UDK 504:3703; 502; 541;553
DOI https://doi.org/10.32846/2306-9716/2022.eco.5-44.1

SYSTEMIC APPROACH TO ELIMINATION OF THREATS OF ENVIRONMENTAL DISASTERS AS A RESULT OF MILITARY ACTION

Bondar O.I., Mashkov O.A., Mukhina K.E.
State Environmental Academy of Postgraduate Education and Management
St. Metropolitan Vasyl Lypkivskyi, 35, 03035, Kyiv
dei2005@ukr.net

The article substantiates the methodological approach to the application of a systematic approach to the elimination of threats of environmental disasters due to hostilities in Ukraine. The problems of research are related to the fact that the technology of application of the systematic approach to liquidation of threats of ecological catastrophes as a result of military operations which provides: definition of a condition of a question concerning occurrence of problems of ecological revival of the destroyed territories is not developed earlier; assessment of the ecological characteristics of the destroyed territories as a complex organizational system; formation of organizational and legal principles of public administration to eliminate the environmental consequences of hostilities; consideration of scientific aspects of environmental security on the elimination of the consequences of hostilities; identification of humanitarian aspects of environmental security (taking into account the consequences of hostilities). Organizational and legal principles of public administration to eliminate the environmental consequences of hostilities include: the economic aspect of environmental security of destroyed areas; organizational and managerial aspect of environmental safety; basic requirements for standardization of environmental quality in the direction of environmental safety; technological aspects of ecological safety of destroyed territories. It is determined that solving the problems of environmental safety in the destroyed areas requires taking into account economic, engineering, social and other factors, universal values and, given the limited resources, not only immediate but also long-term consequences of decisions in this area. Only with a systematic approach in the organization of public administration it is necessary to eliminate the consequences of hostilities in the destroyed territories as soon as possible and gradually and consistently ensure the sustainable development of the regions. Areas of further research in the field of application of a systematic approach to the elimination of threats of environmental disasters due to hostilities should include the development of a methodology for forming appropriate information, organizational and operational management decisions aimed at bringing the nature of war-torn areas in line with environmental safety requirements. *Key words:* public administration, ecological safety, ecological threats, organizational and legal bases, system approach, complex organizational system, administrative decisions.

Системний підхід щодо ліквідації загроз екологічних катастроф внаслідок бойових дій. Бондар О.І., Машков О.А., Мухіна К.Є.

Означено методологію застосування системного підходу щодо ліквідації загроз екологічних катастроф внаслідок бойових дій на території України. Проблематика досліджень пов'язана з тим, що раніше не була розроблена технологія застосування системного підходу щодо ліквідації загроз екологічних катастроф внаслідок бойових дій, що передбачає: визначення стану питання щодо виникнення проблем екологічного відродження зруйнованих територій; оцінку екологічної характеристики зруйнованих територій як складної організаційної системи; формування організаційно-правових засад державного управління по ліквідації екологічних наслідків бойових дій; розгляд наукових аспектів екологічної безпеки з питань ліквідації наслідків бойових дій; визначення гуманітарних аспектів екологічної безпеки (врахування наслідків бойових дій). Організаційно-правові засади державного управління з ліквідації екологічних наслідків бойових дій містять: економічний аспект екологічної безпеки зруйнованих територій; організаційно-управлінський аспект екологічної безпеки; основні вимоги до нормування якості навколишнього середовища в напряму забезпечення екологічної безпеки; технологічні аспекти екологічної безпеки зруйнованих територій. Зазначено, що розв'язання проблем екологічної безпеки на зруйнованих територіях вимагає обов'язкового врахування економічних, інженерних, соціальних та інших факторів, загальнолюдських цінностей і, зважаючи на обмеженість ресурсів, не тільки найближчих, а й віддалених наслідків рішень у цій сфері, які приймаються сьогодні. Тільки при системному підході в організації державного управління необхідно як найшвидше ліквідувати наслідки бойових дій на зруйнованих територіях та поступово та послідовно забезпечити сталий розвиток регіонів. Напрямами подальших досліджень у площині застосування системного підходу щодо ліквідації загроз екологічних катастроф внаслідок бойових дій слід вважати розробку методології формування відповідних інформаційних, організаційних та оперативних управлінських рішень спрямованих на приведення природокористування зруйнованих бойовими діями територій у відповідність до вимог екологічної безпеки в нинішніх економічних умовах. *Ключові слова:* державне управління, екологічна безпека, екологічні загрози, організаційно-правові засади, системний підхід, складна організаційна система, управлінські рішення.

