Development of innovative architecture of the organizational and economic mechanism for the nature protection management

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Abstract. The problems of the efficient functioning of environmental and economic systems of various levels on the basis of the adequate organizational and economic management mechanism are considered in the article. The purpose of the study is the analysis and development of theoretical provisions for the formation of a modern, innovative organizational and economic mechanism of the nature protection management. The compliance matrix of the innovative elements presented in the structure of the organizational and economic mechanism of the nature protection management is developed. The main result of the study is the improvement of the existing management mechanism to minimize the negative impact on the environment, including through the incentive system, and to improve the financial performance of the economic entity. The practical component of the study conducted can be recommended to municipal, regional and federal authorities, as well as the industrial enterprises, to support the adoption of the effective, environmentally sound management decisions that are consistent with the global concept of sustainable development.

1. Introduction

The development of the real sector of the economy determines the high level of anthropogenic impact on the environment, stipulating the need to solve the problem of resource and nature conservation minimizing the financial costs [1]. The nature protection efficiency increase depends on the process of managing the territorially distributed environmental and economic system with its unique features. Of decisive importance in this case is the formation of the organizational and economic mechanism for the nature protection management, which corresponds to high modern requirements caused by the international integration of the enterprises and the environmental legislation enforcement [2]. This situation determines the relevance and practical significance of this study.

2. Material and methods

The object of the study is the geographically distributed environmental and economic system management. The subject of the study is the organizational and economic mechanism of the nature protection management. The study is based on an analysis of domestic and foreign literary sources on this issue. The particular attention is paid to the study of the innovative elements of the organizational and economic mechanism of the nature protection management, which have practical significance. The verification of the adequacy of theoretical developments is based on the factual data of the enterprises from environmental reporting forms. The elements of system analysis and the results obtained by the specialists in the management of environmental and economic systems are also used in the work.

3. Results and discussion

In the conditions of the environmentally stressed region which has the highly developed industry, the process of the effective environmental and economic system management, the simplified scheme of which is presented in Figure 1, seems to be of relevance [3 - 6].
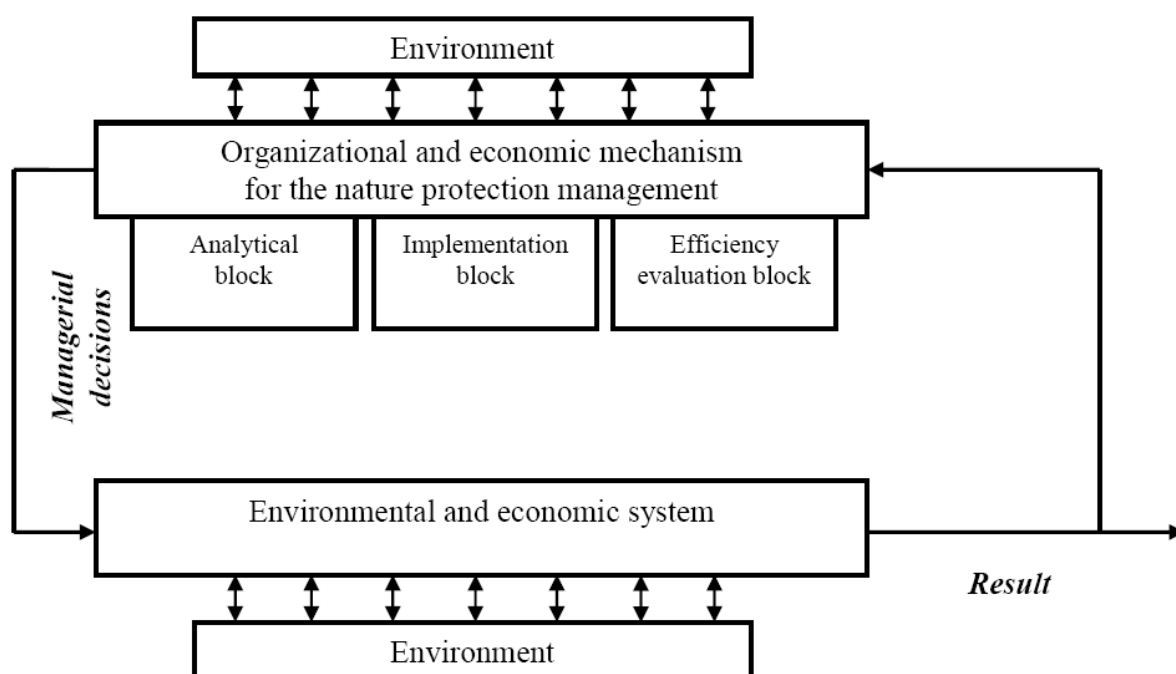

Figure 1 - Simplified scheme of the environmental and economic system management mechanism

Figure 1 shows that the key element of the presented scheme of the mechanism for managing the geographically distributed environmental and economic system is the organizational and economic mechanism for the nature protection management; in which three main elements being identified:

- Analytical block;
- Implementation block;
- Efficiency evaluation block.

