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NEW PERSPECTIVES in ECO-TECHNOLOGY and ECO-ECONOMY

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INTRODUCING A NEW DESIGN APPROACH: “ENERGY HARVESTING BUILDINGS”

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Buildings that are to take place in the environmental system are judged according to the success of relationship they establish with the numerous components of that system. A building can take place in the complex patterns of cities, as well as standing-alone in rural areas. It is important to master various layers as historical, actual, functional, physical, economical, formal and symbolical layers belonging to that spot and the relationships between those layers, when designing a building in urban areas, in order to be able to predict the interaction between that building and its manmade and social environment. In cases there is not a very strong context binding the design decisions except the urban area, it is easier to build successful relationships with the manmade and social environment.

However, context is not solely made up of manmade physical and social layers, that is to say concrete and abstract characteristics belonging to the manmade and social environment. Generally, in the processes of architectural planning and designing, inputs regarding the natural environment components are not taken into consideration except some few basic concerns. These efforts rarely go beyond concerns like topographical features, site characteristics, prevention from the wind, orientation towards the sun and the landscape , that are impossible to avoid anyway. Natural environment components becoming more attractive was only possible after the reflection of global problems to architectonics.

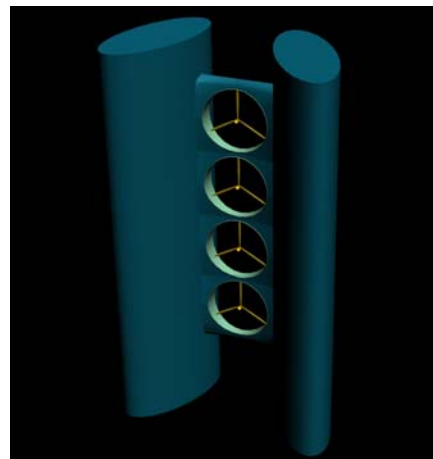
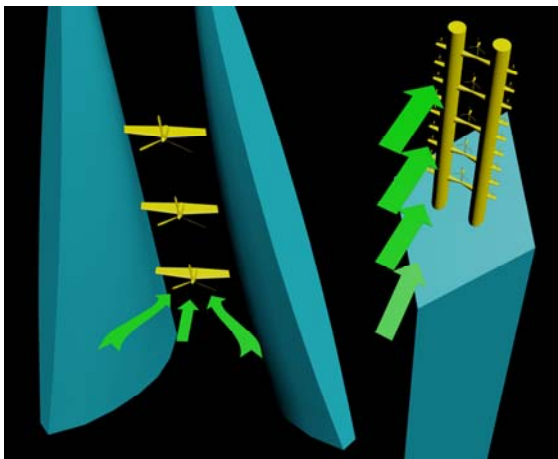
Fundamental approaches that designers took into consideration through the history of architecture were to be the scene of departing from formal and symbolical approaches to being mass production-economy focused approaches. Now, a new and a vital concern had turned the opportunities that were already known but not paid attention to, to a design approach.

Rapid increase of population around the world, difficulties of production from limited resources being suffice to demands, and most important of all, destruction of environmental systems by waste and harmful by-products, had almost a revolutionary effect on architectural design approaches. Each year the energy consumption of the world increases about 4-5% when compared to the former.(1)The damage caused by the fossil fuels to the environmental system is being accepted as a “social cost” and is equivalent to 5 trillion dollars annually in financial terms.(2)

Efforts limited to energy reduction in buildings and solar panels heating the water in the beginning, are replaced with attempts to recognize and make use of every

advantage that the environmental system offers. One of the most essential inputs of buildings is energy. Today, it is impossible for buildings to survive without large quantities of energy. About one of five of the energy being consumed by the buildings is being used for the illumination of internal volumes requiring lightning in day time or night time.(3) Besides, large amounts of energy are required for the production of building elements and materials and for a building to be built. It is obvious that reduction in buildings' energy requirements not only will contribute to the solution of this global problem but also will have significant effects on reducing the production and usage costs. This is mostly because of the carbon emissions of electric production processes damaging the environmental system and causing a serious social cost. Building production for housing is responsible consumption of 1/6 of the worlds fresh water stock,1/4 of cut trees, 2/5 of fossil fuels and manufactured materials.(4)

In the last five years, environment-focused design thinking had triggered the rising of numerous buildings that use the natural renewable resources to produce their own energy. These buildings, mostly vertical and large in area, require such a mass amount of energy for circulation, heating, ventilating, lighting, security and such, that if even nearly 20% of their energy consumption is produced via using renewable resources there would be a wide multi-dimensional gain both in that building and country wise. On the other hand, middle and small capacity buildings can also be designed according to these concerns. To achieve this, there is a need for updating the customary concerns and evaluation criteria of architects. Today, there are even some types of buildings that even their building envelopes are formed with the intention to obtain energy with active methods. These kinds of buildings use wind, tides or solar energy to produce energy with active methods.(P1-2)