Introduction. Military action in Ukraine since 2014 have already caused and continue to cause enormous damage to the people and infrastructure of the settlements where the fighting continues. At present, it is not even possible to fully assess the impact of the war on the environment due to a lack of accurate information. There are two reasons for this. First of all, even collecting this data is dangerous for specialists, as active hostilities continue. Second, not all information can be made public for tactical purposes. However, it is clear that the longer the war lasts, the more damage it will do to the environment, and the more consequences we will have in the future. It is necessary to try to predict the consequences of hostilities: the impact on the landscape and villages; loss of biodiversity and threat to Red Book species; fires in ecosystems due to hostilities; chemical pollution from shelling and missiles; soil and sea pollution by oil products; consequences of fires at industrial facilities; water pollution by organic matter due to damage to utilities.

After the war, we will reap the fruits of hostilities – the destruction of ecosystems, soil pollution, biodiversity loss, increasing the number of pests in forests. In addition, rebuilding the country will require a significant amount of natural resources. There is also a risk that Ukraine will not meet its climate goals, as war is a contribution to climate change, and the country's recovery will inevitably be accompanied by significant greenhouse gas emissions.

As significant chemical contamination of soils and waters is expected, it is important to ensure an effective environmental monitoring system after the war. Which would record the real extent of the damage to the environment and take the most effective measures to avoid further deterioration and to restore ecosystems to a safe state – both for humans and wildlife.

It is also important that the process of restoring Ukraine includes measures to restore and preserve ecosystems. At the same time, it is advisable to include nature-oriented solutions and measures to adapt to climate change in the plans for the reconstruction of settlements. Therefore, environmental protection, rational use of natural resources, environmental security – an integral condition for sustainable economic and social development of Ukraine. When there is an armed conflict, people die and are seriously injured, and some may think that talking about the damage done to the environment is not appropriate at this time. After all, it is necessary to save people immediately. However, this is only one side of the war, apparently. And there is still the invisible side of any armed conflict, which results in many years of gradual destruction of human health and the environment. This is due to the entry into the human body through water, air, food of dangerous substances that over many years of accumulation lead to fatal diseases and death, affect reproductive properties, affect the ability of biological organisms to perform their function, affect the economic development of the region. was affected by hostilities. The hostilities in Ukraine have led to many additional social and humanitarian problems. One of the most pressing issues that needs to be addressed urgently is environmental issues.

Risks associated with damage to communications, businesses and other facilities that pose an increased environmental risk are of particular importance, because in the absence of control and the ability to eliminate their negative consequences potentially increase the scale of negative impact every day.

The fighting has serious environmental consequences – pollution of groundwater, water bodies, flooding and subsidence of the soil, air pollution, destruction and damage to nature reserves, forest fires and others. The fighting itself leads to no less dangers: spilled fuel, destroyed equipment and spent weapons – all this contaminates the soil and groundwater with chemicals and heavy metals.

After the end of the war, some environmental consequences will be felt even for years. This is due to the accumulation of carcinogenic waste, threats not only to man-made and environmental disasters, the destruction of natural areas that provided habitat for rare species and their endangered habitats.

In the midst of hostilities, it is difficult to see the real scale and level of pollution. A real assessment will be made after the end of active hostilities, and the consequences will last for years. Therefore, it is now important to develop a methodology for applying a systematic approach to eliminating the threat of environmental disasters due to hostilities.

Analysis of recent research and publications.

Research on a systematic approach to eliminating the threat of environmental disasters due to hostilities was conducted by Ukrainian and foreign experts and scientists, as evidenced by relevant publications.

The paper «Environmental security as a fundamental component of national security» states that in determining the place of the environmental component in the national security system an important methodological context is strategic environmental policy planning and identifying features of appropriate forecasting strategies as part of an integrated national security system in the short and long term, provided by a system of organizational and legal, economic, technical, sanitary and hygienic and other environmental measures (Hilko, 2021).

The monograph «Environmental Damage Assessment and Priorities for Environmental Recovery in Eastern Ukraine» covers issues of statistical analysis and forecasting of environmental risks and threats (Denisov, Averin, Ermakov, Ulitsky, 2017).

Thus, the book «System approach to decision-making in public administration: Methodology for solving problems of public administration and making objective decisions of a certain quality» formalized the issue of systematic analysis of decision-making processes in public administration, development and justification of tools for solving public problems management, which will assess the quality of the decision and allow to design the most effective trajectory of its implementa-

tion, taking into account the existing risks and uncertainties (Polovtsev, 2021).

The study «On the nature and content of public administration mechanisms» found that a systematic approach to understanding public administration mechanisms is based on the dialectical unity of government as a complex system and the impossibility of rigid separation of mechanisms from government as a whole (Dreval, 2020).

The author's team «Methodology of research and systems approach in the field of public administration: mechanisms, levers, methods, tools» determined that the formation of research methodology in the field of public administration in three main blocks: substantive target, system-methodical and project-effective – allows to carry out scientific research in accordance with the principle of «management – by objectives, evaluation – by results». This approach is able to ensure the efficiency, quality and appropriateness of scientific activities. (Ivashova L.M., Ivashov M.F., Kveliashvili I.M., 2020).

