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**PREIDENTIFICATION OF ADAPTIVE MECHANISMS OF BIOSPHERE-COMPATIBLE CONSTRUCTION TECHNOLOGIES**

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*The article discusses the main stages in the selection of optimal production technologies that are adapted to environmental and economic constraints in accordance with international regulatory acts on the state of the environment. The boundaries of the selection of optimal solutions and the algorithm for the stages of their assessment based on sustainable development taking into account environmental, economic and social imperatives are presented. On the example of the construction industry, the ways of transition to a new concept of economic development are proposed, in which the priority objectives of the extraction and processing of natural resources are provided by movement in the direction of a "circular" economy with cascading use and minimization of residual products.*

*It also analyzed and proposed promising areas for the use of IT tools and biosphere-compatible technologies to ensure sustainable development.*

*Key words: greening the economy, environmental audit, secondary raw materials, recycling, biosphere-compatible technologies.*

**Introduction.** Since the second half of the last century, mankind has realized that coordination of efforts to collect, store and process information about the state of the environment is a necessity, due to the possibility of further existence. In March 1970, under the auspices of the UN, the Stockholm Conference on Environmental Protection was held, where the

Environment Program (UNEP) was adopted. It developed, adopted the basic concept and program for monitoring and assessing the state of the environment, and agreed on a general terminology for the concept of “monitoring” as an integrated system of observations, assessing and forecasting changes in the state of the environment under the influence of anthropogenic factors.

In fact, since that time, enterprises and companies in Europe and America have been legally liable for environmental damage [1]. This led to significant additional financial losses that companies began to experience. Financial and fiscal instruments have caused a shift in the psychology of business towards compliance with environmental legislation in their activities. Outwardly, such events were very similar to financial audits [1, 2]. Therefore, the environmental review procedure is called environmental audit. Among the first companies to develop and implement their own environmental review programs were US Steel, Allied Chemical, and Occidental Petroleum. The leaders in the environmental audit were originally industrialized countries of the New World, Western and Northern and Europe. Today, the European leaders in eco-expertise are the Czech Republic and Poland.

The most widespread is a specialized environmental audit on the accounting of production wastes, determination of their safety and related factors affecting the state of the environment, occupational diseases and the like.

Analysis of recent research and publications. It should be noted that a modern environmental audit is not only a check of the state of an enterprise for compliance with environmental legislation, but also the basis for developing a set of measures to prevent its possible violations [3, 4]. Thus, the environmental audit is transformed from the usual administrative tool for monitoring compliance with the law to an economic and legal tool to

stimulate the environmental activities of the enterprise [4]. Thus, the environmental audit is transformed from the usual administrative tool for monitoring compliance with the law to an economic and legal tool to stimulate the environmental activities of the enterprise [4]. In Ukraine, the main component of the environmental assessment system is environmental review, which is carried out by state environmental authorities.

**Statement of the problem and connection with scientific and practical problems.** Today in Europe there are already more than 50 international agreements and directives of the European Community, which directly relate to environmental monitoring and audit of the state of enterprises and the adjacent territory. Special working groups have been created whose task is to develop recommendations and action plans on environmental monitoring for UN member countries. The legal and environmental policy of the Community leaves the task of preventing the generation of waste, promoting the reuse, recycling and recovery of waste in order to reduce its environmental impact. The priority goal in this case is to turn waste into resources and reduce the volume of their generation. Domestic legislation in this area, despite a fairly developed regulatory framework, only partially complies with EU requirements. Therefore, the implementation of these directives is associated with significant changes and additions in the legal field. First of all, Ukraine faces a transition to a new conceptual basis for economic development. Most sectors of the economy, which are resource-intensive due to direct dependence on the resource base, are built on a linear model of the economy. The linear model assumes an increase in the expenditure of resources in direct proportion to the volume of production, contrary to the task of preserving valuable natural resources. In contrast to the linear model, a circular (circular) economy is oriented toward continuous or cascading circulation of technical and biological materials in production and minimization of residual product volumes. Such

an approach coincides with biosphere-compatible landmarks of human activity and environmental imperatives [6, 7].

**The purpose of the article.** But the mechanisms of greening the economy, their success depends on the degree of correlation of specific programs to the requirements of environmental standards and trends of each sector of the national economy. The modernization strategy of the construction industry, as one of the resource-intensive, which produces significant volumes of residual scrap, is one of the urgent problems of modern Ukraine.

**Statement of the main material.** Directive 2008/98/EU of the European Parliament of November 19, 2008 on waste introduces measures to protect the environment and human health by preventing or reducing the negative effects of production, as well as reducing the overall consequences of the use of resources and increasing the efficiency of such use [3].

