ATLANTIS PRESS

Advances in Economics, Business and Management Research, volume 90

International Scientific-Practical Conference on Business Cooperation (ISPCBS 2019)

Social and economic aspects of environmental protection measures for environmental safety

Manzhilevskaya Svetlana
Don state technical university
DSTU
Rostov-on-Don, Russia
smanzhilevskaya@yandex.ru

Petrenko Lubov
Don state technical university
DSTU
Rostov-on-Don, Russia
sp8061989@yandex.ru

***Abstract*—There is an environmental assessment of construction projects in the Russian Federation. The results of this assessment can reduce the risks posed by projects which are already implemented. Current trends in the development of environmental safety in the assessment should be aimed at improving the level of environmental protection during construction.**

The environmental assessment of the construction in the region should take into account the optimal conditions for preventing the damage to the population, both during construction and throughout the entire life cycle of the designed facility.

The environmental problem of finding the optimal mutual location of objects should take into account a large number of factors that determine the cost of construction of a specific type of objects in a given territory, the cost of organizing infrastructure and the improvement of a given territory. It is necessary to formulate a criterion for the optimal location of objects, taking into account the current environmental situation and to predict the costs of environmental restoration, for example, socially significant costs of restoring people's health.

The use of calculations contributes to reducing the environmental burden of the region, improving the quality of life of the population, rational use of territories and resources, which in general will affect its favorable development. The favorable development of all regions, with its natural features, provides prospective well-being of the country as a whole.

Keywords—environmental safety; environmental costs; ecology in construction; construction organization; economics in ecology; environmental protection measures; environmental assessment; mathematical modeling in ecology

I. INTRODUCTION

According to the economic calculations made by the Ministry of Natural Resources and Ecology of the Russian Federation, the costs of progress, which caused damage to the environment from the transport, agricultural and construction industries in 2018 are about 475 billion rubles [4]. Consequently, each passport holder of the country spent about 3275 rubles annually on the destruction of nature. According to the activity plan of the Ministry of Natural Resources of Russia, it is planned to spend more than 2 billion rubles for the restoration of ecology in its various sectors for the period 2019-2024, including about 500 billion to reduce the total emissions in cities, which will improve the quality of life of the population. These figures are based on various assumptions, but they can be taken as a starting point [5].

II. METHODS

There is an environmental assessment of construction projects in the Russian Federation. The results of this assessment can reduce the risks posed by projects which are already implemented. Current trends in the development of environmental safety in the assessment should be aimed at improving the level of environmental protection during construction [1-3].

The need for an assessment is justified, but the environmental compatibility of projects control is not enough. Today we live in a market-oriented economy, where globalization processes take place. There is interaction of numerous participants in the construction market, both at the national and international levels there. Such trends in the market due to the interaction of a large number of producers and consumers create hidden costs of progress, where they are sometimes little or not taken into account. The hidden costs, such as maintaining the health of the population, rehabilitating the environment, the economic losses of the population are often incalculable, and the damage to the environment is irreversible. A general view of environmental costs is presented in Fig. 1 [6].

The market saturation makes the manufacturers to look for the marketing areas in other regions of the world. For example, organizations engaged in the construction of unique structures will look for a new field of activity abroad, when the possibilities of implementing their projects in their countries are exhausted or unprofitable. In the interests of global environmental protection, the activities of these organizations should be carefully monitored, as they have already given rise to environmental problems, which required regulatory measures.

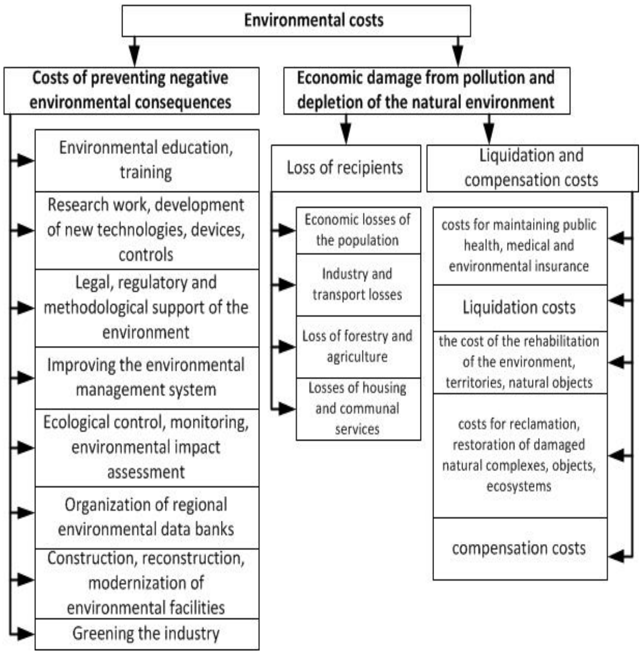

Fig. 1. The environmental costs.

