ECOLOGICAL PROBLEMS OF A MANKIND, AS INFLUENCING FACTOR ON ARCHITECTURAL FORM MAKING

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Abstract. The influence of global crises together with ecological challenges of a mankind as influencing factors on the architectural form making have been stated in present article. Objective this research is to identify the impact of the global crisis as an influencing factor on architectural form making.

Keywords: Modern architecture, ecological challenges, формообразование, global crises

Connection of present work with scientific programs and plans.

The research have been made as a constituent of a common line of research No. 01114U004417 (topic: “Resource analysis and evaluation of the architectural and urban potential of Kharkov region”) under the program of the Department of the architecture of buildings, constructions and a design of the architectural environment of Kharkov Beketov National University of Municipal Economy.

1. Problem settlement

The fundamental solution of global problems of humanity is an extremely complex and lengthy process. Within the framework of XXII World Architecture Congress, held in 2005 in Istanbul, the following problems have been indicated as main environmental challenges:

- Population growth, resulting in the increase in consumption, the growth of municipalities, decreasing of living standards, environmental pollution, overcrowding and changes in the population structure;

- Resource crisis - the lack of land, raw materials, energy;

- Increasing environmental pollution;

- Changes in gene resources.

Crisis, or disasters and slow changes of the planet that had occurred with the natural system for millions of years of its existence, have caused its mutation. In recent years, more and more evidences are accumulated showing that the current image of our planet had been formed not only by the slow evolutionary processes, such as volcanic activity reduction, but also due to the relatively short in duration, but very powerful disasters that have repeatedly occurred in

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geological history of the Earth. Indeed, in the strata of sedimentary rocks, geologists are finding evidence of huge natural disasters.

The anthropogenic activity of human being has become a factor of planetary importance that have brought another crisis of nature into proximity. In the worst scenario, the ecosystem that has most of its species would be restored after a very long period of time in a new form. Other scenarios are entirely subordinate to the will and knowledge of a human. And a huge role in this process is given to the architecture.

2. Research results

Architecture becomes that very environment, able to write the scenario of an "ecological" existence of a human kind on the planet.

Great Soviet Encyclopedia gives the following definition of architecture: the art of design, building and construction of buildings. Architecture certainly creates materially organized environment that is necessary for people in their lives and activities in accordance with the modern technical opportunities and aesthetic views of society.

The following conclusion can be made on the basis of this definition: architecture is an artificially created environment, which possesses the function of protection against external negative influences and option of provision of optimal conditions for the business and intellectual activities of a human being.

Today, in order to guarantee the survival of a mankind, what we need first of all is a creation of healthier and cleaner environment. At this stage of consideration of the problem only three ways of solving it had been determined. First one: the disappearance of a human from the planet. In this case, the ecological balance will be restored on its own within a few centuries. This approach is not considered due to its meaninglessness. Second way lies in the integration of entire human subject activity to the nature. This means free circulation of a matter and energy between the biosphere and the technosphere. This scenario is the most attractive. Though, at the present stage of development of knowledge it is almost impossible. Third way is maximal reducing of pressure on the nature by means of localizing of humanity in megalopolises. To implement this plan, the metropolises should become self-sustaining from the point of view of resources.

Integration into the nature and self-sufficiency of megacities now become the subject of intense study by scientists all over the world. This interest is conditioned by only one but together with that very important factor - a demographic crisis. Experts identify some of the negative consequences of the demographic crisis.

3. Population growth

United Nations Organization have published the forecast of a population of our planet by 2050, according to which the population of the Earth will increase on 2.5 billion and will amount to 9.1 billion people. UN experts have calculated that in the future growth of the population of the Earth will take place exclusively at the expense of the poorest states. Number of people in the US, Europe and other developed regions is predicted to steadily decline. [1]

Reducing the birth rate is directly related to the technological progress. A hundred years ago, for the 90% of the population it was enough to have an education on the level of 5 classes and certain special courses. In rural areas the figure might have been even lower. This means that in a village children since 5 years old had been engaged in gathering of mushrooms and berries, at
the age of 10 they started grazing geese and small-size cattle, 13-15 was the age for an orchard and a heavy beasts, and with 16 hay and pasture started being among children’s’ chores. In fact, children have been the only kind of the pension fund.

With the development of technology the requirements for all working population have been rising, and today 11 classes have become the norm, and in the future the additional special education from 3 to 7 years will be of great need everywhere. In the modern European family today, on average, less than one child falls within one nuclear family. The education called upon to ensure a child's successful future costs so much that the average family is not able to provide a greater number of children with it.

Reduction of the population in developed countries, coupled with the energy and raw materials crisis a priori marks the end of a process of globalization. The attempts of the governments of developed countries to solve the problem of aging population with the help of an opened emigration have only exacerbated the problem. It becomes particularly sharp in France, where the growth curve of crime is identical to a growth curve of emigration. Attracted from the outside immigrants in an amount greater than the amount needed to the possibility of their assimilation, are able to radically change the very nation and to disturb its stability.

A country or a town where the same number of people is living from decade to decade must have had absolutely different technology, different cultural norms, and different architecture. With the decline in the population the new housing (first 50 years) will be very limited, and reconstruction and restoration would become main type of activity for the architecture. Scandinavian countries can serve a striking example of this process, where pace of construction of new facilities have greatly slowed down in the recent 20 years. Later, with the decreasing of a population pressures and stabilization of the number of population, the requirements for the constructed facilities has changed significantly.