In order to identify the developed innovative elements of the organizational and economic mechanism for the nature protection management, three main blocks have been identified, for which the compliance matrix presented in Table 1 has been developed.

Table 1 – Compliance matrix of the developed innovative elements in the structure of the organizational and economic mechanism for the nature protection management

Innovative elements	Analytical unit	Implementation block	Efficiency evaluation block
Reduced integral indicator of the aquatic ecosystem state	+		
The system of enterprises fining for providing the unreliable information on the level of negative impact on the environment		+	
System of the universal environmental and economic indicators of the enterprise	+		+
System of environmental and economic indicators of production and consumption wastes	+		+
Diversification of the company's production program according to the environmental restrictions		+	

Table 1 shows that the greatest number of the developed elements belong to the analytical block, which additionally reflects its significance. To determine the practical feasibility of using the proposed innovative elements, their detailed study is necessary [7, 8].

Estimation of the quality of the aquatic ecosystem can be carried out using an integral indicator, the main disadvantage of which is the laboriousness due to the need to use a multitude of input data. The carried out sensitivity analysis allows to conclude that a number of components of the complex indicator yields little information because of the use of strongly correlated components. Therefore, some of them can be discarded in order to simplify the integral indicator and to insure its more effective practical application. As a result, the integral indicator was reduced [9].

The implementation block (Figure 1, Table 1) is represented by the development of the system of enterprises fining for providing the unreliable information on the level of negative impact on the environment [9]. The different levels of penalties for providing the inaccurate data with the differentiation according to hazard classes and depending on the range of deviations between the results of sampling of pollutants by an officially authorized state environmental management authority and the enterprise are shown below. In formulas (1) - (4), the interest means an additional level of penalization with respect to its base value for pollutants of different hazard classes.

$$F_{ADD\_I} = \begin{cases} 10\ \%\ F_{BASE}\ , if\ \Delta A^E > (1-5)\ \% \\ 15\ \%\ F_{BASE}\ , if\ \Delta A^E > (5-10)\ \% \\ 30\ \%\ F_{BASE}\ , if\ \Delta A^E\ is\ over\ 10\ \% \end{cases} \tag{1}$$

$$F_{ADD\_II} = \begin{cases} 8\ \%\ F_{BASE}\ , if\ \Delta A^E > (2-10)\ \% \\ 15\ \%\ F_{BASE}\ , if\ \Delta A^E > (10-20)\ \% \\ 20\ \%\ F_{BASE}\ , if\ \Delta A^E\ is\ over\ 20\ \% \end{cases} \tag{2}$$

$$F_{ADD\_III} = \begin{cases} 6\ \%\ F_{BASE}\ , if\ \Delta A^E > (3-10)\ \% \\ 10\ \%\ F_{BASE}\ , if\ \Delta A^E > (10-20)\ \% \\ 15\ \%\ F_{BASE}\ , if\ \Delta A^E\ is\ over\ 20\ \% \end{cases} \tag{3}$$

$$F_{ADD\_IV} = \begin{cases} 4\,\%\,F_{BASE}\,, if\,\Delta A^E > (4-10)\,\% \\ 5\,\%\,F_{BASE}\,, if\,\Delta A^E > (10-20)\,\%\,, \\ 10\,\%\,F_{BASE}\,, if\,\Delta A^E\,is\,over\,20\,\% \end{cases} \qquad (4)$$

where F_{ADD} - additional amount of fines for providing the false information; F_{BASE} - the base amount of fines for the pollution of the environment element;

$$\Delta A^E = \left| \frac{C_{SEM} - C_{IE}}{C_{SEM}} \right| 100\,\%\,, \qquad (5)$$

where ΔA^E - is the amount of excess concentration of pollutants according to the officially authorized state environmental management authority, %; C_{SEM} - is the actual concentration of pollutants according to the sampling data of an officially authorized state environmental management body; C_{IE} - actual concentration of polluting substances according to sampling data of an industrial enterprise.

The conducted calculations showed that the proposed incentive system allows increasing the amount of fines by an average of 18 %, which should motivate the economic entities to provide the most reliable information in connection with the increase in costs included in the cost of production or attributed to the net profit of the enterprise.

The most important aspect of the analytical block is the development of the system of universal environmental and economic indicators of the enterprise performance, which can also be used to form the complex assessment of its environmental safety [10, 11]. If we consider the current activities of the enterprise, the developed schemes for the production greening, including the environmental and economic evaluation of the anthropogenic impact on the environment can be used to prepare the adoption of the environmentally economic decision [12]. The authors developed the system of environmental and economic indicators, taking into account the features of the studied enterprise [6, 13]. The final innovative element of this block is the system of environmental and economic indicators of production and consumption wastes [14, 15].

