

Natural resources as the basis for the economic and environmental characteristics of construction projects

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Abstract. The purpose of the publication is to consider the economic and environmental characteristics of facilities. The environmental component of natural resources is considered as a component of production processes at different stages of the facility creation. The economic component of natural resources is determined by the relevance of the ratio of costs and profits. The methods used for the study (differential rent, economic method of environmental management, methods of calculating environmental and economic damage) involve a comprehensive consideration of the natural resource: the land plot. The value and investment attractiveness of one or another of the natural resources (land plots) in any case is made taking into account additional costs and, of course, a cumulative assessment of environmental indicators in the external environment. The obtained results confirm the solution of the issues of the balance of economic and environmental indicators in the implementation of construction projects. A comparison is presented to determine the differential rent of land plots with different natural conditions, but potentially investment-attractive in terms of conditions sufficient for the organization of construction production. Typical indicators that characterize the economic and natural effects are considered taking into account the characteristics of the implemented construction project at different stages of its life cycle.

Keywords. Investment and construction process, construction object, natural resources, economic and environmental characteristics of the object

1 Introduction

The investment and construction complex is one of the fundamental areas of the economy. At present, the need to adapt the necessary types of resources is obvious. One of them, in addition to innovative [1, 2], technical and technological, including the use of technological platforms [2], information [3], is, of course, natural [4, 5]. It is biosphere-compatible

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construction that is based on the generally recognized concept of rational consumption of resources [6], organically built into the system of lean construction [7]. It is important that the redistribution of resources in the implementation of construction projects, collectively forming a risk component [8], is structurally part of the economic security of the enterprise. Natural resources shape production processes and determine the adoption of managerial decisions in construction organizations. Recently, it is advisable to consider the management of natural resources from the point of view of the obtained effects: environmental and economic [9, 10], taking into account the conservation of natural resources and ensuring the systematic implementation of construction projects. We propose to focus on the financial (economic) component in order to fully take into account the tasks of nature protection and better use of natural resources in the implementation of economic reform along with other conditions of production, it is necessary to resort to economic measures, as noted by T.S. Khachaturov, M.N. Leuter. These scientists also reflected that the need to establish the right balance between the exploitation of natural resources and economic development is of great importance when measuring the costs necessary for the development, use or protection of the natural environment with the overall economic effect achieved on this basis. This is also due to the fact, from our point of view, that the practical results of the implementation of complex multidisciplinary and multifunctional facilities involving modern design elements are confirmed, namely: solving the problem of lean attitude to natural resources and maximum accounting of available natural resources depending on the location of the construction site, which cannot be achieved only by legislative and administrative measures.

2 Materials and methods

The implementation of the task of the study creates the need to justify the priority of independent consideration of the effects. Given that different formulations and phrases of the obtained effects are presented in the scientific sources of the literature, we seem to focus more on their separate consideration. For the formation of a comprehensive analysis due to the multifaceted and interconnected effects and their replacement, sharing the point of view of A.A. Lapidus, it is important to take into account that natural resources are presented both to external factors of the project (the environmental situation around the project, the presence of influencing natural factors) and to internal ones (selection of the correct location of the construction object, the presence of road infrastructure). In addition, in the process of achieving the final result – the construction of the facility, we propose to pay attention to the fact that the possibility of providing construction with materials, the sequence of actions at the stage of operation of the construction facility, depending on natural conditions, will determine the direction of solving production tasks for the construction organization and other participants in the investment and construction process as a whole and operational tasks for the owners of the acquired real estate objects.

Economical methods of environmental management are taken into account, which include indicators that affect the costs and revenues from alternative actions of nature users, and thereby form such actions of a construction organization as a user of natural resources, as a result of which the desired state of the environment is achieved. Economical methods of environmental protection management form a responsible attitude of all participants in the investment and construction process for the implementation of environmental protection actions, as well as affect the formation of the price of construction products [11].

In addition, at the design stage, environmental and economic damage to natural environment objects is determined on the basis of approved methods for calculating such damage in monetary terms [12].

In addition, the differential rent method is used.

3 Results

The construction industry, which directly uses natural resources, represents an increased level of economic justification for investment decisions. Their aggregate assessment of different resources is the most important condition for the implementation of capital investments. It is especially important that when substantiating large projects on relatively small natural resources (land plots, mainly), the use of comparative efficiency methods should help to identify the best option for such development, but efficiency calculations by types of effects are no less important.

