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Research paper

The Organization of Biosphere Compatibility Construction : Justification of the Predictors of Building Development and the Implementation Prospects

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Abstract

The article considers the modern practice of urban innovation, based on the principles of biosphere compatibility. The project solution of providing organizational and technological reliability of construction from the point of view of the possibility of realizing the functions of a biosphere compatibility city and introducing innovative constructive and architectural and planning solutions is analyzed. In relation to the construction project, the formalization of the methodology for calculating the indicators of the biosphere compatibility of cities and settlements, the quantitative indicators of the implementation of the functions of the city are determined. The obtained results of numerical analysis of the realization of city functions can predict the development of urban areal, assess the comfort and safety of the urban environment from the standpoint of biosphere compatibility of construction objects in order to harmonize the characteristics of the life cycle of these projects with the characteristics of the microenvironment of their implementation. The basis of such tools is: multifactorial, multicomponent modeling and multicriterial selection of alternatives for building construction for projects, provided that the level of biosphere compatibility is used as the leading analytical coordinate of such simulation. These models, implemented in the format of modern construction, will serve as a basis for organizational and technological and environmental expertise of projects.

Keywords: *organizational and technological reliability, uncertainty of environment, construction project, biosphere compatibility.*

1. Introduction

At the present stage of development of the construction industry, the synergetic basis of the components of the processes of organization and management of construction is significantly increased. In fact, no significant investment and construction

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project is being implemented today without a collaborative component at the level of management, resource and information interaction of design and construction processes, their documentary, regulatory and technical and technological support. In this sense, there is a need to build a system of formation of innovation competence in the field of system engineering, economics, organization and management of construction. In general, the construction management is being improved in the direction of developing organizational schemes for the formalization of business processes and the formation of proper contractual relations, which is becoming a decisive factor in innovation development at the level of investors and contracting construction organizations. Multidimensional project management systems integrated with systems of modeling and life cycle management of new levels of objects will provide the necessary quality of object and process analysis and management decisions, including deployed cost management systems, construction dates, investment and project risks. Implementation of project management based on modern information models should promote the potential of innovative development of the construction industry.
Within the concept of sustainable development, a new approach to the design and construction of objects, called environmentally sound design, has emerged. It involves the integration, analysis and optimization of environmental, technological, social and economic factors at each stage of the design process, the widespread use of energy-saving technologies and renewable resources, including a closed cycle of resource consumption, the harmonious entry of a new building into the environment, and much more should minimize the harmful effects of human activities on the environment.
Inadequate consideration of the laws of interaction between society and the nature of urban development is accompanied by significant negative (anthropogenic and man-made) impact on the natural environment, which threatens catastrophic consequences for the biosphere and man. According to the results of the analysis, it is concluded that there is a fundamental need for the adoption of a new urban planning policy and the implementation of biosphere compatibility technologies in the construction and reconstruction of urban structures.
The purpose of the article is to formulate methodological and analytical requirements for the introduction and construction of tools for organization of construction and organizational and

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technological support of construction projects on the basis of biosphere compatibility.

3. Organizational and Technological Reliability

Conceptual basis and general-methodological provision of organizational and technological reliability of the preparation and organization of construction determines the content and direction of adaptation of existing construction tools to the principles of biosphere compatibility as a guarantee of the proper level of organizational and technological reliability (OTR), which in general will ensure the success of construction development throughout the cycle construction project. An important issue in the implementation of the concept of biosphere compatibility construction - especially in connection with the fact that it is often considered as evolving - was the discovery of its practical and measurable indicators. In this direction, both international organizations and academic circles are now working. Based on the above-mentioned triad, such indicators can bundle three components and reflect: environmental, economic and social aspects. Various authors have repeatedly pointed out the inaccuracy of the Ukrainian translation of the from English «development» - creation, event, improvement, growth, expansion, development, improvement, design, evolution, improvement, manifestation, circumstance, proof, enterprise, preparatory work, new construction, preparation of the deposit, withdrawal, cultivated plot of land, conclusion; from German «development» - manifestation, development, creation, construction, change, design, modernization, design, design; from French – «developpement» - development (durable, long lasting, reliable). But in the context of biosphere compatibility, this translation should have a narrower meaning. This is the development of "continuing" ("self-sufficient"), that is, that does not contradict the further existence of humanity and its development in the previous direction.