In the work «On the verge of survival: the destruction of the environment during the armed conflict in eastern Ukraine» made a comprehensive analysis of the environment in the armed conflict in eastern Ukraine, identified the state and outlined problematic issues of environmental protection Medvedev, Parkhomenko, 2017).

In a number of works attention is paid to the urgency of operational elimination of threats of ecological catastrophes as a result of military actions (Ivanyuta S.P., 2019), (Omelchuk, Sadogurskaya, 2022).

Ensuring the environmental security of the state encourages the active development of new methods of implementing a systematic approach (Nastasenko O.G., Bondar O.I., Mashkov O.A., 2014) to create a system of support for appropriate environmental solutions (Bondar O.I., Mashkov O.A., Mikheev V.S., 2020).

The purpose of the article. To substantiate the mechanism of application of the system approach on liquidation of threats of ecological catastrophes as a result of hostilities on the territory of Ukraine, as the tool of implementation of executive power of the state in logical interrelation of the corresponding elements, processes and laws.

Research methods.

In the course of the study, the results of which are given below, a set of scientific methods was used, which included: methods of systematic analysis – in studying the state of the issue of environmental regeneration of destroyed areas; methods of theory of complex systems – to determine the ecological characteristics of destroyed areas as a complex organizational system; methods of synthesis of managerial decisions – for the formation of organizational and legal foundations of public administration to eliminate the environmental consequences of hostilities.

Results of the research.

1. Ecological characteristics of destroyed areas as a complex organizational system.

The war in Ukraine continues, but today we also need to talk about the ecological restoration of the liberated regions, so plans for environmental reforms (strategic and situational environmental management) must be ready in advance. We believe that reforms to rebuild war-torn areas should be effective (in terms of resources, time, cost, etc.). This is a multi-criteria task. Therefore, it is advisable to start with a systematic reform of the administrative-territorial division on the concept of sustainable development, namely the systematic analysis of situations in the regions and management decisions: information, organizational, operational.

Systemic transformations, both structural and functional, must be the most radical. First of all, economic reforms must be implemented in combination with social and environmental ones. In economics, there is such a thing as reorganization. This is a structural restructuring and re-equipment of the enterprise, which involves the complete elimination of old industrial facilities with the construction of new production lines. Therefore, for outdated industry and agriculture, remediation is the only way out. We believe that the state should get rid of unprofitable branches of the economy decisively and definitively.

In our opinion, the territories destroyed by the war should be declared tax-free territories for several years, and foreign investors should be invited to build new enterprises from scratch.

It is also worth thinking about the optimal cost of reconstruction of natural and man-made objects destroyed by the war. After the war in Ukraine, a massive outflow of population and a reduction of hundreds of thousands of people is predicted. Therefore, it is worth thinking about how to help people settle in other areas where there are more prospects. Perhaps small settlements that are dying are better resettled and liquidated so as not to spend money on rebuilding and maintaining their infrastructure. It is unlikely that such settlements, where for many years there is no central heating and water in homes, have a future. We must admit this. In order to solve the problems of restoration of the territories destroyed by the war and to develop the optimal plan of their reconstruction, it is necessary to develop a plan of socio-economic-ecological development of territories and announce a competition of projects for their immediate restoration. Of course, to cut this knot of serious problems in one fell swoop will not work. But if you involve a team of your own professionals and crisis managers, successful steps can quickly yield positive results. Together with consistent systematic work towards sustainable development, it is possible to change the appearance of territories in three to five years. This requires a clear business plan for systemic environmental development (synthesis of environmentally friendly structure).

The conduct of hostilities raises questions not only about the security of the civilian population, but also about the socio-economic and environmental factors of national and regional security. Thus, in the conditions of hostilities, in addition to purely military issues, the

problems of vulnerability of the population to secondary factors of impact are relevant – the impact on life and health of the region, caused by the destruction of potentially dangerous objects and critical infrastructure. Such consequences of military events include, for example, flooding, abysses and landslides that may occur due to the destruction of hydraulic structures, dams and hydroelectric power plants, various contaminants due to the destruction of warehouses and storage of radioactive and toxic substances and waste, petroleum products, explosives, explosives, transport and engineering communications, etc. Risk forecasting and the choice of environmental safety management strategy significantly depend on how we assess the situation (information management decisions).

The first question should be the problem of cluster analysis, correct classification (identification): what type of environmental emergency we are dealing with.

From the point of view of elimination of direct consequences, assessment of the «static» situation, ie without forecast, driving forces and genesis of catastrophes are of secondary importance. But in terms of a systematic approach to security management, strategic planning and risk forecasting, it is necessary to pinpoint the nature of the threat and the type of emergencies we are dealing with.

Therefore, the task of strategic management (combination of strategic and situational management) is relevant, and we, in particular, need to determine what type of emergency we have to work in the destroyed areas: environmental, economic, social or military.