On the issue of economic valuation of natural resources, we propose to highlight such related aspects as:

- 1) the feasibility of economic assessment of natural resources used in the production process, which is particularly acute in the construction industry both in connection with the study of the problems of efficiency of capital investments, and in connection with the daily planning and design calculations carried out in the field of capital construction (investment component), due to the fact that capital costs and natural resources are essentially used in the complex in the construction process, but in various combinations, directly, in one or another version of “interchangeability and complementarity”;
- 2) the need to protect nature from human production activities causing damage to it (security component);
- 3) development of directions of economic measures that would neutralize the impact of natural conditions on the results of economic activity of individual construction organizations, since the use of various types of natural resources in production and their involvement in production form the need for various needs for additional investments or, conversely, free the construction organization and participants in the investment and construction process from some part of the costs (economic component).

They are reflected in environmental and economic indicators.

Table 1. Environmental indicators at different stages of construction.

Stage of construction production	Environmental indicators
Creating an investment project, solving financing issues	Taking into account the indicators of the nature protection zone, the presence of water bodies, etc.
Design, examination and approval of design and estimate documentation	The level of pollution of water, air, soil (indirect impact when choosing building materials and their use) Mandatory payments for natural resources
Preparation of construction production by all participants of investment and construction production	
Construction	The level of pollution of water, air, soil (direct impact during construction)
Operation	
Liquidation	

Table 2. Economic indicators of natural resources by the ratio of costs and profits

Stage of construction production	Economic indicators
Creating an investment project, solving financing issues	Land acquisition costs
Design, examination and approval of design and estimate documentation	Costs for taking into account climatic conditions (wind direction, air temperature, etc.)
Preparation of construction production by all participants of investment and construction production	Investments
Construction	
Operation	Profit of the construction organization at the stage of commissioning
Liquidation	Liquidation costs and cumulative costs for the presentation of an identical property, if necessary

Based on the differential rent, taking into account the necessary additional costs, the value of land plots was determined with the existing advantages and disadvantages. In this case, the principle of initial assessment for its acquisition and development, as well as additional costs for its development during the construction period, are taken into account. In this case, the differential rent, as the effect of using a resource of higher quality and with more attractive quantitative and qualitative characteristics, is expressed in the rental rate of the land plot (income from the lease of the land plot). This value of the rate, in the case of renting a land plot from all existing proposals, taking into account the demand of developers for their development, will form a land rent, which economically equalizes the demand and supply for existing land plots in a certain territory (city, district). The cost of land plots with different natural characteristics (in this case, different natural resources) will form the initial costs of the proposed investor.

In practice, depending on the competitive conditions of the investment and construction project being implemented, the determination of the amount of differential rent is associated with a number of factors. In excluding the double economic cost account, it is logical to separately take into account the differential rent and additional net income that will be received due to better organization of production, elimination of losses as a result of the use of different methods of work, more profitable sale of finished construction products, a more skillful marketing strategy, use of market conditions, etc. Within the framework of the study, comparing land plots with different natural conditions, but potentially investment-attractive (average) in terms of production conditions, to determine the differential rent, the following is observed:

- 1) the minimum value of the differential rent for a worse land plot;
- 2) investing more labor and disparate costs in a land plot that is worse in terms of natural resources, which can be compensated only by net sales income;
- 3) differential rent for the owner who leases natural resources and the right to develop them to a potential participant in the investment and construction process determines at the legislative level any natural resources suitable as a possible means of production, except, of course, withdrawn from circulation and limited.

The difference assessment based on the differential rent is clearly not enough, in this case, to determine the value of a particular land plot, since in any case additional costs are required and, of course, a cumulative assessment of environmental indicators to the external environment.

As the analysis shows, when studying and assessing natural resources in the calculation of the comparative efficiency of capital investments, a very realistic and systematically feasible option for the use of a particular land plot based on the total technical and economic potential takes into account a number of indicators.

Typical indicators that characterize the economic and natural effects are considered taking into account the characteristics of the implemented construction project at different stages of the life cycle. Significant characteristics of the facility under construction are determined on the basis of the indicators under consideration. The results showed that it is possible to use lean construction tools, and the implementation of the principles of environmental management in the field of construction activities is of particular importance, since construction facilities provide different effects, environmental, economic, for the health and daily life of people.

4 Conclusion

The implementation of construction projects is carried out taking into account natural resources and natural conditions. Their location on the land plot is associated with external environmental factors and the necessary acceptable justification of characteristics in the design. The proposed version of the indicators provides an opportunity to implement an alternative option that combines the balance of reliability and safety of commissioned construction facilities and taking into account natural support at the design stage, as well as, directly, natural factors at the operational stage.