The document is based on a rather ambitious goal - bringing the European Union closer to the "recycling society". It gives priority to recycling measures, encourages the separate collection of waste and the reuse of products. Benefits are provided for technologies based on renewable energy and secondary raw materials. But such a condition is a limitation not only in the use of primary environmental resources (as a cause), but also in economic development (as a consequence). The concept of environmental restrictions has several vectors:

1) the limitation of basic natural resources and energy sources necessary to continue the development process and economic growth;

2) the limitation of the main components of the environment, characterizing its qualitative parameters, an assessment of the state, which, on the one hand, is a derivative of the amount of polluted emissions, and on the other, on the ability to self-regulate various terrestrial ecosystems;

3) a restriction in the socio-economic dimension, which is associated with the demand (demand) for a clean environment, that is, a restriction in the satisfaction by various elements of the natural environment of the needs of a psychological, aesthetic recreational nature;

4) the limitation of the functions of terrestrial ecological systems as the natural capital of the planet [8, p. 34].

The main problem at the microeconomic level, where environmental and economic problems are localized and spatially determined, is the need to make a difficult choice between “economically exalted” and biosphere-compatible technical progress. Not every new production technology that is beneficial in terms of labor productivity and capital is environmentally sound. This means that the technology needs to be evaluated according to the environmental standard for the indicator of emitted pollution and / or the indicator of the use of primary natural resources. Thus, the choice that enterprises make in connection with the greening of new technologies and products will depend not only on purely economic factors (economic calculation), but also on mandatory legal regulation and environmental awareness of consumers. That is, the assessment of new technology by a business entity is to determine the balance between choice and constraint. It is difficult to make a choice in favor of a cost-effective technology that would meet environmental standards and could be implemented in a particular region based on material, technical and human resources, without a qualitatively new methodology and tools for environmental and economic analysis.

The complexity of the choice is also due to the multivector nature of environmental policy, an excess of goals, which, given the limited financial, material and labor resources, cannot be realized simultaneously. Therefore, it is necessary to evaluate a promising technology by such a cumulative indicator that takes into account environmental and economic constraints,

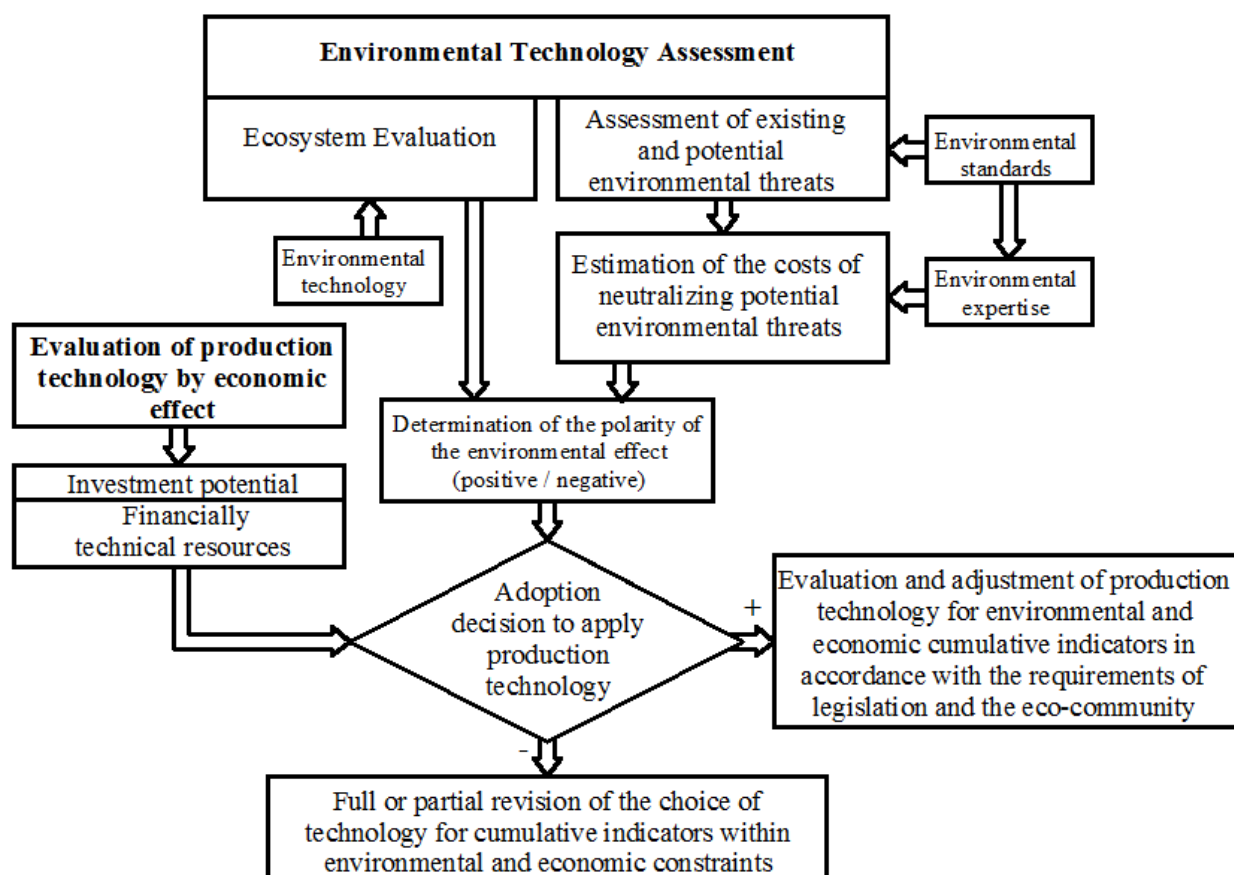
financial possibilities of the present and is capable of transformation over time in accordance with changes in the legal and technological field. The sequence of selection and evaluation of rational production technology is presented in Fig. 2.