Today, we are dealing with the escalation of emergencies caused by environmental threats resulting from hostilities resulting from the use of military means of destruction. Therefore, the minimization of environmental threats and the appropriate management of environmental risks is the planning of organizational measures (organizational management), and operational management is the responsibility of the central government and special administrative bodies.

Risks in areas of hostilities are complex (systemic) socio-economic and environmental nature, so their minimization is to effectively respond (information management decisions) to sources of threats in accordance with applicable law. Determining the effectiveness of this response requires specification in terms of resources, time, cost, the consequences of management decisions.

The following hazards must be taken into account when determining environmental risks:

a) artillery shelling, bombing, use of small arms: funnels from bursts of mines and shells; trenches, trenches, anti-tank trenches and other engineering structures for military purposes;

b) the use of aircraft: the fall of aircraft; occurrence of explosions and fires in case of damage to aircraft and their fall;

c) blasting and mining of industrial enterprises, including environmentally hazardous facilities (chemical, radiation, meteorological); energy supply, critical man-made infrastructure facilities;

d) movement of military equipment (including heavy armored vehicles);

e) arson with fires at facilities in the occupied areas;

f) occupation of territories.

These factors can lead to the following negative environmental consequences:

– intensification of erosion processes;

– occurrence of fires with the manifestation of dangerous factors (destruction or damage to property, high temperature, emissions of toxic volatile products of combustion-pollutants, including ozone-depleting, greenhouse gases, dioxins, furans, radioactive substances, etc.);

– pollution of water resources (terrestrial, underground) with environmentally hazardous substances and complicating their use;

– contamination of soils with environmentally hazardous heavy metals, plant protection products;

– pollution of territories due to the fall of aircraft, including fires;

– loss of living beings and reduction of biological and landscape diversity;

– death of people;

– destruction or withdrawal from nature management of forests, protective forest belts, economic (including fertile) lands;

– deterioration of the dynamics of livestock development;

– Deterioration of the ecological condition of the Black and Azov Seas, wetlands of international importance;

– deterioration of atmospheric air in settlements (including radiation);

– Deterioration of drinking water quality with a negative impact on public health;

– violation of soil cover;

– disturbance of ecosystems;

– violation of the infrastructure to ensure the livelihood of the population and territories;

– violation of the national ecological network;

– creation of preconditions for scattering and pollution of soils, atmospheric air (dust) and water resources with wastes of I-III hazard class;

– creating obstacles to the inclusion of objects in the Emerald Network of Europe (for example, the Ukrainian steppe nature reserve; Holy Mountains National Nature Park; Donetsk Ridge Regional Landscape Park; Kleban-Byk Regional Landscape Park; Meotida National Nature Park»).

Thus, the general socio-ecological and economic situation in the areas of hostilities is extremely disappointing.

It is known that the annual emissions of polluted water is about 500 million tons. The total amount of groundwater pollution is estimated at 5 million tons of mineral and 300 tons of ammonia salts. Only about 12%

of groundwater sources meet water quality standards. By restricting access to water resources, this can be critical to the survival of the population in crisis situations.

The main hazardous substances that are among the typical pollutants of water resources in the regions are sulfur and sulfur compounds, ammonia, phosphorus, coal pollen, sulfuric acid and sulfate compounds, formaldehyde, lead, mercury, as well as composite chemical wastes from various enterprises, among which are strong toxic substances, such as mononitrochlorobenzene, which is a highly toxic substance. The greatest threat, on average, to pre-crisis indicators is shown by indicators of chemical and biological danger: the greatest pollution is observed on indicators of the content of compounds of nitrogen, iron, heavy metals and bacterial pollution. In surface waters there is an abnormally high prevalence of pathogens, in particular, Escherichia coli, which is due in part to the unsatisfactory situation with waste: the accumulation of waste is 3.8-4.2 times faster than their processing.

Any additional pollution of the atmosphere, especially water bodies, can become critical, ie have fatal environmental and social consequences for the regions. To respond to threats and plan measures to manage environmental safety, it is necessary to know the distribution of sources of danger, especially man-made.

The main threat factors in combat areas are significant limited availability and reduced quality of water resources, including the risk of destruction of industrial facilities and infrastructure, increasing the likelihood of failure of settling tanks, treatment and drainage systems, sewage and hazardous waste in sources of drinking water. This is a special danger against the background of reduced availability of medical services and sanitary and epidemiological control.

Therefore, in the current situation, ensuring the required level of socio-economic and environmental security with the help of local resources is not possible. This requires a systematic approach to the organization of public administration. Procrastination and self-exclusion from making the necessary scientifically sound decisions only brings us closer to the highly probable catastrophic resolution of the environmental crisis.

2. Organizational and legal principles of public administration to eliminate the environmental consequences of hostilities.

