
ТЕОРЕТИКО-МЕТОДОЛОГІЧНІ ПИТАННЯ В ГАЛУЗІ ОХОРОНИ ДОВКІЛЛЯ

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ECOLOGICAL THREATS, RISKS AND ENVIRONMENTAL TERRORISM: SYSTEM DEFINITION

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The article identifies the main environmental problems of society: changes in the atmosphere; Greenhouse effect; ozone hole in the atmosphere; acid rain; water pollution; water resources; water pollution; pollution of the earth's surface; destruction of plants and forests; problems of the animal world. On the basis of the system analysis, the concept of "environmental terrorism" is defined. Ways and ways to increase the level of environmental safety and prevent "environmental terrorism" are proposed. The necessity of environmental risk management is grounded. *Key words:* environmental safety, environmental terrorism, environmental risks and threats, a systematic approach

Екологічні загрози, ризики та екологічний тероризм: системне визначення. Бондарь О.І., Машков О.А., Жукаускас С.В., Нігородова С.А. У статті визначені основні екологічні проблеми суспільства: зміни в атмосфері; парниковий ефект; озонна діра в атмосфері; кислотні дощі; забруднення акваторій; водні ресурси; забруднення води; забруднення земної поверхні; знищення рослин та лісів; проблеми тваринного світу. На основі системного аналізу визначено поняття «екологічний тероризм». Запропоновано шляхи і способи підвищення рівня екологічної безпеки та запобігання екологічному тероризму. Обґрунтована необхідність керування екологічним ризиком. *Ключові слова:* екологічна безпека, екологічний тероризм, екологічні ризики та загрози, системний підхід.

Экологические угрозы, риски и экологический терроризм: системное определение. Бондарь А.И., Машков О.А., Жукаускас С.В., Нигородова С.А. В статье определены основные экологические проблемы общества: изменения в атмосфере; парниковый эффект; озонная дыра в атмосфере; кислотные дожди; загрязнение акваторий; водные ресурсы; загрязнение воды; загрязнение земной поверхности; уничтожение растений и лесов; проблемы животного мира. На основе системного анализа определено понятие «экологический терроризм». Предложены пути и способы повышения уровня экологической безопасности и предотвращения «экологического терроризма». Обоснована необходимость управления экологическим риском. *Ключевые слова:* экологическая безопасность, экологический терроризм, экологические риски и угрозы, системный подход.

Problem statement. Human activities lead to the destruction of natural resources and environmental pollution. Currently, the biosphere of the planet is in critical condition. Only a few steps remained before the global catastrophe. French geographer Elise Reclu said: "Man creates the environment in his own image and likeness". We have the environment you deserve. At the same time, two aspects of the environmental problem can be distinguished: environmental crises resulting from natural processes and crises caused by anthropogenic impact and irrational nature management.

Melting glaciers, volcanic eruptions, the formation of mountains, floods – all of these are terrestrial natural factors. On average, one catastrophic earthquake occurs on the globe every year, 18 strong, 120 medium and about a million weak shocks. What man has done to the surrounding nature is already in scale the result

of a catastrophe. As a result, water is already polluted in the air, the atmosphere itself is polluted, millions of hectares of fertile soils and forests have been destroyed, the planet is contaminated with toxic chemicals and radioactive waste, and the biosphere is being destroyed. Nature is experiencing the influence of society in the following areas: the use of environmental components as a resource base of production; the effect of human production on the environment (its pollution); demographic pressure on nature (agricultural use of land, population growth, growth of large cities). Today many global problems of humanity are intertwined – resource, food, demographic. All of them have access to environmental issues. But it has a feedback, – a great influence on the problems of mankind.

The purpose of the publication is to propose ways and means of improving environmental safety and pre-

venting environmental terrorism, as a tool for creating an environmental risk management system, based on a system analysis of the main environmental problems of society.

