streams, rivers and parks that exist in the wider area in order to benefit by the proximity with them and achieve the maximum use of such elements.
- Adaptation of the design to the characteristic *site views* that may offer opportunities to design open spaces and orientate building openings.

Structured environment

- Existing *landmarks* of the area is important to be recognized in order to design proposals that may establish a dialogue among the old and the new citys' topography.
- Each new design has to adapt to the areas' *land uses* and facilitate new uses in such a way that can create liveable places for the whole community that can function throughout the day and upgrade the surroundings area.
- The new buildings have to respect the *architectural morphology* of the existing buildings of the area and at the same time designed in a way that

Edouard Francois, Tower Flower

Agni Kouvela, House in Santorini

Peter Zumthor, Bregenz Kunsthaus

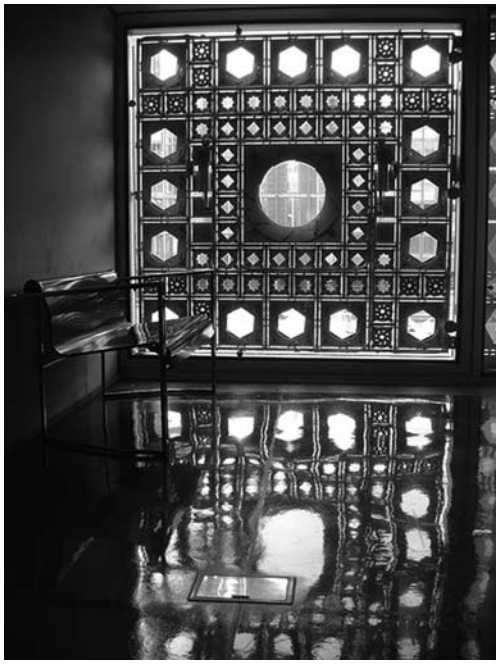
can be recognised as newer constructions that create an unbroken urban entity.

- The existing *urban grain density* as much as the size of the *city's blocks* have to be considered before designing a new proposal as they define a scale of the area that have to be continued without creating either gaps or thickenings.
- The propose designs have to take under consideration a number of *visual and acoustic annoyances* that are commonly border on such central areas as highways, railways and former industrial complexes. Each new design should create protecting "filters" and assure that doesn't allow those annoyances to disturb the usage of the proposed elements.
- For every new building that we design we have to adapt to the surroundings *buildings heights* or at least be close to them in order to maintain the areas identity.
- We should create *pedestrian networks* that link each important element of our design and make sure that such elements are in walking distances. In such way we can minimise car use and create zones that are liveable and friendly to the pedestrians.
- We must assure also that we have separate access via *vehicles networks* that do not interfere with the pedestrian's ways and provide access for the disabled and for emergency vehicles. The vehicle networks should be combined with parking areas that will "feed" the rest of the networks with people from other areas.
- We must encourage the bicycle use by creating proper *bicycle networks* that will connect larger areas providing access to a wide variety of places. Small scale parking areas are also essentials.

Jean Nouvel , Institut du Monde Arabe, Paris

Sean Godsell, Carter Tucker House, Melbourne

David Yoca, Chicago City Hall Green Roof



- The most important element of transportation is to create efficient *public transport networks* that will also linkage all the aforementioned networks among them in order to create a cohesive transport system that can work in a combined way providing multiple choices of transportation system.

B) Designing buildings and surroundings

Every structure could be perceived abstractedly as an entity of four distinctive elements: the building envelope consisting of walls, the openings on the perimeter, the roof and finally the surrounding spaces. Each element can be designed in a sustainable way keeping in mind that it should be perceived as part of a wider strategy that responds to our main conceptual ideas.

Building envelope

- The use of *mass walls* can isolate in a natural way our structures and at the same time create a solid and compact building that fits to the surrounding environment.
- New technological solutions have created *green walls* that work perfectly as an isolation and can be perceived as vertical gardens. Those walls can be constructed in many ways giving each time a different final facade.
- In very hot and dry climates such as those of the southern mediterranean countries, *water walls* can create around them a microclimate that according to their size may vary and affect areas of different scales.
- The use of *passive systems* such as Trombe walls, Sunrooms and Thermal Chimneys can heat or cool a house in a natural way using the sun

Alexandros Tombazis, Office Building, Athens

Renzo Piano, EMI Headquarters, Paris

and the wind without the use of any other energy source.