According to the considerations of minimizing internal production costs, organizations have in practice to import the raw materials from abroad, including from the Russian Federation. At the same time, the prices of raw materials on the worldwide market remained largely independent of the labor costs and the destruction of nature, depended on supply and demand or being established by cartels. Now it becomes clear how closely our consumption is associated in some cases with the destruction of forests in the development of mineral resources for export and with the greenhouse effect [7].

There is the danger recognition of hydrocarbon reserves depletion and the energy crises beginning generated by rising prices for them. It led to the reorientation of energy companies to the use of resources from other countries, in particular Russian ones.

Nowadays in Russia it is in practice the advanced processing of raw materials in situ in order to save money on transportation that requires greater energy consumption. However, this did not lead to a greater economic independence of the state, towards which it worked for, but to a stronger pressure on the environment for the local population [10].

It is also in practice the outsourcing of environmentally harmful industries to other countries, since the environmental compliance requires significant additional investments, which are no longer necessary due to the lack of relevant directives or their non-observance due to lack of information or regulatory bodies [11].

Financial organizations consider the allocation of the loans for large projects construction as economic process depended on the solvency of loan recipients than on timely assessed social and environmental impacts. As a rule, the population of the respective regions is not informed in advance about the project construction planning and development. People find out the ecological problems of their inhabiting territory only after the project implementation.

The environmental assessment of the construction in the region should take into account the optimal conditions for preventing the damage to the population, both during construction and throughout the entire life cycle of the designed facility.

The global assessment of the compatibility of projects with environmental and social conditions should follow the characteristics of the product produced. Sustainable long-term development does not depend on the inexhaustibility of oil, ore, or non-renewable resources, and whether it is possible to avoid adverse effects on water, air and soil [8].

Cross-border economic activities (foreign trade, flight of industries, foreign loans, the search for cost-effective development areas) are, as a rule, capital-intensive plans that will bring all sorts of benefits both to the state as a whole and to investors participating in them. The consequences related to the population, adverse environmental impacts are often global in nature.

It is often in practice that during the conducting an environmental assessment of projects, it is not known which of the local authorities is responsible for this, since they have no relevant experience. The cooperation of experts in various countries on the assessment of the environmental and social acceptability of projects is professionally necessary. In addition, the agencies of states which conduct the impact assessments timely should be open to requests from non-governmental organizations. This would be a step forward in comparison with studies that are carried out late, without public control [9].

Ultimately, the knowledge accumulated by local specialists in the regions is the best long-term guarantee of sustainable social and economic development [13, 14]

III. RESULTS

The environmental problem of finding the optimal mutual location of objects should take into account a large number of factors that determine the cost of building a specific type of objects in a given territory, the cost of organizing infrastructure and the improvement of a given territory. The analysis of factors and the use of the mathematical models will make it possible to find optimal solutions, [12] such as:

- the placement in the region of construction production of specific objects in accordance with calculations determining the minimum levels of impact on the population, and the ecology of the region as a whole (for example, the construction of an industrial facility in the territory located near the city with the calculation of the sanitary protection zone);
- the placement of construction objects on the territories allocated for construction, according to the town-planning solution plans and urban area development plans or region as a whole (for example, the construction of large housing complexes in connection with the urban encroachment in the allocated territories and construction stages observation);

- the planning the construction of civil and industrial facilities with the determination of their optimal placement in the territories without causing damage to the population and the environment;

It is necessary to formulate a criterion for the optimal location of objects, taking into account the current environmental situation and to predict the costs of environmental restoration, for example, socially significant costs of restoring people's health.

For the criterion calculation, let's denote a_{jk} as the cost of restoring human health in an ecologically significant region with number k calculated per person per year and per any pollution concentration, for example, fine dust j. Let's denote N_k as the total population in the region. Then the cost of restoring the health of people due to pollution will be equal to

$$c_{jk} = \int_0^T dt \int_{\Omega k} \alpha_{jk} N_k \varphi_j d\Sigma \tag{1}$$

It is necessary to sum up this expression across all ecologically important regions. As a result, we get

$$R_{pj} = \sum_{k=1}^{n} c_{jk} = \sum_{k=1}^{n} \int_0^T dt \int_{\Omega_k} \alpha_{jk} N_k \varphi_j d\Sigma \tag{2}$$

or

$$R_{pj} = \int_0^T dt \int_{\Sigma_0} P_p^j \phi_j d\Sigma \tag{3}$$

where

$$P_p^j = \begin{cases} \sum_{k=1}^{n} \alpha_{jk} N_k, & r \in \bigcup_{k=1}^{n} \Omega_k \\ 0 & outside the domain. \end{cases} \tag{4}$$

Another important part of the cost is associated with a decrease in the number of environmental components, for example, vegetation cover, due to a decrease in the areas of productive soil cover of the territory of the proposed development. Denote them by R_{bj}. The value of R_{bj} will be

$$R_b j = \int_0^T dt \int_{\Sigma_0} P_b^j \phi_j d\Sigma, \tag{5}$$

where

$$P_b^j = \sum_{l=1}^{S} \beta_l n_l b_{jl}, \tag{6}$$

b_{jl}– level of the damage to the environmental components by pollutants of a particular type;

β_l–component recovery price;

n_l–area size or density l of a component on $\sum$o – territory;

ϕ_j–pollutant concentration.