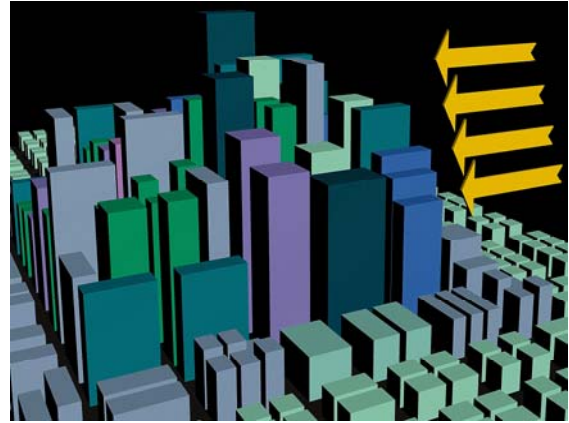
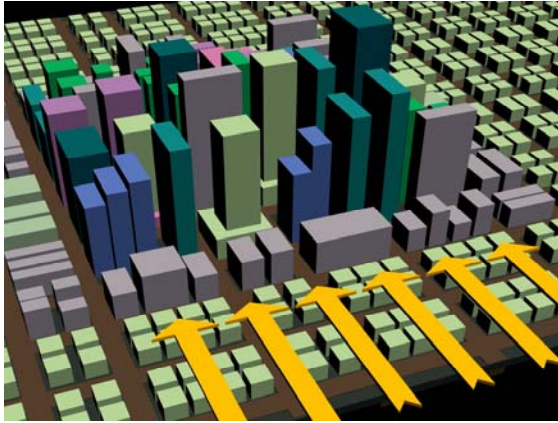
P1-2 The buildings design to generate electricity from wind.

If the building consist of a smooth and streamlined form optimum performance can be obtained. The most positive forms of wind flow are boomerang and kidney.(5) This architectural design approach will become standard behavior model in the future. An architect can face many design problems, ranging from single house

designs to central business district designs. Undoubtedly, environmental-focused design thinking is a universal idea that will affect buildings of any kind and capacity. And in buildings of any kind and capacity, opportunities that natural environment provides can always be used to produce energy. However, there are three basic barriers that stands as an interference on the way:

- Increases in the costs between 1/10 and 3 times of the classical cost of building for that building to have those apparatus in order to get these additional features
- Lack of design principles and methods that architects should have, to use during their design activity and the insufficiency of their architectural education process in this particular area.
- Lack of inadaptability of old and historical settlements, when handled both in single building scale or the whole settlement morphologically, to be transformed into settlements that can harvest energy or be energy efficient.

Unquestionably, there are other obstacles standing on the way of environment-focused architectural design thinking. However, these three seem the hardest ones to overcome. In fact, the phrase 'energy producing buildings' refer to 'buildings that have the ability to harvest one of the energy types'. Every year, sun transmits more than 1000 times of energy that humankind needs. This huge amount of energy causes the tides, the streams and rivers, which are solar sourced energy types, to appear. A building can be transformed into a building that can obtain energy from solar resources using passive and active methods. The most efficient methods are the solar cells and wind tribunes that can transform solar energy to electric power. However, even tough the first to obstacles listed above can be passed over, the third obstacle remains to be a problem. In metropolis that a have a significant morphological structure, this structure changes very slowly. In the city centers that have very dense and high-rise built environments, tough the need for energy is at its pick point, it is hard to transform solar energy sufficiently. The high-rise built environment makes it hard to use techniques of transforming wind power to energy.(P3-4) To be able to use wind power by every building, the buildings have to be positioned and shaped in such a way that they will allow the wind flow uninterruptedly. The situation stands the same when photovoltaic cells are in question.



P3-4 The high rise and dense built environment make it impossible to take advantage of the wind and sun.

If there is not appropriate positioning of the buildings, it will be impossible to install the apparatus with the adequate surface area, to turn the light into electric energy. Likewise, in the mass buildings, as for the collectors aiming to collect energy for the spaces that have no access to sunlight during daytime, the same problem stands. In an existing urban pattern, what an architect can achieve to design a building, that can produce energy with renewable resources, is limited.

The situation with the new-developed settlements:

In our country and in many parts of the world, the option to organize the buildings in such a way that, they can at least produce some part of their energy consumption is ignored. In most of the new settlements, approaches are getting their motivation solely from stylistic and esthetical concerns and contented with meeting what the market demands. In these types of settlements, the positive/negative aspects of wind and solar energy opportunities are not considered from the point of energy production and also the most fundamental human needs. The approaches, that environmental focused design means only the planting of the roofs with the point and linear blocks in the mass housing settlements, directed towards to every direction that some of the dwellings face with the problem of having no access to sunlight and getting the worst weather conditions because of the wind, are frequently seen around. Because of all these negative reasons, mentioning of some few successful examples is possible.

Settlement planning and planning education: the necessity of new approaches
In order to be able to reach to the globally targeted intentions and to get both single buildings and settlements being able to produce a part of the electrical energy they

consume, architects need the support of city and region planners in the forming of the most convenient conditions that contribute the architectural design process.

- During the process of planning a region, city planners have to hold practical and easy-to-understand methods and principals specially formed for an environment-friendly settlement. Education processes have to be re-structured to provide the required knowledge and practice experience.
- During all the activities ranging from designing roads and city block layouts to determining the density of those blocks, it is a must to consider the idea of obtaining electrical energy transforming solar energy, as the main design criteria.
- According to this main idea, a multi-disciplinary approach must be followed in the work groups including architects specialized in this area of design.

City planners have to design the blocks so that both low-rise and high-rise buildings do not make each other incapable of using their potential. Besides, city planners have to start determining the design criteria for the settlements on seas. The world population is growing rapidly and because of the decreasing agricultural areas and forests, some of the new settlements will have to take place on seas. In a situation like this, sea-sourced energy use will be point at issue. Unless the right planning decisions are made about settlements, no matter which approach is considered during architectural design process, it will not be possible to obtain the utmost electrical energy from solar resources.

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