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# Ecological safety of the region`s population in the aspect of the logistic-activity approach to its formation and legal regulation

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**Abstract.** The issues of ensuring the ecological safety of the region`s population are actualized in the context of the growth increasing in the natural resources, accompanied by the increase in anthropogenic pressures on the environment and humans, aggravation of environmental problems, deterioration of the life quality and environmental conditions of activity in the region. The aim of the study is to develop the theoretical foundations for ensuring the ecological safety of the population of the region on the basis of a logistic-activity approach to its formation in the context of legal regulation of the environmental management process as a factor in achieving sustainable development goals and increasing energy efficiency. Using the methods of economic and mathematical modeling it is substantiated the existence of the relationship between the level of ecological safety of the region's population and the amount of the funds from the budget allocated to finance environmental programs. Improving the legal regulation of the processes of ensuring the ecological safety of the region's population for optimizing the budget expenditures for the implementation of environmental programs will create the conditions for realizing the economic potential of the region's development, increasing the level and quality of life of the population.

## 1. Introduction

The important component of the environment for the regional entities functioning is the regional ecological environment which contains the natural resources and determines the environmental conditions of activity (life) in the region. Natural resources include the fuel and energy sectors, mineral resources, land, forests and water. Their combination creates the natural resource potential of the territory, reflects the availability of the minerals for industrial use and ensures the implementation of ecosystem functions (maintaining life, natural aesthetics and entertainment, maintaining a global ecological balance). The ecological state of the area determines the safety of the population in the certain area and is characterized by the quality of air, water resources, soil and the possibility of the natural disasters. The volume of the natural resources and their rational use directly affects the environmental conditions of activity in the region, the ecological safety of the population.

The works of foreign and domestic researchers such as Aleyn, S.-G. [1], Boulding K [2], Ghosal V [3], Levaschova O [4], Morgacheva N [4], MacArthur E [5], Smol M [6], Van der Straaten [7] are devoted to the theoretical and applied aspects of rational environmental management and the introduction of the principles of energy efficiency and resource conservation.



Peculiarities of the normative-legal provision of the ecological safety, encouraging electricity consumers to use electricity economically in everyday life are considered in works of such known scientists as Ylyna AY [8], Zvyagintseva A [9], Sazonova S [9], Kuzmynchuk N [16]. The domestic economy is characterized by low energy efficiency of the energy sector as a whole due to outdated, insufficiently efficient infrastructure, high market concentration (monopolism) together with an unprotected system of excessive subsidies and lack of platforms for competitive forms of trade, relatively low regulated prices that do not create any real price signals and incentives for investment, inadequate regulatory framework, high energy intensity of the national economy [16]. Evaluation of the results of preliminary research by the scientists on this topic in the country and abroad allows to argue that the certain aspects of the problem of ensuring the ecological safety of the region's population on the basis of the formation of the effective strategy for the use of natural resources, energy conservation and the use of renewable resources remain unsolved and allows to solve the social, ecological and economic problems at the regional level. The importance of solving these problems requires a detailed analysis of existing tools and the search for innovative approaches to the formation and legal regulation of the ecological safety as the basis for achieving sustainable development goals and the certain social ecological and economic effects.

The aim of the study is to develop the theoretical foundations for ensuring the ecological safety of the region's population on the basis of a logistic-activity approach to its formation in the context of legal regulation of the environmental management process as a factor in achieving sustainable development goals and increasing energy efficiency.

## **2. Materials and Methods**

The theoretical and methodological basis for writing the article were the development of domestic and foreign economists in the field of environmental management, the areas of ecological security of the region, the logistical approaches to optimizing the functioning of economic entities, regulatory regulation of the environmental sphere. The research carried out with the use of such general scientific and special methods such as: generalization and comparison, deductive and inductive analysis to substantiate the logistic-activity approach to the ecological safety of the region, statistical analysis to identify and generalize trends in the dynamics of the ecological safety, economic and mathematical modeling for the relationship between the components of the ecological safety and the amount of budget funds allocated for its provision.