3.1. Concept of Biosferous Construction

In the European Union, innovative building programs and urban development projects are being gradually developed on the principles of "biosphere bundling". The key strategic determinants of such programs and projects are:

- organization of construction on a fundamentally innovative basis, aimed at the formation of a safe (and self-development) human life;
- ensuring the balance of bio-, techno-, and socio-spheres of urbanized territories.

The work of is devoted to the study of this direction V. Il'ichev [1], A. Lapidus [4], A. [1], S. Veremeenko, A. Ginsburg [3], V. Mlodezdsky [4], V. Bolshakov [5], V. Pokolenko [6] P. Kulikov [7]. The works of the above-mentioned authors formalize the process components and structural and factor basis of the reliability of the projects, but the question of reducing the entropy of organizational and technological reliability of such high-tech projects as biosphere-compatible projects and the creation of methodological bases for the design, calculation and implementation of biosphere compatibility construction projects in Ukraine is not considered sufficiently in them.

The basic principle of the implementation of the concept of biosphere compatibility is that the development of human potential is possible only through the restoration of nature, including at the expense of leveling the impact on it (costs of exhaustive natural resources, deterioration of the environment, etc.) from the person.

These principles can be ensured with a comprehensive consideration of all aspects of human activity that form four main groups: socio-cultural (meeting the needs for quality of life), environmental (conservation and protection of the environment), energy and resource consumption (energy saving and energy efficiency, recycling of materials, use of renewable energy sources, etc.) and economic (reduction of the cost of the life cycle of construction ojects) [1; 2]. An important task is to establish the importance of the priorities of the rating system, that is, quantitative assessment of the properties of construction objects, which characterize the potential for improving their quality in a particular region.

The proposed system of certification of objects of biospheric construction is formed on the basis of a rating index, the content of which is provided by an integrated set of assessments of the achievement of certain levels of compliance in priority areas (categories). Each category is represented by a separate group of criteria - specific requirements for project design of buildings. That is, the amount of ball scores according to these criteria determines the ballroom value of the category as a whole.

It is proposed to determine the rating for 5 categories that contain 59 criteria, which are classified in 5 groups:

1. Quality of the internal environment - 15 criteria;
2. The use of land and the quality of the environment - 13 criteria;
3. Energy and energy efficiency - 7 criteria;
4. Life cycle of the object - 14 criteria;
5. Materials, construction and quality of architectural decisions - 10 criteria.

A preliminary analysis [2] has shown that the division into categories and criteria of analogues of the developed system of rating environmental and energy efficiency of buildings in other countries is excellent. For example, BREEAM (UK) - 9 categories and 48 criteria; DGNB (Germany) - 6 categories and 59 criteria; Green Standards (Russia) - 10 categories and 46 criteria and so on. Such a quantitative (and accordingly, for filling) difference is explained by the specific functions that must be provided by the certification system, and which depend on the available climatic, resource, socio-cultural, economic conditions, normative and scientific and technical developments of the country of the developer.

4. Concepts of «Green Lease» and «Surveying»

One of the trends in the development of the world economy in the field of commercial real estate management is the active dissemination in the science and practice of the concepts of «Green Lease» and «Surveying», which consists in developing strategic priorities of management, their implementation, control over the implementation process; the formation of a list of potential contractors and the definition of conditions for cooperation with them regarding the provision of quality housing and communal services; introduction of modern energy-saving technologies in order to increase its energy efficiency.

Now, in conditions of significant energy intensity of the economy, growing demand for the introduction of «green» technologies, the demanded servicing services at the management of objects of real estate of various functional purposes. However, in practice, often there is a problem related to the clarification of the content of servicing activities, the allocation of the specifics of server services and their differences from other types of services in the commercial real estate market.

There is a distinction between the functions of the owner and the manager in the context of the system of professional management in the commercial real estate market. The functions of operational management of real estate objects are delegated to specialized servicing management companies, and the owner retains the functions of making strategic decisions and functions of control of the quality of management.

One example of the successful implementation of syncretism of the concepts of «Green Lease» and «Surveying» is the development company Pyramid, the largest developer in the United States (owns and manages more than 17 million square feet of commercial real estate).