The main material. Today, the main sources of anthropogenic pollution of the environment are energy producers (thermal power plants, nuclear power plants, hydroelectric power plants), all industrial facilities (primarily metallurgical, chemical, oil refining, cement and cellulose-paper), chemical production, military industry and military facilities, motor transport and other types of transport (sea, river, railway, air), mining production. They pollute the environment with hundreds of toxic substances, harmful physical fields, noise, vibrations, excess heat.

With the development of chemistry, metallurgy, energy and engineering mankind began to be threatened with waste synthetic washing powders, oil products, heavy metals, nitrates, radionuclides, pesticides and other harmful substances. These harmful substances are not absorbed by microorganisms, they do not decompose, but accumulate in thousands of tons in soils, water bodies, and groundwater [1–3].

Now, only as a result of burning fuel resources, more than 22 billion tons of carbon dioxide get into the atmosphere of the planet every year. Every year, global industry dumps more than 160 km³ of hazardous wastewater into rivers. Every year, 500 million tons of mineral fertilizers and about 4 million tons of pesticides are introduced into the soil by mankind. Most of the mineral fertilizers deposited in the soil or carried by surface water in rivers, lakes, seas and oceans. Over the past 45 years, the use of mineral fertilizers has increased 43 times, and toxic chemicals – ten times.

Another – no less important than previous problems, the problem of waste. Losses from them are not only huge areas of land occupied by landfills, waste heaps, slag farms, etc. The main anthropogenic pollutants of the environment also include various noises from industrial enterprises, transport, ionizing radiation, vibrations, light thermal effects.

System analysis of environmental threats to society. Ecological safety is a state and environmental conditions in which ecological balance is ensured and environmental protection is guaranteed (biosphere, atmosphere, hydrosphere, lithosphere, cosmosphere), species composition of the animal and plant world, natural resources, preservation of health of I and human activity. According to Art. 50 of the Law of Ukraine “On Environmental Protection” environmental safety – this is the state of the environment, which is guaranteed to prevent the deterioration of the ecological situation and human health. Ensuring environmental safety includes the following actions: environmental auditing, monitoring, forecasting the development of the environmental situation, environmental management. Ensuring environmental safety is aimed at solving environmental problems. At the same time, an “environmental prob-

lem” is a change in the natural environment as a result of anthropogenic impacts, leading to disruption of the structure and functioning of natural systems (landscapes) and leads to negative social, economic and other consequences. The concept of “environmental problem” is anthropocentric, since a negative change in nature is assessed relative to the conditions of human existence. The solution of environmental problems is aimed at preventing environmental disasters [5–7].

Ecological disaster is a dangerous change in the environment associated with causing enormous damage to the environment, the loss of plants, animals and people. An example of an environmental disaster in Ukraine is the Chernobyl disaster. It is considered the largest in the history of nuclear energy, both in terms of the estimated number of people killed and affected by its consequences, and in terms of economic damage. The radioactive cloud from the accident passed over the European part of the USSR, most of Europe, the eastern part of the United States. Approximately 60% of radioactive substances settled in Belarus. About 200,000 people were evacuated from the contaminated area.

The forerunner of ecological disaster is the ecological crisis. An environmental crisis is an unfavorable state of relations between society and nature, which arises as a result of the disparity between the development of productive forces and the resource and ecological capabilities of the biosphere. The elimination of the global environmental crisis is today the most important task of mankind [8–15].

Classification of environmental problems.

We define the following main environmental problems of society.

1. Changes in the atmosphere. This environmental problem is caused by the increased anthropogenic impact on the environment. It includes a number of aspects.

Firstly, the destruction of the ozone layer of the atmosphere occurs due to the increasing pollution of the atmosphere by freons, nitrogen oxides, etc. By the middle of the XXI century. these contaminants can lead to a 15% reduction in the stratospheric ozone content.