## **3. Results and discussion**

Legal regulation of the ecological safety of the region's population is regulated by the laws of Ukraine "About the basic principles (strategy) of the state environmental policy of Ukraine for the period till 2030" [10], "On Environmental Protection" [11], the Decree of the President of Ukraine "On the Sustainable Development Goals of Ukraine for the period up to 2030" [12] and other regulatory legal acts in the field of ecology. The draft development strategy of Kharkiv region for 2021-2027 [13] defines the strategic goals aimed at ensuring a quality life in the region; clean environment throughout the region; creating a competitive knowledge economy; attractiveness of the investment environment in the region; European level of the government and autonomy [14, 15]. However, these goals may constitute a threat specifically to the ecological environment of the regions which plays a significant role and significantly affects the level and development opportunities of the region's population. The critical ecological situation observed in the natural and economic spheres not only the national but also the world economy is the result of growing anthropogenic pressure on the environment which disrupts its regenerative mechanisms and creates a real danger of irreversible global processes, the threat to the existence of humanity. Thus, the main goal of environmental policy is to create safe living conditions and restore the natural environment by guaranteeing the ecological safety of the population, the rational use of nature, protection of the population and the environment; minimizing the harmful effects of environmental disasters; improving the ecological condition of rivers; greening technologies.

Today, there is a weakening of attention to the environmental factor on the part of the legislative and executive authorities, the public and non-governmental organizations, a significant decrease in the level of integration of the ecological safety of the population in the system of making socially and economically significant decisions. Management of the ecological safety or its individual elements is carried out by the various ministries and departments and is not comprehensive enough and therefore not effective enough, obviously associated with miscalculations in the environmental management system, negatively affects the state of the region's population [16].

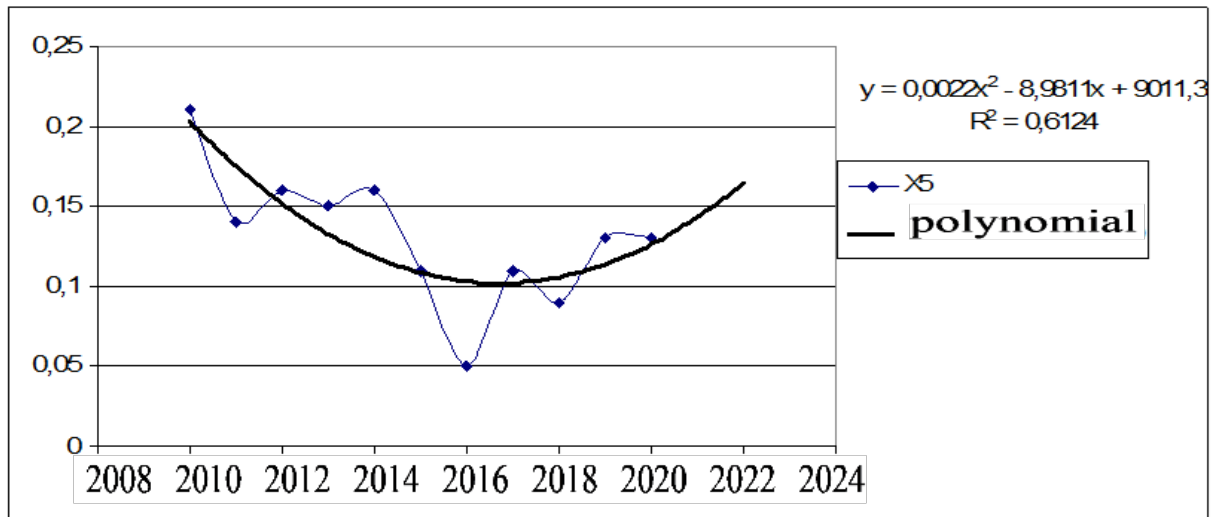
When determining the priorities in the field of the ecological safety in certain regions, action must be taken to reduce transboundary flows of pollutants into the atmosphere, to improve the state of degraded lands, restoration of degraded natural landscapes and conservation of biological diversity of flora and fauna. Measures to reduce the accident rate of economic activity, the morbidity of the population due to the high technogenic load of the territory deserve the special attention.