Since the end of the 20th century and until now, the main task of the construction industry lied in the rapid provision of a growing population of megalopolises with the affordable housing and related infrastructure, which had naturally affected the choice of building technologies. The average estimated lifetime of the majority of modern buildings is equal to 50 years. Under these terms the construction of buildings operating similar architectural forms as the Baroque period, or Modern era loses every possible sense. If the stabilization of the population of 1.5 billion people on the planet (demographic optimum) will occur, it would eliminate the need for expansion, and consequently the amount of needs for architectural structures will be equal to the amount of inherited property. The payback of the architectural object of a shopping and entertainment destination within 3-7 years, as it is practiced today, will stay in the past. Hence, in the result of inevitable change of ethics and ideology of the consumer towards the "ecologisation" of consciousness (a necessary condition of survival for a human kind) the requirements to the environmental performance, durability and aesthetics of the buildings will be changed dramatically.

4. Overgrowth of megalopolises

In recent sixty years in USA cities began growing along roads and around urban and rural centers because of the emergence of a large number of private cars, cheap fuel, inexpensive land and growing welfare. Loose homebuilding is threatening to a farmland and is harmful to the open spaces. Together with that increasing in the level of prices on public services encourage people to leave the big cities. All these factors caused traffic jams on the roads, environmental pollution and the deterioration of the quality of life. Existing regulations create the preconditions for the degradation of cities. “Spreading” is a dispersed development that is mono functional and cannot meet the daily needs. To counter this phenomenon in the XXI century,
there is a need to adjust the existing town planning regulations. It turned out that in most cities building according to the traditional model of construction is impossible, as existing rules prevent this. But humanity has no choice as the existing design standards contributes to "spreading" and isolation of an existing residential development.

5. The concept of arcology

Arcology (hybrid of two words – “architecture” and “ecology”) is the architectural concept which takes into account the ecological factors while designing the human habitat. In a more narrow sense, by the arcology is meant an idea that the way of erecting a large, self-sufficient, well-designed, multi-level structures (hyper-structures), enclosing a population of a city, can reduce the negative impact of settlements on the environment.

American architect of Italian origin Paolo Soleri is considered to be an ideological father of the arcology. Other authors had tried to build up the principles of symbiosis of city buildings and the environment before him, but he was the first one to collect and systematize the data, formulate the basic postulates in his book called "Arcology: a city in the image and likeness of a man" [2].

According to his opinion, the arcology gives us answers on how to achieve a harmony with the nature and use of the space allotted to us more efficiently. It is more than just a new approach to a process of construction - this approach is more like a path of development, which a civilization can follow. Reducing energy losses and emissions of toxic waste, a fundamental change in our way of life - arcology proves that these challenges can be achieved.

Developing the ideas of other architects and scientists, Soleri hypothesized that one of the reasons for the negative impact on the environment is the horizontal nature of urbanization. Cities are growing wide, occupying a larger area, subjugating the flora and the fauna, and, in fact, destroying ecosystems that have been taking shape over millions of years. And the troubles do not end there: the urbanized space is used, as a rule, irrationally, creating lots of other problems, such as congestion of the transport systems at rush hours. Industrial zones are another well-known lack of megacities. Plants, which one hundred years ago had been situated on the edge of a city, are now located practically in the center of a swollen megalopolis. Production processes spoil the air, and besides that the territory in which it is located, can be used quite differently - more efficiently for the changed urban situation.

According to the author of the idea, in the process of urbanization, urban settlements, first occupy the unnecessarily large area, thereby causing the damage to the environment, and then spent this used space inefficiently in the process of condensation of population. Soleri sees a way out in the creation of structures that have a self-sufficient infrastructure, fit perfectly into the landscape, using clean energy sources, in particular - solar panels and wind energy. An important principle of the arcology lies in the most efficient use of the earth's surface and compact settlement of people inside the building. That is, if to grow broadwise is problematic for the settlements, then it is logical to grow upwards. The literal embodiment of this principle can be seen in the projects of skyscrapers the height of which exceed few kilometers.

Such structures had received the name of hyper-structures (or mega-structures and mega constructions). Hyper-structures really can solve a lot of problems that are associated with a growing population. The same area can become the accommodation for several times more people than the "horizontal" layout. Many transport lines will exist inside the hyper-structure and that will remove the problem of the pollution by exhaust gases.
In addition, hyper-structure will also affect the way people live. For example, in cases where the place of residence and work will be located in one mega structure there will be no need any more to overcome tens of kilometers of road every single day, people will just need to go up or down to the desired level, spending only 15 minutes on a path "from door to door". The emergence of free time and decreasing of daily stress will surely change life for the better. Significant saving of the energy that has been used on the constant displacement of hundreds of thousands of people is especially important in the context of the danger to develop all non-renewable resources to the end.

Some principles of arcology, for example, self-sufficiency and isolation of infrastructure, now are being embodied in major residential and shopping complexes. Their visitors can spend a whole day without leaving the building: to go shopping, go to a movie and have a snack in the cafe. In modern residential complexes people can visit the gym and hair salon, or purchase products without leaving the building. Any modern sufficiently large office building is highly functional: it contains canteens, gyms and shops.

6. Conclusion

The peculiarity of the present situation in the development of the architecture is that the international community is facing at the same time all sorts of crises: systemic, socio-economic, agricultural, political, environmental and other consequences that change the trajectory of human development and, accordingly, the trajectory of the development of architecture in an unpredictable, as they say "non-linear", "disequilibrium" and "unstable" direction. The acceleration of the development of these crises as a result of globalization and the impending global ecological crisis has been marked.

As a result all this leads to the emergence in the architecture of innovational architectural typologies that are, together with saving of development of architecture in terms of style and material within the professional consciousness, are opening fundamentally new opportunities to overcome the crisis. As hasty and ill-considered innovations can easily but irrevocably change the ecological situation on the planet. It is necessary to understand not only the guidelines for implementing of the technological purposes, but also a shift to a new level of studies of the mechanism of periodic turnover of professional ideals, doctrines and standards to see and understand something new that arises, and save historical values.

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