Taking into account the systemic nature of the problems of eliminating the environmental consequences of hostilities, their organic correlation with all political, social and economic factors, the strategy of environmental security is seen as one of the fundamental components of national security. Such a policy must be based on the generally accepted postulate of the priority of human rights in the civilized world. One of such indisputable rights is the right of citizens to environmental security. It is guaranteed by a set of political, legal, economic, technological and humanitarian factors, etc.

Thus, informational, organizational and operational management decisions are needed to eliminate the consequences of hostilities. For the formation of management decisions, it is advisable to address at the legislative level the issue of establishing an international group of experts to assess and audit the environmental situation in combat zones, determine its composition, ensuring the representation of national and international experts and competent organizations. Based on the conclusions of national and international experts, it is advisable, in our opinion, to develop a national action program to eliminate the effects of hostilities and ensure environmental and man-made security of the population and destroyed areas. At the same time, we believe that the following measures should be envisaged:

development of the corresponding program of national, regional, local actions;

advanced training of specialists – environmental ecologists (strategic environmental management);

conducting environmental monitoring and forecasting using aerospace technologies;

raising awareness of the population of the destroyed territories on the state policy in the field of reconstruction of the infrastructure of the regions.

It is also possible to organize and periodically hold public hearings on environmental and man-made safety of the population and destroyed areas (feedback in the environmental management system).

The implementation of these measures requires appropriate mechanisms to implement a systematic approach to the elimination of the consequences of hostilities. As evidenced by our systematic research, the priorities of systemic decisions on the mechanisms of environmental safety of the destroyed areas should be determined as follows:

economic mechanisms of ecological safety;

state environmental safety management system;

industrial safety and technological bases of ecologically safe development of industry, energy and transport;

regulatory and legal activities in the field of environmental safety;

scientific bases of ecological safety;

public organizations in the field of environmental safety.

2.1. Economic mechanisms for ensuring the environmental safety of destroyed areas.

An effective way to regulate the security of destroyed areas are economic mechanisms, which are conditionally combined into two groups: mechanisms for compensation and mechanisms to prevent them.

Damage compensation mechanisms in the destroyed areas should provide for the assessment of losses, the need for compensatory resources and the reimbursement of costs. At the same time it is necessary to distinguish two forms of damage – inflicted and compensated. It is almost impossible to fully estimate the losses. However, it is quite possible to determine the damage caused:

– a person, taking into account the additional costs of restoring his health and material well-being);

– nature, based on the amount of additional costs required to restore ecological balance;

– the national economy, taking into account the costs of compensation for product losses and losses to enterprises.

An important means of compensation – the insurance system, the effective operation of which involves the implementation of a number of principles:

– close connection of insurance with risk cards and distribution of insurance premiums between objects depending on expected losses;

– compulsory insurance of high-risk facilities and their employees; at the same time, as a supplement to the mandatory one, a system of voluntary insurance (for the population, enterprises) should be created;

– transformation of the insurance system into one of the most important elements of security control in the region.

Insurance authorities must respond promptly to changes in the situation by reducing or increasing insurance premiums depending on the likelihood of an accident or catastrophe.

The compensation system is obliged to compensate the losses of the uninsured part of the population and enterprises, to compensate for the loss of health, housing, work, products, etc. It is necessary to create additional capacity and significant reserves of funds to compensate for losses of industrial and non-industrial nature, to expand the capabilities of the health care system, to have a reserve of housing for refugees. The compensation system also includes long-term investment activities, which will allow the restoration of housing, economic facilities and lost ecological balance at the expense of special reserve funds.

Damage prevention mechanisms. These mechanisms should provide: legal and economic protection of damage prevention activities; legal and economic responsibility for increasing the amount of risk; interest of business and management entities in risk prevention. This mechanism has measures of both economic and administrative nature. Its components can be divided into five groups.

The first group of mechanisms is related to the change in the structure of the national economy in favor of industries that would meet human needs. An important way to increase the level of safety is also to eliminate structural imbalances in favor of processing industries, in particular the production of secondary waste.

The second group consists of mechanisms that should help reduce accidents. These include, first of all, paid risk quotas, which allows you to create a quota market and maintain a minimum level of risk in the region as a whole. Acquisition of risk quotas by some companies in others allows subsidizing security measures.

Such a purely economic mechanism can be supplemented by administrative and economic measures. First of all, it is a system of fines for exceeding the established risk quotas in the region. In order to interest companies in reducing the amount of risk, it is necessary to create special regional funds and provide for regular payments of premiums for risk reduction.

The third group of mechanisms requires replacement and improvement of the technical base, restoration of equipment, introduction of new technologies and information systems.

The fourth group is designed to expand the market for skilled workers and reorganize the system of retraining.

The fifth group of mechanisms is aimed at stimulating investments that would prevent losses through tax policy.

The solution to this problem depends primarily on improving the economic situation in the country.