Table 3. Economic indicators of natural resources in terms of cost ratio (coefficient of additional costs, thousand rubles per 1 m² of land)

Options for obtaining a land plot with the presence of existing natural resources	General objective	Principal provisions	Coefficient of additional costs, thousand rubles per 1 m ² of land
Redevelopment of the city territory	Mechanism of integrated development of territories	Contract price under the auction conditions	0.85
		Additional costs for dismantling buildings, creating favorable living conditions	1.25
Development of territories of garden societies and vegetable gardens	Implementation of organizational and economic tasks of construction	Price of purchase and sale of a garden land plot	1.15
		Costs for well-equipped communications	
Search for areas with hidden investment potential	Search for undeveloped land plots. Implementation of projects on inconvenient land plots	Costs of dredging in shallow waters, ravines, steep slopes, etc.	1.45

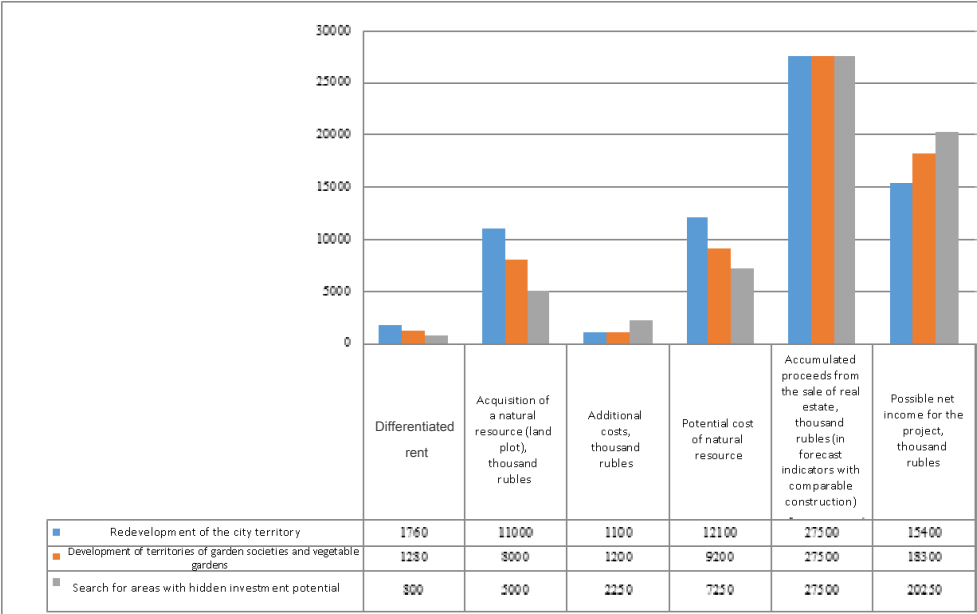


Fig. 1. Change in additional costs and net income of facilities on land plots with different natural resources (distribution of cash flows).

The scientific and practical novelty of the scientific problem being solved is of interest due to the fact that the negative impact of the construction object on the environment is reflected, since almost all types of work (preparatory, construction and installation works, waterproofing, etc.) have the opposite effect on natural factors.

In the economic assessment of natural resources (natural) that are used in production, it is advisable to distinguish two points. First, identifying the comparative economic value of natural factors of production (for example, different land plots for a construction site). Such an assessment makes it possible to determine the investment value of certain natural resources based on the results of the study. Secondly, a valuation of these natural factors of production is required, which can be carried out primarily in relation to those natural resources that are directly used in the production process. It is important to take into account that natural resources as part of the natural, geographical environment do not have a value that would be transferred to products, since their creation did not require labor costs. However, economically, with the practical implementation of projects already at the stage of investment justification, their availability allows you to save resources or the necessary additional labor. Of course, the costs of additional labor and additional resources depend on natural resources, their objective conditions that affect production, thereby organizing and strategically determining various production results when using natural resources of different quality. The cost of manufactured products (construction site, or part thereof) is formed to the extent that additional labor and resources necessary for the implementation of the project are replaced by natural resources.

Of course, natural resources increase in value only after additional labor is invested in them, which is more or less typical for all resources subject to reproduction. Together with the involvement in the production of natural resources, the reserves of which are not unlimited, the share of attracted additional resources in the development of new unattractive land plots for construction, or in their reproduction (regulation of the water regime,

regeneration of wastewater and air in industrial areas, forest cultivation, fish farming, etc.) increases.

In general, it becomes necessary to analyze in the economic assessment of natural resources the objectively existing differences in the quality of resources of the same name, since their use provides an equal economic effect only when costs are differentiated.

Summing up the results of the study, it is important to emphasize that the assessment of natural resources can be made only by comparing the projected values of costs and the effects obtained as a result of the project implementation, that is, with the actual ones. It is necessary to take into account the general rule of comparability of all cost calculations of the forecast, where the costs for certain types of natural resources are indicated, as well as additional costs for fuel and hydroelectric power, depending on the climatic conditions of the territories and the level of their development before the project implementation.

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