- Industrial design has lately developed a variety of *recycled building materials* that can be used in every construction phase. At the same time we can favourite the use of materials on second use and try to anticipate recycling of the materials that we have used in our construction.
- Another technological trend is the development of *environmentally preferable materials* that have very low environmental impact during their production, distribution and usage. Many of those are natural products that are being hardly processed and can be easily recycled or reused.
- South and west orientated facades in climates likes the mediterannean are usually being overheated during the summer and eventually heat up the whole structure. Proper *facade shading* can be easily achieved and benefit the buildings as much as their surroundings open spaces.
- The design of buildings envelope can support with proper arrangements the *natural lighting control* by creating open spaces in the areas that we desire to light and helping the sun light to enter the whole volume of a building minimizing artificial lighting and accordingly energy consumption.
- In the same way as the control of natural lighting we can properly design a building to take advantage of *natural ventilation.* Each area has different prevailing wings due to its environment, natural or build, that can be imposed or should be protect from and a study with suitable developed programs or models could always help getting the necessary data before starting the design process.

Building openings

- Designing the facades construction we can use solutions that refer to *Double skins.* In this way we create a protecting filter between the external environment and the inner building which can be used accordingly to shade, cool or heat up the building by controlling natural lighting and ventilation in the same structure.

Diller & Scofidio, Highline, NY

K. Friedman, Ehrlich House, N. Mexico

- Buildings opening should always be designed according to buildings' orientation maximizing the benefits of natural lighting. In same cases although it is inevitable to design openings that are not very well protected and it is essential to use proper *orientation relative shading* of them.

Building roof

- The overheating of the buildings as much as entire central city areas can be confronted by the use of green roofs. A *green roof* can act as an external isolation of the building and at the same time minimise the emission of heat to the surrounding buildings and the environment and absorb as much as possible, substances from the polluted urban areas atmosphere.
- Another type of construction that can be used on roofs in hot and dry climates to cool the buildings is the *use of water elements*. Apart from the isolation they offer to the buildings' roof, the evaporation of water also cool the surrounding spaces.
- Problems that arise from the overheating of roof and terraces can be confronted in a simple way with proper *roof shading*, via constructions such as pergolas, shading devices or vegetation.
- Another aspect that can be taken in mind is the use on roofs of *photovoltaic panels* that can at the same time format the shape of the roof, shade a construction beneath them and of course produce energy necessary for the buildings' use.
- Proper constructions can be used to *collect rain water* in order to use it for irrigation or even at water-closets and other household uses. In countries with dry climates the use of such systems combined with water tank was something very common at the past; therefore it can be easily re-established in a wider scale.

Outdoor spaces

- A very common problem of the design of outdoor spaces is the overheating of the surfaces that arise from the fact that they are exposed in direct sunlight throughout the daytime. In those cases we can use similar to the aforementioned for the buildings strategies in order to lower the temperature on the surfaces of outdoor spaces. In this way we can use *shading structures, vegetation* and *water elements* that can be used combined or separately and create a microclimate around them that can even affect a wider area.
- Another important element is the use on outdoor spaces of *water permeable surfaces,* that can leave the rain water pass through them but at the same time leave the lower ground temperature to cool them. Those surfaces can be made out of natural products such as stones and soil which can easily be recycled and reused.
- In the cases that we can not use water permeable surfaces, we can *collect the rainwater* in proper tanks and use it for irrigation or other uses.
- The *temperature of the ground* under a certain depth remains almost unchanged during most of the year time. By using a properly designed system of pipes we can use this stable temperature to bring warm or cool air according to the season into our buildings and therefore minimise the needs for artificial heating and cooling of spaces.
- Finally other important sources of energy that we can use at the design of open spaces are *wind and solar energy.* With proper design we can exploit those sources and in most of the cases even cover most of the energy consumption on opens spaces such as parks and squares.

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