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Ecological criteria considering the connections between the construction, building-site and the spatial planning development

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Abstract. The integration purpose of the ecological criteria in the projecting process is preceded by an intrinsic connection between the existential building space and global environment. The starting point is given by the evaluation of the balance amongst the functional resources of both systems, natural and anthropic. Thus, the ecological criteria open a path for the project leaders to identify and to evaluate the renewable resources potential, as alternative sources, and also their impact on the natural environment. In regard of the anthropic geo-system, following the increase of the population density in the urban areas, or of the depopulation of the rural areas due to the migration of the population to the metropolitan areas, the ecological answer is necessary to be concluded with the sustainable spatial planning. This study aims to develop and compare new categories of factors involved in spatial planning projects, having the goal to mitigate the irreversible damages of the natural environment.

1. Introduction

One of the greatest challenges of our time is undoubtedly related to the changes to the environment, the effects of which we are currently witnessing. Although the causes of these effects are being debated, substantial sections of the research communities are focusing and working together on reducing the multiple factors which are generating the global warming with its climate consequences for the entire planet. For the industrial countries (at the very least), one of the key ways to deal with negative man-made climate effects lies in the development of building environments focusing on reduction of carbon emissions. The urban environment can most easily be upgraded by changing the current approach, and creating a sustainable spatial development, especially for the big cities and metropolitan areas.

A correct attitude in the integrated ecological planning of buildings is the process starting from the urban planning.

The main purpose on this level has a prevention character, avoiding some measures, which once having been taken, even if they are supported by the community progress, can create irreversible damages [1].

Decoding the concept of sustainable development requires a holistic analysis. The impact of the research group's results on planning development has changed the importance of promoting the progress to socio-human implications which has been determined in the ecological context [2].

2. Basic requirements in the ecological planning

The aim of this study is to clarify the potential impact of the ecological environment and eco-system concepts, and how they can help to produce a balance to sustainable development in the building and urban design fields.

In the field of integrated architectural research, an important role in the development of sustainable concepts has been studied at University of Architecture and Urbanism "Ion Mincu"-Bucharest, one of the promoters being Prof. dr. arch. Cristina Victoria Ochinciuc. In her book, "Sustainable development concepts in architecture. Integrated planning", a synthesis of the important ways of integrating the ecological criteria in planning and implementing the urban development is shown by the following six criteria [2]:

- the connection between the environment and the resources (natural and human);
- managing and implementing the development projects;
- major problems of the operational ways in the projects frames;
- socio-cultural factors;
- environment protection with regard to preserving the population health,
- long term estimations[2].

The first ecological criterion refers mainly to the characterisation of the local, natural and anthropic geo-system (economics resources), geological, hydrological and seismological studies and analysing the microclimate, the landscape perception with regard to spatial typologies and perspectives. The predictable changes of the environment factors, including the social and sanitary issues, are also mentioned.

The second criterion is about the importance of including environment protection measures and population health protection, cchoosing measures for soil protection, controlling forestry, erosions, landslides, other secondary pollution effects; evaluating the side-effects on the rivers: rate of flow, pollution of the water; aadopting protection measures on the ecosystem: fauna, vegetation; ddevelopment possibilities as functionality, landscape perception, environment protection.

The third criterion includes projects in reducing the negative impact on the environment, studying the ways and the systems of treating the waste water, gas emissions, the ground-water, recycling the solid-waste, rreducing the negative impacts on the well-being of the local population, avoiding increasing migration, teaching the active population in getting involved in the process of detecting and combating the unpredictable harmful effects, as well as in detecting olfactory and sound pollution, transporting and depositing the solid waste, explosion risks, accidental presence of toxic substances [3].

The fourth domain is enhancing the evaluation of the consequences of the demographic rate and the population density in relation to the social and cultural behaviour in the local communities, and, in the case of the population migration, making sure sufficient supplies, accommodation, transporting solutions are available. This criterion also refers to estimating the needs regarding buildings and functions: housing, educational system, administrative and socio-cultural programs and having perspectives for upgrading the programs, and connecting them with the development of the society.

The fifth criterion links the natural environment with population health by evaluating the consequences in case of behaviour changes in food-production or culinary habits, controlling the water quality, controlling wastes to prevent health damages to the population; evaluating the evolution of the life-hope and the morbidity (on age groups and different pathologies) following the chemical and physical mutations of some elements or factors in the natural geo-system which can lead to increasing undesirable species or causing diseases; adopting measures for preventing contamination with pathological factors in case of population migration to other, less populated areas.

The last ecological criterion described long terms procedures: Evaluating the effects on the microclimate in case of the felling of trees and other changes due to the excessive utilisation of lands [4]; elaborate solutions for further landscaping to prevent the ecological disasters which can accidentally appear through development planning; evaluating the possible consequences in case of further extension of some functions over the anthropic geo-system; natural ventilation of the

neighbourhood, planting surfaces having protection role against the wind, or the excessive sunlight in the summer; Considering water surfaces which can improve the climate by changing the ambient temperature can contribute to decreasing energy consumption [5] .

It is thought that an urban planning thinking can lead to a 50% reduction in the needed heat of a building, when in hard climate conditions buildings have received an optimal insulation.

By knowing the balance between the functional resources of both natural and anthropic geo-systems, the ecological urban planning allows the researchers to identify and evaluate the usage potential of some regenerating resources, such as alternative energy solutions: sun, wind, geo-thermal heat, bio-masse [6] .

Many countries have developed their own regulations in the fields of sustainable energy, ecological and environmental development, but some of them are specific at national level, while some of them can be implemented at international level.