Secondly, the increase in CO₂ concentration occurs due to the combustion of fossil fuels, reduction of forest areas, depletion of the humus layer and soil degradation. By the middle of the XXI century. gas doubling is expected. As a result of the “thermal effect” in the 30s. XXI c. an increase in the average temperature of the surface air layer by $3 \pm 1.5^\circ\text{C}$ may occur. It is predicted that maximum warming will occur at the Earth’s pole, and minimal – at the equator. An increase in the rate of melting of glaciers and rising sea levels at a rate of more than 0.5 cm/year is expected.

Thirdly, acid precipitation has become an essential component of the atmosphere. They fall in the countries of Europe, North America, as well as in the areas of the largest agglomerations of Asia and Latin America. The main cause of acid precipitation is the entry of sulfur and nitrogen compounds into the atmosphere when burning

fossil fuels in stationary installations and engines of transport. Acid precipitation damages buildings, monuments and metal structures, destroys forests, reduces the productivity of many crops, and impairs soil fertility and the state of aquatic ecosystems.

In the industry uses about 70 thousand names of chemicals. Every year, the circulation receives almost 1.5 thousand chemicals. Most of them pose a threat to human life and health and the environment. As a result of accidents involving improper handling of hazardous chemicals and wastes, a significant number of people die or become sick, and the environment is polluted. The enterprises of the chemical complex are permanent sources of environmental pollution by emissions of hydrogen chloride, nitrogen and sulfur oxides, hydrogen sulfide, carbon tetrachloride, ethylene chloride, formaldehyde, ammonia, chlorine, dioxins, polychlorinated biphenyls and polychlorinated dibenzofurans, organic solvents. Heavy metals, cyanides, organic substances, oil products are dumped into the water.

Refrigerants, process fluids, transformer oil, solvents, chemicals for water treatment and processing of materials and products, household, medical and pharmaceutical waste are also dangerous. The problem of accumulation and use of large-tonnage waste in such industries as mining and metallurgical (37 million tons), chemistry (47 million tons), production and processing of polymeric materials (about 1 million tons) remains topical.

A serious threat to life and health of people and the environment are unsuitable for use pesticides, which in Ukraine have accumulated about 21.38 thousand tons pesticides are stored in almost 5 thousand warehouses. 46 percent of storage facilities are in poor condition, from which 52 percent are unsuitable for use (pesticides are stored in damaged packaging).

The issues of ensuring chemical safety and handling chemicals are regulated by relevant legislation and international acts ratified by the Verkhovna Rada of Ukraine. Government programs have been developed, relevant regulatory and legal acts have been adopted, including on occupational safety, fire and environmental safety. Sanitary and hygienic norms and rules are introduced. The list of central executive authorities that carry out state regulation in the field of chemical safety and chemicals management is defined. However, these programs are not fully implemented. The actions of central and local executive bodies are not coordinated, there is a duplication of their functions.

2. Greenhouse effect. Currently, the Earth is warming up much faster than it has ever been in the past. This is caused by a sharp increase in atmospheric carbon dioxide. In the earth's atmosphere, carbon dioxide acts like glass in a greenhouse: it transmits sunlight, but retains the heat of the sun-warmed surface of the earth. This causes the planet to warm up, known as the greenhouse effect.

Recently, anxiety of scientists about the greenhouse effect has increased. In addition to CO₂, some other gases (small impurities) cause the greenhouse effect. What is

the danger of the greenhouse effect? Calculations show that increasing the average annual temperature of the Earth by 2.5° C will cause significant changes on Earth, which will have negative consequences for people. The greenhouse effect will change such critical quantities as precipitation, wind, cloud layer, ocean currents, as well as the dimensions of polar glaciers. The hinterland of the continents will become drier, and the coasts wet, winters shorter and warmer, and summer longer and hotter.

The most unpleasant for humanity are the two effects of the greenhouse effect. The first is a significant increase in aridity in the main grain areas. The second is the rise in the level of the oceans by 2–3 meters due to the melting of the polar ice caps. This will cause flooding of many coastal areas.