In our opinion, the priority tasks that exist in the economic problem of environmental security in the destroyed territories are:

– development of methods for determining the economic consequences of hostilities;

– development of effective economic mechanisms of responsibility and stimulation of increase of level of industrial safety in the destroyed territories;

– creation of a comprehensive system of methods and regulations that should regulate the economic consequences of hostilities.

In our opinion, the system of public administration should create conditions for investing significant investments in the implementation of environmental measures aimed at reducing the threat of military consequences.

2.2. Organizational and managerial mechanisms to ensure environmental safety.

Various ministries, departments, agencies and organizations of the state should be involved in the implementation of measures aimed at achieving, supporting and monitoring compliance with environmental safety requirements. The components of compliance with the requirements of environmental safety of Ukraine are the provision of chemical, physical (ionizing and electromagnetic radiation, noise), biological, industrial safety and prevention of natural and man-made disasters. The result of such measures can be obtained only with their integrated application, which in turn requires the introduction of a well-established mechanism of organizational management of all actors in this process. To implement such a mechanism, the state system of ecological security of Ukraine must be formed.

The state system of ecological security of Ukraine is a set of state measures (legal, economic, technical, humanitarian and medical) aimed at maintaining the balance between its ecosystems and anthropogenic and natural pressures. The structure of this system should consist of governing bodies, forces and means to ensure its functioning.

Among the priority organizational and managerial problems of man-made safety in the destroyed areas are the following:

– development of national policy and legislation in this area;

– creation of an integrated system of state security management;

– strengthening of control functions on the part of the state on observance of technogenic safety;

– creation of a system of state reserves;

– introduction of a new system of training and certification of specialists in the field of industrial and natural safety.

2.3. Mechanisms for regulating the quality of the environment in the direction of environmental safety.

Standardization of the quality of the environment in combat areas should be carried out in order to establish maximum permissible norms of environmental impact, which ensures environmental safety and preservation of genetic resources, ensuring the rational use and reproduction of natural resources in sustainable economic development. Standards of maximum permissible harmful effects, as well as methods of their determination must be determined by specially authorized state bodies of Ukraine.

Taking into account the natural and climatic features, as well as the increased social value of certain areas (reserves, sanctuaries, national parks, resorts and recreational areas) for them it is necessary to establish stricter standards of maximum permissible harmful effects on the environment. The environmental rationing system should cover all environmental risk factors associated with the location, construction and operation of industrial facilities and complexes with the creation of new equipment, technology and materials.

An important requirement is the harmonization of standards with project examination procedures and environmental monitoring. Measures to prevent the greening of nature management should be the legislative consolidation of the requirements for mandatory state and public environmental review of plans and projects. According to the analysis, the system of means and incentives of economic and other nature to comply with laws and regulations in the field of environment is insufficient. At the same time, there is a real opportunity to avoid them, the sanctions for non-compliance are too lenient. For example, various oversight bodies can only propose penalties, but cannot enforce them themselves. The previously proposed sanction is often changed or revoked altogether. Centralization and the associated monopolization of some industries can lead to a situation where environmental disturbances do not stop (the amount of fines may be included in production costs).

Therefore, the main mechanisms for implementing the state system of environmental safety of destroyed areas should be:

– organization, management and control over compliance with environmental safety requirements in the destroyed areas;

– planning and coordination of comprehensive programs of environmental protection and environmental management;

– control over the observance of the unified state policy, which guarantees the reliability and sustainable functioning of national security facilities;

– prevention and elimination of environmental consequences of industrial accidents, natural disasters and natural disasters;

– assessment of the state of ecological safety on the whole territory of Ukraine and in its separate administrative-territorial formations, forecasting of its dynamics.

2.4. Technology of introduction of mechanisms of maintenance of ecological safety of the destroyed territories.

The following are recommendations that should be considered regarding environmental regulations in the preparation of environmental legislation on the elimination of the consequences of hostilities.

Ensuring the legal framework for the elimination of the consequences of hostilities includes the following measures:

1. Development of scientifically sound environmental standards and their harmonization with existing legislation.

2. Making appropriate changes and additions to the Administrative and Criminal Codes of Ukraine.

3. Introduction of a system of economically tangible penalties for violations of environmental management.

4. Development of relevant bylaws to the Law of Ukraine «On Environmental Protection».

5. Ensuring compliance with laws on environmental protection.

6. Development of mechanisms for economic incentives for environmental activities, which would ensure the necessary balance of environmental and economic interests. This applies in particular to measures of state support for those types of investment and business activities aimed at improving environmental safety and environmental protection, such as various incentives and benefits, especially taxes.

7. Adoption of additional measures to improve criminal liability for environmental crimes, including liability for the most dangerous types of encroachments on the environment and some of its elements, while aligning the content of criminal law with basic environmental legislation.