The algorithm can be adapted to any sector of the national economy with the addition of specific blocks of restrictions and variable blocks characterizing the features and stages of the choice of technological solutions. For the construction industry of Ukraine, the regulatory framework (DBN, DSTU) is added to the algorithm, which already has references and harmonization with environmental standards in accordance with Directive 2011/92/EC on assessing the impact of individual public and private projects on the environment (codification) [3].

The base of environmental technologies for the construction industry should be formed in accordance with the fundamental principles of EU legislation in the field of waste management, namely, it should focus on reducing the amount of waste sent to final disposal. For this, it is necessary to be guided by a clear hierarchy of waste management, where priority is given to technologies that prevent their formation, based on recycling, and using reduced energy. It should be noted that the recycling of building materials and structures is the process of reusing waste for the same purpose after its recycling. Despite the fact that recycling is one of the directions in the greening of building technologies, today in our country there is no single cost estimate for a project using recycled construction waste, and the absence of a regulatory framework that would legitimize (and sometimes simplify) the use of products from secondary resources, does not contribute to the widespread dissemination of environmental solutions.

It should also be noted that the cost of processing raw materials is too high primarily due to the lack of proper initial sorting, secondly, the system

of control and punishment for non-compliance with environmental standards is ineffective, and thirdly, a collective social and environmental consciousness of the community has not been formed, aimed in support of intangible assets.



**Fig. 2. The algorithm for the selection and evaluation of rational production technology within the framework of environmental and economic restrictions. (Developed by the author)**

Overcoming is the centralized implementation of the system of compulsory recycling of construction waste and its recycling, submission of design technological and economic solutions to environmental restrictions and principles of balanced nature management; technological re-equipment of construction production under environmental control by the state and the territorial community.



**Conclusions.** For the effective implementation of European standards in Ukraine, just bringing the legal aspects into line is not enough. Development and adjustment of building standards is required to increase the possibility of using construction scrap as a structural material, expanding the boundaries of the use of recycling and recycled products. At the same time, IT technologies should be more widely introduced into the process of the entire life cycle of an object, which will make it possible to implement many aspects of environmental and economic development, namely:

- timely assessment of the state of the construction object in order to ensure the warranty and post-warranty operation period to extend the life cycle;

- designing the timing and scope of modernization, reconstruction, disposal of a construction site to predict the production capacities of construction and processing enterprises;

- the introduction of new concepts in the approach to the design of buildings and structures that would take into account changes in the functional feasibility of objects on the real estate market - the concept of functional transformation [9].

Technology is a necessary factor in economic development and growth. There is no doubt that new technologies offer an advantage in economic development. But in the conditions of environmental restrictions imposed on economic growth, it would be wrong to pass by another component of sustainable development - social. The greening of the economy is accompanied by a shift in the center of economic analysis from expenditures and intermediate results to the final results of economic activity and further to projected development trends in accordance with the principles of social responsibility. Therefore, the achievement of balanced socio-ecological-economic decisions should be based on a change in the



ecological-economic orientation of the structure of human needs and welfare standards in the direction of abandoning the dictate of supply and artificial stimulation of secondary optional needs. For the construction industry, this is the stimulation of processing production, recycling, the introduction of new concepts in design, aimed at increasing the life cycle of an object by universalizing architectural and design solutions based on the biosphere compatibility paradigm.

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