3. Ozone holes in the atmosphere. The ozone layer of the atmosphere protects the biosphere from the destructive effects of the short-wave ultraviolet radiation of the sun. Observations of meteorologists who work in Antarctica indicate that the ozone layer over this continent has begun to decrease. There was a hole, the ozone content in which was 40–50% less than usual. There is a tendency to increase its area (its area exceeds the area of the mainland of Antarctica).

Alarming messages come from the Northern Hemisphere: a smaller ozone hole is found over Svalbard's archipelago than over Antarctica. A decrease in the ozone content in the atmosphere threatens a decrease in crop yields, animal and human diseases, an increase in harmful mutations, and the like. If ozone disappears completely, all life on our planet will be destroyed.

According to scientists, a serious threat to the disappearance of the ozone layer will lead to serious consequences. On the causes of the appearance of ozone holes there is no consensus. It is established that the destruction of the ozone layer contribute to some chemicals. As a result, more ultra violet rays come to Earth. Such substances are widely used in industry (as refrigerants in a refrigerator, etc.) and in everyday life (aerosol packaging of cans for paint, varnish, perfume). In total, several million tons of freon are produced annually in the world. Freons are harmless to humans, but they are extremely stable (they can store up to 80 years in the atmosphere). Freon vapors fall into the stratosphere. Under the influence of the Sun, their molecules decay, releasing chlorine atoms. This substance acts as a very strong catalyst, decomposing ozone molecules to oxygen. High-altitude flights are also causing significant damage to the ozone layer. Engine exhaust contains nitrogen oxides.

4. Acid rain. Sulfur and nitrogen oxides, which enter the atmosphere as a result of the operation of thermal power plants and automobile engines, form small droplets of sulfuric and nitric acids. They are carried by winds in the form of acid mist and fall to the Earth in the form of acid rain. These rains have a detrimental effect on environmental factors: the yield of many agricultural crops is reduced by 3–8% (due to acid damage to the leaves). Acid precipitation causes the leaching of

calcium, potassium and magnesium from the soil. They contribute to the degradation of flora and fauna. Forests are degraded and die, the water of lakes and ponds is poisoned, in which fish and numerous species of insects perish. The disappearance of insects in water leads to the extinction of birds and animals that feed on them. The disappearance of forests in mountainous areas leads to an increase in the number of mountain landslides and mudflows. Sharply accelerated the destruction of architectural monuments, residential buildings. Human inhalation of air contaminated with acid mist causes respiratory diseases, eye irritation, and the like.

According to environmentalists, a third of the forests in Switzerland are dying of acid rain. 69% of surveyed beech trees in the forests of the UK dry up from the tree-tops. In Sweden, 18,000 lakes poisoned by acid rain, in 9000 of them, the fish have already partially died out, and in 4 thousand – disappeared altogether.

A big threat is the “transboundary” nature of this pollution. Air currents carry acid mists thousands of kilometers from their places of origin. Thus, the Swedish lakes were damaged by acid rains resulting from emissions from thermal power plants and metallurgical enterprises in the UK. Winds in the area carry poison far from the British Isles – to Scandinavia. Acid rain to Canada is brought from the United States, to Ukraine from Romania and the like.

5. Pollution of water areas. In our time, water pollution has become an environmental problem. The water quality of rivers and lakes has sharply deteriorated. This can not affect the state of the environment, the health of people.

6. Water resources of the planet. The reserves of water on Earth are huge – $1,39 \times 10^9 \text{ km}^3$, which is 0.023% of the total mass of the Earth. However, the absolute majority of this colossal mass is bitter-salty sea water, unsuitable for drinking and technical purposes. The mass of fresh water on the planet is $35 \times 10^6 \text{ km}^3$ (only 2% of its total amount).

The problem of depletion of water resources is caused by the growth of water consumption by industry, rural and municipal farms, on the one hand, and pollution of water sources, on the other. Every year, mankind uses an average of up to $6,000 \text{ km}^3$ of water, of which about 3400 are in agriculture, 2200 are in industry, 400 km^3 for household needs.