3. Scientific aspects of environmental security in the aftermath of hostilities.

The system of environmental security management in the aftermath of hostilities cannot be built without knowledge of the basic scientific laws of the impact of harmful anthropogenic factors on ecosystems, including humans. Knowing the state of the ecosystem and the laws of nature and society, you can predict changes in the state of the environment and predict the undesirable consequences of such changes or prevent them in advance. This requires considerable attention to scientifically sound regulation of various anthropogenic pressures on the environment.

All this brings to the fore the development of a number of priority theoretical problems of environmental regulation of anthropogenic pressures, including:

1. Elaboration of theoretical bases of formation of noocenoses is a fundamental problem of modern science and a strategic direction of ensuring ecological safety of society. The primary task is to develop criteria for envi-

ronmental safety (noosphere-compatible) development of productive forces and to develop on this basis a system of environmental standards.

2. Elaboration of scientific bases of ecological standardization of anthropogenic pressures on natural systems of Ukraine and the decision of the contradictions arising at interaction of the nature and the person.

3. Determining the permissible limits of the dynamics of ecological systems of different rank, exceeding which indicates the approach to a critical state. The choice of the scale of these indicators depends on the specific circumstances, but the rule here should be to minimize the risk of catastrophic changes in the ecological system.

Environmental standards are not absolutely strict, and the task of rationing, in fact, is to find a compromise between the requirements of compliance as far as possible from the stability of the ecological system and get the maximum possible products, taking into account technological capabilities of a business.

In addition, environmental standards should be focused not on the amount of damage and the consequences of specific types of impact on natural complexes, but on the response of biological systems. The new system of environmental regulations and rules should direct the environmental security of Ukraine to achieve specific environmental results, rather than the creation of environmental facilities.

It is possible to find quite effective system solutions through the development and implementation of scientific foundations of public policy, which operate in the course of state, regional, sectoral scientific and technical problems. Thus, rich statistical and analytical material on the parameters and dynamics of environmental change is analyzed and published annually in a number of publications.

Among the priority tasks of the scientific and technical problem of environmental safety in the destroyed areas are the following:

– creation of real scientific bases of maintenance of industrial safety, safety of difficult technical systems, people and environment;

– development of methods for hazard assessment of industrial facilities;

– development of scientific bases of the concept of acceptable risk concerning conditions of functioning of technogenic systems;

– creation of a data bank and a system of man-made safety monitoring;

– development of forecast estimates and scenarios for the development of natural ecosystem changes in the destroyed areas and effective response measures;

– development of socio-economic, regulatory and organizational measures for sustainable development of regions in the transition to market relations, taking into account the threats of man-made, natural or man-made origin;

– development of mathematical models for reducing potential threats to industrial facilities to solve a wide range of optimization problems related to reducing threats to the population.

The consequences of hostilities in the area require a comprehensive solution to the following humanitarian issues:

– the formation of the idea of «environmental imperative of military action» – a forbidden limit, which humanity has no right to cross under any circumstances;

– environmental education (environmental knowledge should include awareness and understanding of environmental laws, the principles of the relationship of various objects of nature with each other and with man due to hostilities, organization, management, use of nature and its resources to ensure human and human life on the principles of functioning « noosphere «);

– environmental awareness and environmental thinking (reflecting not only the activities to protect nature, but also the attitude to it, to the conditions in which it is as a result of hostilities.

An important factor in improving the environmental culture of society and optimizing the environmental protection of the state is environmental information. The state system of environmental information in Ukraine is provided by the Ministry of Environmental Protection and Natural Resources of Ukraine. Prompt informing of citizens on various issues of ecology, nature protection is carried out by mass media through issues of information services (television, radio). At the same time, ecological information can provide different degrees of ecological knowledge, different depth, thoroughness depending on individual psychological characteristics, age, life experience, professional affiliation, social and moral position of the individual.

Conclusions.

Summing up, it should be noted that the problem of environmental security, given the consequences of hostilities, has reached unprecedented proportions in Ukraine and needs a systemic solution. Environmental security is aimed at eliminating the environmental threat that manifests itself on a local, regional and global scale (environmental disasters, social crises and man-made disasters). Ensuring environmental security in the destroyed territories is the main way to solve environmental problems, which guarantees the citizens of Ukraine development and living in a biosphere-compatible form. In addition, the results of separate studies of the problems of anthropogenic impact on the natural environment in the war zone allow us to express a number of generalized provisions. Problems of anthropogenic impact on the natural environment in the war zone objectively require systematic greening of socio-political thought, increasing attention to solving environmental problems at all levels of society, finding new approaches to solving them based on the priority of environmental laws and scientific knowledge. The level of national security in the devastated areas is determined by the magnitude of the risk of both man-made disasters and the negative effects of hostilities that occur rapidly and quickly lead to social