In order to implement a strategy based on syncretism of the concepts of «Green Lease»and «Surveying», «Pyramid» has identified LEED certification as a priority for tenant real estate. The company's development has taken into account the multi-dimensionality of energy usage profiles for enterprises, as well as the LEED criteria that provide flexibility for different types of business. The strategy of implementing the syncretism of the concepts of «Green Lease» and «Surveying» was to: conduct a discussion; consultation of tenants at each stage of implementation of energy efficiency measures; use of the most effective approaches to the management of commercial real estate

5. Formalized Model

The formalized model of the dynamics of the change of the state of biospherically compatible urbanized territories in general is described by the nonlinear equation:

$$\frac{dx_i}{dt} = f_i(x_1, x_2, ..., x_n), i = 1, n,$$

fi – continuous or piece-continuous functions;
xi – coordinates of the system reflecting the position of a certain point on the phase plane or in the coordinate space and characterize the state of the components of the system at any given time.
As a criterion for assessing the balanced state of biosperous-compatible urbanized territories, there is a quantitative correlation between the indicators of the state of its components, namely:
- level of satisfaction of the needs of natural resources (so-called primary needs - water, oxygen, air, mineral raw materials, etc.);
- the level of innovative development of the infrastructure component in cities and settlements;
- level of development of human potential.
The mathematical representation of a dynamical system is determined by a set of nonlinear differential equations:

$$\begin{cases} \dot{X}_1 = a_{10}X_1 - a_{11}X_1^2 + \gamma_1 X_2 X_3 - b_1 Y + U_{10}; \\ \dot{X}_2 = a_{20}X_2 - a_{22}X_2^2 + \gamma_2 X_1 X_3 - b_2 Y + U_{20}; \\ \dot{X}_3 = a_{30}X_3 - a_{33}X_3^2 + \gamma_3 X_1 X_2 - b_3 Y + U_{30}; \\ \dot{Y} = a_{40} - a_{44}Y^2 + X_1 X_2 X_3, \end{cases}$$

X1 – a variable characterizing the level of consumption of natural resources and the level of pollution of the environment with waste;
X2 – a variable that characterizes the level of development of the industrial-infrastructure component in the region (the use of "green" technologies, the number of innovative productions, the rate of renewal of fixed assets, etc.);
X3 – is a variable that characterizes the degree of satisfaction of rational life-support needs of the population of urbanized territories (work, housing, education, medicine and health care, transport, etc.);
Y – a variable that reflects on the system level the processes of life, which proceed simultaneously (the effect of synergetics);
U10, U20, U30 – variables characterizing control influences aimed at achieving the target state - compatibility with the biosphere and progressive development of urban areas;
a10, a20, a30, a40 – feedback ratios characterizing the influence of various environmental factors;
a11, a22, a33, a44 – feedback ratios characterizing the stabilizing influence of external factors on the implementation of biospheric-compatible construction (for example, the amount of man-made and domestic waste being recycled as an innovative, environmentally safe industrial-infrastructure component has the effect of compensating for the harmful effects of the corresponding component on the natural environment);
γ1, γ2, γ3 – coefficients characterizing the mutual influence between the individual components and components of the natural-sociological structures (indirect influence of the level of air pollution, water environment and other components of life support in urban areas on the health of the population, etc.);
b1, b2, b3 – coefficients characterizing the stabilizing influence of the environment, dictated, for example, by changes in the regulatory base, demographic processes, migration of the population, etc.
In the framework of this concept, [6] a conceptual model of the "complete resource cycle" of a civilian house is proposed in which the waste generated during the life cycle of an object is suitable for further resource or energy use.

6. Conclusion

The article considers the prerequisites for updating the modern paradigm of organizational and technological planning of construction production in accordance with the modern understanding of providing integrated reliability as a multiplicative flow of a set of key indicators of the project and the creation of methodological bases for designing, calculating and implementing biosferous-compatible construction projects in Ukraine.
As a result of the study of the syncretism of the concepts of «Green Lease» and «Surveying» conducted on the example of Pyramid, it is concluded that it is developing dynamically, from considerable experience in the field of commercial real estate, providing various services in all phases of the life cycle of the property, while providing the maximum profit for its clients and investors.
Taking into account the experience of the leading American developer company «Pyramid», we suggest taking into account the specifics of the latest concepts of «Green Lease» and «Surveying» in the course of development management, depending on the cyclical nature of the development of the commercial real estate market and in Ukraine.

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