7. Water pollution. The pollution of many land bodies of water (especially in the countries of Western Europe and North America) and the waters of the oceans has reached dangerous levels. Annually in the ocean falls (million tons): 0,2–0,5 toxic chemicals; 0.1 organochlorine pesticides; 5–11 – oil and other hydrocarbons; 10 – chemical fertilizers; 6 – phosphorus compounds; 0.004 – mercury; 0,2 – lead; 0.0005 – cadmium; 0.38 – copper 0.44 – manganese; 0,37 – zinc; 1000 – solid waste; 6.5 – 50 – solid waste; 6.4 – plastics. In the North Atlantic, oil film takes up 2-3% of the area. The most polluted with oil are the North and Caribbean seas, the Persian Gulf, as

well as the areas adjacent to Africa and America where they are transported by tanker fleet.

As a result of the intensive use of water resources by mankind, significant quantitative and qualitative changes occur in the hydrosphere. Quantitative changes consist in the fact that in certain areas the amount of water suitable for household needs decreases, the water balance worsens, the regime of rivers and the like. Qualitative changes are due to the fact that most of the rivers and lakes are not only a source of water supply, but also those basins where industrial, agricultural, and domestic wastewaters are dumped. This led to the fact that nowadays there are practically no large river systems with a hydrological regime and chemical composition of water, not distorted by human activity, on Earth. Chemical pollution of water occurs as a result of various harmful inorganic impurities (acids, mineral salts, alkalis, etc.) and organic nature (oil and oil products, detergents, pesticides, etc.) entering the water bodies with wastewater. Most of them are toxic to the inhabitants of water bodies. These are compounds of arsenic, lead, mercury, copper, cadmium, chromium, etc. In fish, the concentration of poison can be a thousand times higher than its concentration in water, which in turn is dangerous for birds, animals and people.

A very dangerous factor for reservoirs are petroleum products. Oil is the number one enemy in modern pollution of the seas and oceans. Despite a number of international agreements, oil pollution of the hydrosphere is increasing. Oil films on the surface of the oceans are not only distorted shores, perishing sea inhabitants, waterfowl. This is a decrease in the amount of oxygen in the atmosphere as a result of pollution and the death of plankton.

Wastewater containing dissolved organic matter or suspensions of organic origin adversely affect the state of water bodies. Most of these substances help reduce oxygen in the water. Depositing to the bottom of water bodies, organic suspensions silt it and retard or completely stop the vital activity of organisms involved in self-purification.

The main suppliers of organic substances in wastewater are the pulp and paper industry, oil refineries, large livestock farms, and the like. The number of chemical water pollutants is constantly increasing. Their harmful effects manifest themselves in the next generations of living beings and consist in the appearance of harmful mutations, genetic disorders, and the like. Physical pollution of water is associated with changes in its physical properties – transparency, radioactivity, temperature.

Of particular danger to all living things are radioactive impurities that enter the water through the release of nuclear power plants. There is tremendous damage from radioactive landfills in the ocean. Thermal pollution of reservoirs caused by the descent into the reservoirs of warm water from various power plants. In the rivers, which are located near thermal and nuclear power plants, the conditions for fish spawning are violated, zooplank-

ton dies, and fish are affected by diseases and parasites. Biological pollution of the aquatic environment consists in the entry of various types of microorganisms, plants and animals (viruses, bacteria, fungi, worms) into reservoirs with sewage, which were not there before. Many of them are pathogenic for people, animals and plants. The pollutants are domestic wastewater, enterprises of the pulp industry, meat processing plants, sugar factories.

Biological pollution of water bodies acquires particular urgency in places of public recreation. Due to the poor state of sewage and wastewater treatment plants in recent years, the city leaders of Odessa, Mariupol and other cities on the Black and Azov Seas have repeatedly closed their beaches. In seawater, pathogens of such dangerous diseases as viral hepatitis, dysentery, and cholera were detected.