The attainment of this goal is possible only on the basis of the formation and implementation of modern approaches to ensuring the ecological safety of the region's population. It is important to use a logistic approach, the essence of which is manifested in reducing overall costs, improving the level of ecological safety of the population and accelerating environmental processes at the different stages which allows to obtain the positive effect in the environmental sphere compared to those regions that use the traditional methods and tools [17]. The innovativeness of the logistic approach in the system of ensuring the ecological safety of the region's population consists in changing the priority of environmental activities and focusing on the reducing costs associated with the process of environmental management, the introduction of resource-saving technologies, solving the certain social, environmental and economic problems of the region

At the same time, it should also consider that the ecological environment and the processes of activity in the region are under mutual influence and the regional activity itself is in a socio-economic nature then the regional environment of activity acts as the ecological-socio-economic environment [18]. In addition, environmental conditions with a certain degree of convention can be regarded as resources. The reason for this is that favorable environmental conditions have a reserve for their deterioration to a level where they are not yet harmful to the health of the inhabitants of the region. Based on this position, the logistic-activity approach to the formation of the ecological safety of the region's population is a direction of the general scientific methodology of cognition and social practice which is based on the study of objects of the different nature as a set of directions, types of activity in the environmental sphere in combination with the process of managing material, information and financial flows of the region, provides for the planning, organization, management, control and regulation of their movement, taking into account the requirements of the population to the level of environmental safety of the region's population, the subject to minimizing costs and achieving a synergistic effect [19].

Thus, objectively, there is a need to ensure the ecological safety of the region's population on a fundamentally new basis of the logistic-activity approach to the study of problems associated with determining the characteristic features and connections between the main components of socio-economic activity in the region [20]. The use of this approach makes it possible to take into account all the resources of human activity in the direction of ensuring ecological safety which affect the effectiveness of socio-economic activity in the region. Determining the resources structure by their subject feature, the characteristics of their functions and methods of creation lays the theoretical foundations for a quantitative assessment of resources in terms of their impact on the efficiency of reproduction processes, determining the level of provision of regional stakeholders with them, planning activities for a balanced sustainable development of the region in terms of resources, the level of the ecological safety. The proposed approach will allow the regional authorities to avoid disproportions in the ecological development of the region, will serve as the basis for creating the effective mechanism for providing state support for the ecological development of the region, overcoming the crisis in the environmental sphere, ensuring the ecological safety of their territory, improving the living standards of the population.

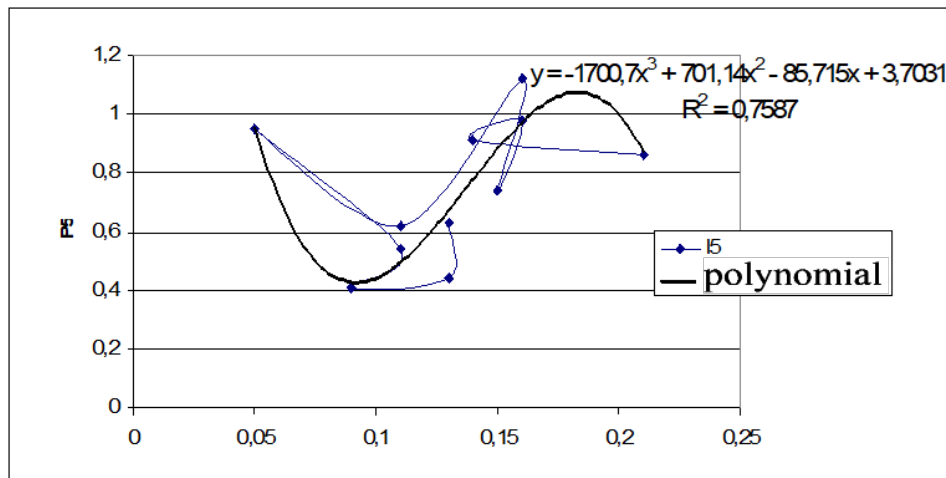
The study of the main processes determining the ecological situation in Kharkiv region was carried out which made it possible to establish the following dynamics of the indicator of the ecological safety of the region's population (Fig. 1). These figures show about the unstable level of the ecological safety of the population in the region during 2008-2024. Taking into account the proposed logistical and operational approach to the formation of the ecological safety of the population of the region, it is important not only to assess the dynamics of the studied indicator, but also the level of budgetary expenditures that were directed to solving the environmental problems of the region.