tensions (environmental problems, social conflicts). Therefore, one of such systemic approaches to natural and man-made security in the destroyed areas should be the principle of non-zero risk, which requires the formation of an effective system of economic mechanisms for systemic (comprehensive) security of man, nature and society. We believe that various ministries, departments, agencies and organizations of Ukraine should take part in the implementation of measures aimed at achieving, supporting and monitoring compliance with environmental safety requirements in the destroyed territories. The real result from such measures can be obtained only with their comprehensive application, which in turn requires the introduction of a well-established mechanism of information, organizational, operational management of all actors in this process. To implement such a mechanism, an environmental safety management system must be formed in the destroyed areas. Creating a system of environmental safety management in the destroyed areas means meeting the environmental requirements of ecosystem entities and should be prioritized at the level of national security of Ukraine. The systemic strategic direction of environmental protection and conservation of natural resources in the destroyed areas should be to overcome resource waste, low use of primary raw materials, secondary resources and waste for recycling, introduction of low and zero waste technologies. The country's economy today remains a complex conglomeration of harmful extensive industries based on low technology. Therefore, the reconstruction of the industrial complex in the destroyed areas (situational management) should be carried out on modern, and preferably on advanced technologies. Economic reform should take into account the need to intensify the production of equipment for the development of unconventional energy, increasing the role and opportunities to use foreign and domestic experience in raising the level of environmental safety of scientific and technical bases, achieving real fuel and energy independence of Ukraine. Thus, solving the problems of environmental security in the devastated areas as a result of hostilities requires a comprehensive consideration of economic, engineering, social and other factors, universal values and, given limited resources, not only immediate but also long-term consequences of decisions in this area.. Only with a systematic approach in the organization of public administration it is necessary to eliminate as soon as possible the consequences of hostilities (operational management) in the destroyed territories and gradually and consistently ensure sustainable development of the regions. Bringing the nature management of war-torn areas in line with the requirements of environmental security in the current economic environment is a distant prospect, but now it is vital to ensure systematic progressive and focused development in this direction by implementing the proposed systemic mechanisms of information, organizational and operational management.

References

1. Бондар О. І., Машков О. А., Міхеєв В. С. (2020). Системний підхід щодо створення системи підтримки екологічних рішень для забезпечення екологічної безпеки держави / *Екологічні науки: науково-практичний журнал.* К.: ДЕА, № 3(30), с. 30-38.
2. Гончарук О. Б., Савичук Н. О. (2021). Поняття механізмів державного управління та їх практичне значення. Інвестиції: практика та досвід. № 7. С. 77–83. DOI: 10.32702/2306-6814.2021.7.77.
3. Іванюта С.П. (2019). Пріоритетні напрями протидії екологічним і техногенним загрозам в зоні військового конфлікту на Сході України, – URL: https://niss.gov.ua/en/node/137.
4. Івашова Л.М., Івашов М.Ф., Квеліашвілі І.М. (2020). Методологія наукових досліджень і системного підходу у сфері публічного управління: механізми, важелі, методи, інструменти. *Публічне управління та митне адміністрування*, № 2 (25), с. 11-19.
5. Місяць війни. Злочини проти довкілля / Засядько Є., 26 березня 2022.URL: https://www.epravda.com.ua/rus/columns/2022/03/26/684714/
6. Настасенко О.Г., Бондар О.І., Машков О.А. (2014). Системний підхід щодо ліквідації загроз екологічної катастрофи у зоні антитерористичної операції. *Науково-практичний журнал «Екологічні науки»*, № 1(6), К., ДЕА, с. 5-20.
7. Бущенко А.П. На межі виживання: знищення довкілля під час збройного конфлікту на Сході України (2017). *Укр. Гельсінська спілка прав людини*, К., КИТ, 88 с.
8. Денісов Н., Аверін Д. (2017). *Оцінка екологічної шкоди та пріоритети відновлення довкілля на сході України*. – К.: ВАІТЕ, 88 с.
9. Половцев О. (2021). *Системний підхід до прийняття рішень в державному управлінні: Методологія розв'язання задач державного управління та прийняття об'єктивних рішень з визначеною якістю* (Ukrainian Edition) Paperback – September 30, 212 с.
10. Природа та війна: як військове вторгнення Росії впливає на довкілля України/ Омельчук Оксана, Софія Садогурська, 1 квітня 2022. URL: https://ecoaction.org.ua/pryroda-ta-vijna.html
11. Хилько М. І. Екологічна безпека як фундаментальна складова національної безпеки. (2021). *Вісник Донецького національного університету імені Василя Стуса*, Сер.: Політичні науки, с. 69-75.
12. Екологічні наслідки війни на сході України. Вікіпедія. URL: https://uk.wikipedia.org/wiki/Екологічні_наслідки_ війни_на_ сході_України
13. Ядерний вибух у Донецькій області. Вікіпедія. URL: https://uk.wikipedia.org/wiki/ Ядерний_вибух_у_Донецькій_області/