8. Pollution of the earth's surface. For a long time humanity has polluted the earth's surface with waste products of its activity. But in the twentieth century there was a sharp leap in character and scale, and the quality of pollution. One of the main environmental problems associated with the deterioration of land resources. As a result of accelerated erosion, deflation and other negative processes, humanity lost almost 2 billion hectares of productive land. Deserts can appear on an area of 45 billion hectares, where about 850 million people live. Deserts appear (up to 5–7 million hectares per year) in tropical regions of Africa, Asia and America, as well as in the subtropics of Mexico. The rate of forest extinction is 6–20 million hectares per year.

Soil, which is not a product of human labor and has been created by nature for thousands of years, is now in a state of exhaustion and depletion as a result of predatory use, unreasonable agricultural policies and squandering for different types of construction, quarries, landfills. In pursuit of the harvest, the soil began to be plowed deeper and more often, bringing huge amounts of mineral fertilizers and pesticides to the fields to control pests, over vast areas. Soils lose their ability to absorb and pass water, their structure has degraded, they are oversaturated with harmful chemicals. Soil yields are drastically reduced everywhere.

Thus, the continued existence of our civilization is endangered by the large-scale destruction of fertile land. Soil erosion causes significant damage to agriculture. Soil erosion leads to a decrease in yield by 30–40%, sometimes by 90%. The emergence of soil erosion contribute to: deforestation on the slopes, the destruction of grass or shrub cover, improper plowing of the earth, and the like. Frequent plowing, cultivation, harrowing, and tamping of the earth with wheels and caterpillars of heavy agricultural equipment most provoke erosion.

Erosion and salinization of soils lead to land desertification. During the last decades, thousands of hectares of arid lands in steppe areas, deserts and semi-deserts (where intensive irrigation is carried out and at first significantly increased productivity), later became unsuitable for use because of salts. Salts are contained in the soil as

a result of evaporation of irrigation water. Soil condition deteriorates due to the accumulation of harmful chemicals in them after prolonged and intensive application of mineral fertilizers and various pesticides. The phosphorus brought in soil practically is not washed away.

One of the negative phenomena inherent in desertification are dust storms. Although they are quite common in nature, it turned out that some of them arise through the fault of man – on degraded lands.

9. Destruction of forests. Forests are one of the most important components of the plant world – the energy base of the biosphere, which plays a very important role in life on the planet. Forests are respiratory lungs of the planet. The actions of humanity led to the fact that forests are disappearing on all continents, in almost all countries. They are cut faster than they grow. But it is the forest that actively cleans the Earth's atmosphere from pollution. Green plants absorb carbon dioxide, using it as a building material for their cells. Each cubic meter of wood is almost half a ton of carbon dioxide collected from the air. It is estimated that the current rate of logging (even in forest-rich countries) is enough for 50-60 years. To restore forests need 100–200 years.

The main measures to protect forests are: limiting their felling; complete processing of wood and related raw materials; rational use and preservation of berry, fodder, medicinal, industrial plants; creation of forest shelter and water protection belts, etc.

10. Problems of the animal world. Solving the problem of improving the ecological state of the biosphere requires a new approach to the animal world. Today, about 600 species of birds and 120 species of mammals, a large number of fish, amphibians, and insects are under threat of destruction. Over the last thousand years more than 100 species of animals, 140 species of birds have disappeared from the face of the Earth. Recently, in the regions of the World Ocean, 25 species of the most valuable commercial fish have almost completely disappeared due to environmental degradation and predatory fishing. Up to 250 thousand dolphins, hundreds of thousands of sharks are exterminated annually. Whales have long been threatened with extinction.

System analysis of the concept of "environmental terrorism".

At the turn of the millennium, the world progressive thought came to the conclusion that “environmental threats”, “environmental risks”, “environmental terrorism”, as dangerous phenomena for humanity, are among the world's threats along with organized crime, drug trafficking, nuclear and national danger. This is primarily due to the fact that “environmental terrorism” is becoming the most common means of resolving conflicts in various regions of the planet.