The last part of the costs is associated with the constant maintenance of components at a given level:

$$R_{gj} = \int_0^T dt \int_{\Sigma_0} P_g^j \phi_j d\Sigma, \tag{7}$$

where

$$P_g^j = \sum_{l=1}^{S} p_l n_l b_{jl}. \tag{8}$$

Then for m different environmental components (animals, plants, soil) we get m functional

$$R = R_{pj} + R_{bj} + R_{gj} \tag{9}$$

After summing up it turns out

$$R = \sum_{j=1}^{m} R_j. \tag{10}$$

Let's denote $c_i(r)$ as the cost of construction of an object i at the point r of the region $\sum_0$ and $c_{ik}(r)$ as the cost of building and operating the infrastructure of the object calculated per unit of the shortest distance between the point r of the i-th object and the k-th protection zone (including the average cost of the planned transportation of goods and passengers). Let's denote $r_{ik}(r)$ as the totality of such distances. In the course of calculations we get the functional

$$E_{ik}(r) = A_i(r) + A_{ik}(r) + r_{ik}(r). \tag{11}$$

This functional determines the cost of construction of the i-th object and the necessary costs associated with the k-th ecological zone. The value of the functional increases with the distance of the object location from the protected area. Summing up (11), we find a single functional

$$I_i(r_0) = R(r_0) + \sum_{k=1}^{n} E_{ik}(r_0), \tag{12}$$

where $I(r)=const$ shows the localized area that is most suitable for the construction production of this object [15].

IV. SUMMARY

The use of calculations contributes to reducing the environmental burden of the region, improving the quality of life of the population, rational use of territories and resources, which in general will affect its favorable development. The favorable development of all regions, with its natural features, provides prospective well-being of the country as a whole.

REFERENCES

[1] Federal law no7-FL (R.E. from 29.07.2018) Environmental Protection Act, Russia. 2002.

[2] Federal law no 184-FL (R.E. from 29.07.2017) Technical Regulation Act, Russia. 2002.

[3] RF Government Regulation N 468 about the order of construction control during construction, reconstruction and major repairs of capital construction objects, Russia, 2010.

[4] RF government program “Environment protection” (R.E. from 29.03.2019, №362), Russia, 2019.

[5] The activity plan of the Ministry of Natural Resources of Russia for the period of 2019-2024, Ministry of Natural Resources and Environmental Protection, Russia, 2019.

[6] O.S. Shimova, “Ecology and environmental economics”. Belarus: BSEU, 2002 – 367p.

[7] L.K. Petrenko, S.E. Manzhilevskaya, A.A. Tutaev, E.V. Timoshenko, Inženernyj vestnik Dona (Rus), 2019, № 1. URL: ivdon.ru/uploads/article/pdf/IVD_135_Petrenko.pdf.

[8] V. N. Azarov, N. S. Barikaeva and T. V. Solovyeva, Monitoring of fine particulate air pollution as a factor in urban planning decisions Procedia Engineering (Amsterdam: Elsevier) - 2016. – Vol. 150. pp 2001-2007.

[9] V.N. Azarov, S.E. Manzhilevskaya, L.K. Petrenko, The pollution prevention during the civil construction. MATEC Web of Conferences2018. - Vol. 196. pp 1322-1326.

[10] L.K. Petrenko, A.A. Buc, Inženernyj vestnik Dona (Rus), 2018, № 2. URL: ivdon.ru/uploads/article/pdf/IVD_155_Petrenko_N.pdf.

[11] V.N. Azarov, S.E. Manzhilevskaya, N.V. Koval, A.D. Semernikova, “Environmental requirements in the design and construction of facilities”, The Eurasian Scientific Journal, (2018), 6(10). URL: esj.today/PDF/96SAVN618.pdf

[12] V.N. Azarov, S.E. Manzhilevskaya, N.V. Koval, A.A. Tutaev, Simulation modeling systems for the implementation of environmental safety. The Eurasian Scientific Journal, (2019), 1(11). URL: esj.today/PDF/39SAVN119.pdf

[13] Lubov Petrenko, Svetlana Manzhilevskaya, Aleksandr Shilov and Al-Hajj Ali Abdullah Saleh, The far-seeing planning systems and models for the construction management. MATEC Web of Conferences. – 2018. – Vol. 170. – URL: matec-conferences.org/articles/matecconf/pdf/2018/29/matecconf_spbwosce2018_01007.pdf

[14] V.N. Azarov, A.I. Evtushenko, V.P. Batmanov, A.B. Strelyaeva and V.V. Lupinogin, Aerodynamic characteristics of dust in the emissions into the atmosphere and working zone of construction enterprises, International Review of Mechanical Engineering 7(5) (2016) pp 132-138.

[15] G.I. Marchuk, Mathematical models in environmental problems, Elsevier, England, 2012 – 542p.