In a European context, it is desirable to establish common standards, norms and criteria for these mentioned scientific fields, so that one can more easily and effectively share best practices and increase the speed of implementation of these concepts. These norms and standards and the extent to which, in terms of local specific implementation, it is reasonable or sensible to implement them across Europe and beyond will naturally vary, but there are concepts that can easily be shared across countries and regions, and one should seek to get them unified and commonly agreed upon.

3. Ecological buildings versus intelligent buildings

The word sustainable has the roots in the Latin "subtenir", which means *hold up* or *support*. A community must be supported by its own population, in present and future. Some areas having a good combination of physical, cultural, spiritual characteristics inspire the people to take care of their community. These places have the best chances where the ecological concepts can be developed.

The concepts with regard to "intelligent buildings", high-tech or eco-tech (ecological high-tech) belong to the same field with ecological architecture and sustainable development. The access to advanced technology permitted many advantages, such as using the buildings with high energy savings, automatic control, intelligent structures [3]. On the other hand, the materials used in building this type and the maximum performance could be in contradiction with the recycle rate or reutilisation. There are differences in on-site integration for an ecological building, as compared to a high-tech one.

Another point of view reveals the fact that the intelligent architecture is always ecological, but the ecological architecture is not always intelligent.

In an intelligent building, the interior and exterior spaces and the comfort parameters are balanced and they are easy to control with electronic systems. A new architectural methodology is developing, having as purpose to keep the balance in relation to interior comfort, as an answer to excess solar heating, exterior temperature or wind effects. Also, the analysis must take account of the bio-electro-magnetism or local ionization radiations or those which are emanated by some building materials (even if they are recycled or natural, from the ground in case of underground constructions) [7].

An intelligent building is characterized by 4 types of interactions [6]:

- the interaction between the annual energy consumption, the optimal interior ecological climate and the thermal and visual proprieties of the transparent façades;
- the interaction between the annual energy consumption, the optimal interior ecological climate and the cardinal orientation (N, S, E, V);
- the interaction between the annual energy consumption, the optimal interior ecological climate and the controlled or uncontrolled indoor air exchange;
- the interaction between solar system (active, passive and combined) and the energy consumption level of the building.

The intelligent building is dynamic, having all the parameters controlled by electronic systems. Due to this process, the balance of the indoor space and the exterior space is constant.

The ecological solutions are based on environment protection and they promote energy and materials savings, recycling, proving the progress of sustainable development. The intelligent

solutions solve two problems: mitigating the environment changes and increasing the utilisation capacity. Recent projects prove the possibility of evaluating ecological buildings as a new type of architecture. The new building techniques, the energy concepts and facades systems bring innovative ideas [8].

Through intelligent planning, it is possible to create buildings with an optimal living and working environment. There are 3 ways to accomplish this result: technical, ecological and reprogramming.

The technical approach focusses on improving the facades and has been launched by introducing the climate facades.

The ecological approach is related to analysing the whole building. The building becomes a system which is exchanging energy with the environment, avoiding the necessity of conventional fuels.

An example of reference, both in terms of observance of the ecological architecture as well as related to sustainable development or the generation of energy from unconventional sources, is the traditional vernacular architecture and the technical equipment used in the past [9].

All the materials used were fully recyclable, without exception, most of them brought from the immediate vicinity of the site where they were found. Examples of building materials, as clay, hemp, lime, in addition to building green roofs and wooden houses show the connection between the past and the present with regard of the ecological concepts [10].

The most useful approach is performing an analysis before the conventional planning process, with the focus on the efficiency of the buildings. This concept can be called reprogramming.

This new concept of architecture has brought the concept of energy self-sufficient buildings like Zero-energy houses and flats, or plus-homes. If these buildings prove that a living space can be created without using polluting energy sources, then this concept should be considered on a larger scale. The planning process herein can be defined in several ways:

- the building as an organism which can function more efficiently (the building and the climate installation make up a whole);
- the building as a system which can be organized more efficiently, having connections with the environment;
- the building as a system which provides better effects on the well-being of its occupants.

The main question is whether a narrow ecological definition is desirable or whether a broader definition containing also social, cultural and spiritual dimensions is preferable. The narrow definition is seen in many both official and grass roots contexts and may make it easier at this time to get funding. The need for framework for education and self-audits as measures of how far we have come and where we go underscores this [5].

4. Conclusions. Architectural answers

Ecological criteria included in the development of urban planning lead to an enhancement of the architectural program. By evaluating the natural and human existing resources, architecture can provide new answers to the needs of our eco systems. To do this, we have to define the functional potential of the natural and anthropised geo-system and settle the development perspectives.

It is necessary to make sure that the spatial planning development leads to good living conditions and optimizes the needs of the construction. An economic analysis has to consider the costs for the main utilization, and the post-utilization of the future buildings.

The planning team will prevent the damages which can be created to the local communities and natural geo-system by the new construction. They will solve the accesses, preserve the landscape, creating transitory spaces, sanitary protection, solving the techno-utility challenges, and facilitating waste recycling. The focus and balance of the environmental efforts depend on the local conditions, including resources, policies and individual actions and the community's unique characteristics. The concept of sustainable community has been applied to various aspects, such as urban spreading, redevelopment of built-up areas, economic development and growth, ecosystem management, agriculture, biodiversity, green buildings, water management and pollution prevention.

The results provided by involving specialists from different fields (social, cultural, economic, health) establish a balance to the ecosystem in the short term and also for the future development of the areas.

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