The implementation block of the organizational and economic mechanism for the nature protection management is also shown by the diversification of the enterprise's production program according to the environmental restrictions schematically depicted in Figure 2, where it is evident that after the first scenario of the environmentally safe production program, the main technical and economic indicator (profit) is compared with various environmental and economic components (ΔP – the increase of payment for the negative impact on the environment, ED – the economic damage from the environmental pollution, F - fines). The decision on the final inclusion in the production program is made on the basis of the Best Available Techniques (BAT) criterion, which is caused by the modern environmental requirements [16].
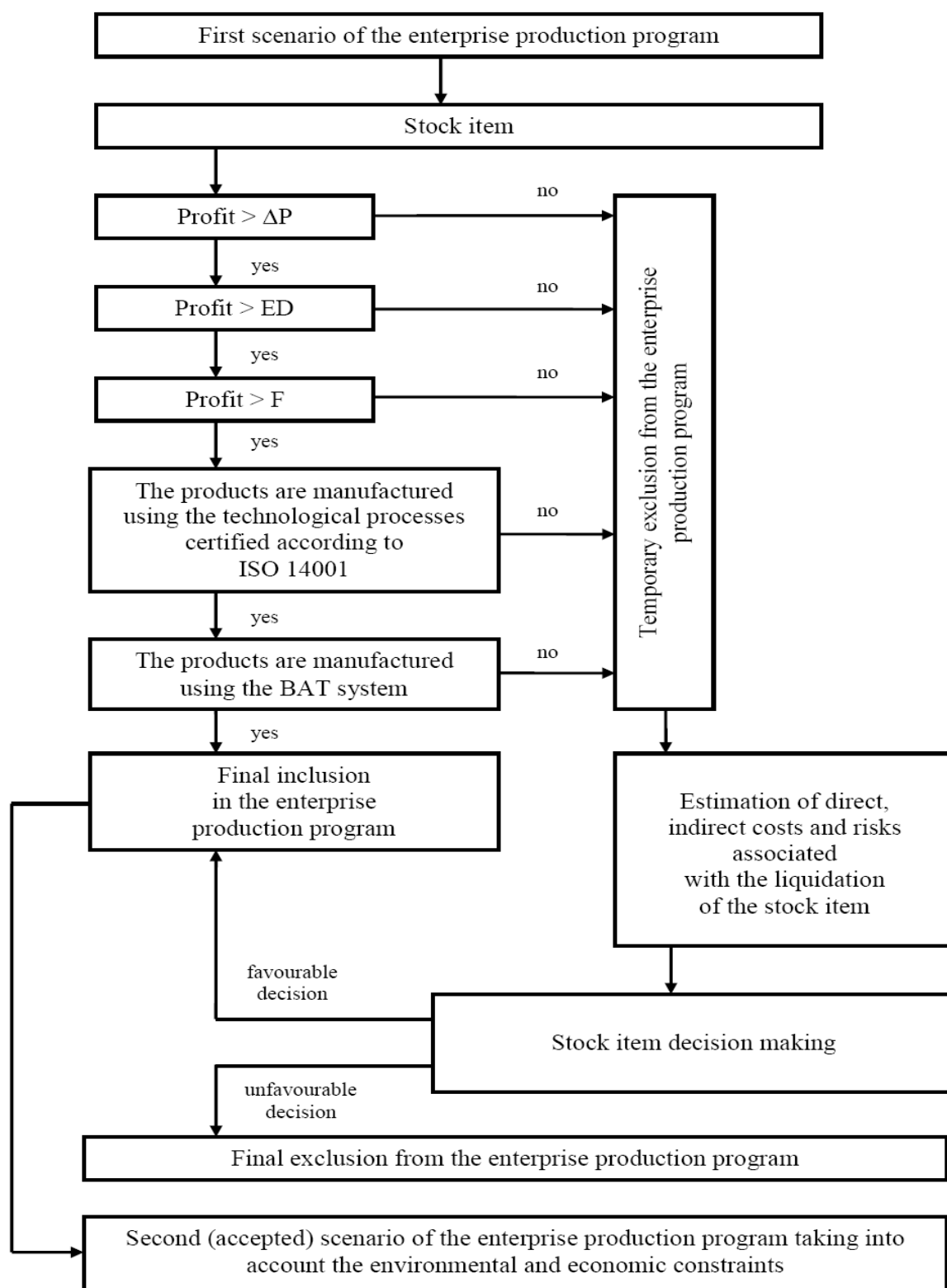
Figure 2 - Scheme for the formation of the production program of the enterprise, taking into account the environmental and economic constraints

4. Conclusions

The study of the development of innovative architecture of the organizational and economic mechanism for the nature protection management made it possible to draw the following conclusions:

- the necessity of improving the organizational and economic mechanism for the nature protection management taking into account the external requirements and the environmental legislation enforcement is substantiated;

- the simplified scheme for the environmental and economic system management mechanism with the differentiation of the blocks of the organizational and economic mechanism for the nature protection management is developed;

- the compliance matrix for the developed innovative elements in the structure of the organizational and economic mechanism for the nature protection management is formed;

- the analysis of various approaches to the assessment and interpretation of the environmental and economic indicators of the enterprise, including the study of the negative impact on all elements of the environment is made;

- the adequacy test of the developed innovative elements of the organizational and economic mechanism for the nature protection management for the purpose of its further practical implementation is carried out.

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