**Figure 1.** Model and trend that describes the dynamics of the indicator of ecological safety of the population of Kharkiv region.

The process of determining the optimal structure of budget expenditures based on nonlinear / linear programming involves the following steps. The study proposes to assess the ecological safety in certain areas, in accordance with which the items of budget expenditures are formed. Thus, the developed optimization model will solve the problem of distribution of funds not for each item of expenditure, but for the studied areas. The amount of funds invested in the  $i$ -th direction:  $P_i = y_i * P_{budget}$ ,  $i = 1, m$ , where  $P_{budget}$  - the total amount of budget funds invested in the  $i$ -th direction of the ecological safety.

At the next stage, it is built a model of the relationship between the areas which characterizes the ecological safety and the amount of budgetary funds aimed at the achieving one. So, to build a model of the relationship between the components of the ecological safety of the population and the amount of budgetary funds required to change it by 1%, the data for the analyzed period of 2010-2020 were used. When carrying out the relevant calculations, the statistical data on budget expenditures were adjusted to take into account the inflation rate, which made it possible to determine their real value based on the use of the methodology for calculating real wages (Fig. 2).



**Figure 2.** The relationship between the level of the ecological safety of the region's population and the amount of funds from the budget required to change it by 0.01 (1%)

According to Fig. 2, it is established that there is no clear positive dynamics of the level of ecological safety of the region's population due to the growth of budget expenditures (the nature of the connection is polynomial), the highest development in this direction was achieved with a high level of funding [20].

Thus, it has been proved that the ecological safety of the region's population is the most humane and responsible task of environmental legislation which, firstly, enshrines the environmental rights of the citizens of Ukraine, secondly, guarantees their implementation and thirdly, determines the legal, economic and social foundations environmental protection. In accordance to Art. 9 of the Law of Ukraine "On Environmental Protection" [11] every citizen of Ukraine has the right to a safe environment for life and health, a high level of ecological safety. Therefore, the implementation of the functions of the implementation of environmental policy at the regional level is to regulate the rational use of natural resources of regional importance, conducting continuous monitoring and accounting of natural resources at the regional level, the implementation of state control over compliance with environmental legislation, the development of regional programs for the implementation of environmental protection measures, etc., on the basis of a logistic-activity approach to promote the environmental protection of the citizens.

#### 4. Conclusions

Thus, as a result of the study, it is established the basis for the legal regulation of the ecological safety of the region's population and it is proposed a logistic-activity approach to its formation as a direction for achieving the strategic goals of the development of the region, the essence of which lies in the quantitative assessment of the resources in terms of their impact on the efficiency of reproduction processes, the determination of the level of their provision of the regional subjects of activity, planning activities for a balanced sustainable development of the region in terms of resources, increasing the level of the ecological safety.

It is carried out a study of the main processes that determine the ecological situation in Kharkiv region which made it possible to establish the unstable nature of the level of ecological safety of the region's population during the study period.

On the basis of economic and mathematical modeling ,it is substantiated the existence of a close relationship between the components of the ecological safety of the population and the amount of budgetary funds aimed at ensuring and confirming the need to finance activities in the environmental sphere at the regional level.

Improving the legal regulation of ensuring the ecological safety will allow to determine the direction of the authorities reforms of the different hierarchical levels in order to ensure sustainable development of socio-economic potential of the region improving the level and quality of life.

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