

Socio-Ecological Risks of Urbanized Territories Development

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Abstract: The article covers the problem of development of effective approaches to risk assessment and selection of investment and town-planning projects. On the basis of revealing the problems in urbanized territories development, determination of problems of modeling risk management processes and structuring of the parameters of systemic factors relationships. The author developed an economic-mathematical model of forming of a socio-economic risk of the investment and construction projects of urbanized territories development.

Key words: Modeling • Project • Risk • Development • Urbanized territories

INTRODUCTION

Modern urbanized environment of urban areas in Russia is characterized by a severe socio-ecological violations, due to the lack of control of ecological parameters of investment and construction projects and as a result large-scale pollutions of atmospheric air, surface & deep soil and water objects [1].

The deterioration of ecological environment parameters, intensification of construction and anthropogenic impact on the environment contribute to a violation of the natural-anthropogenic sustainability and increase the probability of negative socio-economic consequences in the scale of urban agglomeration, exhibited in the increasing incidence, growth of economic losses and expenditures [2].

MATERIALS AND METHODS

At the same time, many researchers use the official publications of the environment pollution as an information basis of data, which, as a rule, do not consider unauthorized discharges and emissions, which leads to poorly objective character of the obtained results and reduces the practical significance of the conclusions. Constellations of criteria used for assessment of the

ecological state of the environment, often reflect only the degree of anthropogenic impact of human activities and does not take into account the risks of social damages [3].

The objects of ecological and economic risks of the realized investment and construction projects of urbanized territories development are individuals, urban population, economic entities (enterprises, organizations, companies), territorial and environmental systems and territorial-production complexes of different levels [4].

The process of deterioration in environmental quality can be as relatively evolutionary in nature, for example, prolonged accumulation of the pollutants in the specific field of the environment and also can have catastrophic rate, for example, in consequence of technogenic accidents, catastrophes or natural disasters [5].

In connection with the indicated circumstances the modeling of processes of social and environmental risks management in the process of planning the directions and realization of investment projects of urbanized areas development is relevant and affects interests of the city community, defining long-term priorities of the environment security of urban areas [6].

An important issue of economic-mathematical modelling is to determine the criteria characterizing the state of the studied object. When studying the socio-ecological environmental parameters, as a rule, can

be used two or three key indices, for example: the volume of natural resource, absolute discharge (emission) of polluting substances, their concentrations in the environment and so on. However, it is obvious that the assessment of socio-ecological parameters of the investment and construction projects of urbanized territories development must be accompanied by considering the significantly larger number of figures. In other words, it's talking about the integrated assessment of the consequences of the condition, quality, safety and sustainability of the natural environment of a certain territory [7].

Most known systems of environmental indicators of the environment is a system of criteria for sustainable development, elaborated by the United Nations Commission on Sustainable Development (UN CSD) and the system of environmental indicators proposed by the Organization for Economic Cooperation and Development (OECD) [8].

Despite intensive nature and a great variety of socio-ecological and ecological-economic risks emerging in the process of realization of urban areas projects and regions development, researches on the degree of their influence on the socio-economic condition of the city and the heterogeneity of the development are practically absent [9].

Under the ecological and economic risks we understand the risks of economic losses and damages emerging within economic entities of different levels of social organization due to the deterioration of the quality parameters of the environment state. The economic part of this term defines the involvement of objects that have ecological and economic risks to the general economic subsystem of the city and reflects the economic characteristics of their losses. The environmental part reflects the causes of the environmental and economic risks [9].

In most studies of domestic and foreign scientists as a function of damage are used simple linear or exponential functions and as an assessment tool is used the method of econometric modeling [10]. It also assumes a direct dependence of the level of health of the population from a number of factors, the most significant of which is determined by the quality of the environment. This relationship can be represented in the form of econometric equations:

$$xy_i = f(x_{ij}, \dots, x_{in}) + e_e, \quad (1)$$

where: f : form of dependence, y_i : dependent variable, x_{ij} : independent variables, e_e : error of the equation.

RESULTS AND DISCUSSION

An important task of the research of this relationship is to determine the degree of influence of the whole complex of factors on the amount of possible damage. It should be noted that the estimation of the contribution of a particular factor in the formation of the identified dependencies is very difficult, due to the multitude of combinations of mutual influence and interaction of risk factors, real conditions and restrictions of risk manifestations, inaccurate forecasts of the amount of damage and environmental pollution [11].

The main group of factors of a damage formation from pollution are the socio-economic factors, which are also characterized by the presence of complex relationships. This circumstance causes the lack of adequacy of the models of simple regression based on the cross-comparison of the values of a certain amount of damage and the related indicators of environmental quality. This is explained by the following circumstances:

- Most of the economical, ecological and social processes are too complex to describe in one equation linking dependent parameter and set of independent variables.
- The independent variables may have multicollinear connections.
- Regression due to its reduced form often cannot fully describe the true nature of the studied system.

Therefore, we conclude that the formalized description of the factors of socio-economic risks caused by the realization of investment and construction projects of urban territories development, must include a system of equations in which the exogenous variables of some equations will be endogenous with respect to the entire system, in other words act as dependent in other equations system. However, we noted that in the majority of the empirical studies of damage from environmental violations is not taken into account the possibility of describing the dependencies of the type «natural damage and environmental pollution» [12].

In this regard, to estimate the potential socio-economic damage from pollution of the environment during the implementation of investment and construction projects of city urbanized territories development, we suggest a model based on the ideas of Freeman [13], which presumes that:

- Indicator of socio-economic damage (incidence rate) (M) is a function of the impact of a pollutant on the environment (P) and other variables of a system of simultaneous equations are the availability of qualitative medical attendance (D) and average of income level (Y);
- Availability of qualitative medical attendance is dependent on the average income level;
- The level of income directly depends on the extent of the damage to the recipient, as the high incidence causes the loss of working time and wage cut.

Thus, the proposed model can be presented as:

$$\begin{cases} M = a_0 + a_1D + a_2P + u_1, \\ D = b_0 + b_1Y + u_2, \\ Y = c_0 + c_1M + u_3, \end{cases} \quad (2)$$

where u_1, u_2, u_3 : residual terms of equation; it is assumed that the free variables must meet the following conditions: $a_0, a_2, b_1, c_0 > 0$; $a_1, c_1 < 0$.

Criteria for the level of morbidity, access to medical attendance and average income levels are endogenous regarding to the system even taking into account that each one of them acts as the independent variable in one of the system equations. The assessment of these equations by the least squares method (OLS) can produce contradictory results, moreover, in this case they cannot be identified. Building a model of simultaneous connections with multiple structural equations adequately reflecting identified relationships, allows to use special statistical methods of their assessment, for example, a two-step OLS that helps to overcome these shortcomings.

Analysis of methodological approaches to economic assessment of possible damage from a pollution of the environment during the implementation of investment and construction projects of development of urbanized territories showed that the most appropriate are the methods of objective group and in particular, the method of valuation impact, based on an econometric damage function.

CONCLUSIONS

We can conclude that the toolset for comprehensive socio-economic impact assessments of investment and construction projects of urbanized territories development are not fully formed. The accounting of possible economic damage from pollution must accompany the development of programs and projects of development of urban

territories. Estimation of such harm, first of all, reflects the relationship of environmental problems and municipal economy and secondly, it promotes a more objective substantiation of efficiency of investments in the development of the urban environment.

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