In Ukraine, scientists have a different approach to covering the issue of identifying terrorism, fighting it, analyzing various aspects of this phenomenon and the form of its manifestation. Thus, some experts define terrorism as the use of violence through intimidation to

influence the integrity of national institutions. Terrorism leads to innocent victims or socially dangerous consequences. Sometimes terrorism is defined as dangerous acts or the threat of encroachment on public safety. Such actions are aimed at creating an atmosphere of fear, anxiety, and depression in the social sphere in order to directly or indirectly influence the adoption of a decision.

The problem of countering terrorist activities has been the object of active scientific discussions of the last decades, but, despite a considerable amount of theoretical work on this topic, a practical solution to this problem has not yet been found. On the contrary, the power confrontation is increasing all over the world, therefore the problem of counteracting environmental terrorist activities remains most relevant today. At the same time, in spite of the considerable scientific potential, in our opinion, the insufficiently studied issue remains a systematic consideration of the characteristics and phenomenon of "environmental terrorism".

In our opinion, conditions exist in Ukraine and such negative phenomena and processes occur that create the threat of the emergence of "environmental terrorism". On the territory of our country there are many technologically and environmentally hazardous objects, among which the greatest concern is caused by the presence of chemical and toxic objects (Azot industrial associations – Severodonetsk, Primorsky plant – Odessa metro station, Dnieper chemical plant – Dnipropetrovsk region, etc.) In Ukraine, the tendency to commit terrorist crimes with the use of improvised explosive devices is becoming increasingly threatening.

Currently, there are more than 100 definitions of the term "terrorism", but none of them are supported by the international community as generally accepted. The terms "terror" and "terrorism" are historically used in several aspects, which, in turn, opens the way for arbitrary manipulation of them. The word "terror" (translated from the Latin language literally means "fear, horror") was first used in the political lexicon in France by the Girondians and Jacobins. These French united to prepare the uprising and overthrow the cabinet of ministers under King Louis XVI "by means of intimidation and pardon".

Ecological terrorism has inherited all the traits of violence from its historical predecessors. It has specific features and constitutes a new stage in the development of this phenomenon. As the analysis shows, when studying the phenomenon of "environmental terrorism", it is advisable to take into account four main features.

First, "environmental terrorism" is one of the forms of organized violence.

Secondly, "environmental terrorism" pursues political goals and motives as a specific form of political violence. Ecological terrorism" is intended to conduct violent actions in order to force state or other bodies to make a decision that would satisfy the requirements of terrorists.

Thirdly, the feature of "environmental terrorism" is a conscious focus on numerous human victims, on the

destruction of the environment and natural resources, which contributes to the emergence and deepening of antagonisms in the world.

Fourthly, actions that terrorists can take against humanity have significantly expanded: mass poisoning, radioactive contamination, infection with dangerous diseases, the spread of epidemics, and the like. Tools for the commission of terrorist acts can be explosive devices of a broad spectrum, radioactive, poisonous and other dangerous biochemical substances.

To date, there is no generally accepted definition of the term "environmental terrorism". The existing inconsistency and uncertainty of the basic concepts and basic signs of the definition of "environmental terrorism", and in some issues even a radical discrepancy (one and the same phenomenon is interpreted as a terrorist act or the struggle for "green" for the preservation of the natural environment) degree of risk of a terrorist act. At the same time, the criteria on the basis of which they are trying to distinguish between terrorism and a fair struggle for the preservation of the natural environment ("green" actions) are very conditional, subjective, and have no generally accepted international legal interpretation.

There is no universal international convention on environmental terrorism. Its creation is hampered by fundamental differences between the views of the UN member states. At present, there is no clear definition of the object of "environmental terrorism" as a crime. This gives grounds for scientific discussions. We believe that "environmental terrorism" may refer to: crimes against the foundations of national security; security crimes of humanity and the international legal order; crimes against public safety; and separately terrorist crimes.

The lack of unity of positions on this issue in the legal doctrines of various states can be traced by the example of legislative regulation of a terrorist act (terrorism). Terrorism is related to crimes against public safety in criminal laws: Russia (Art. 205); Kazakhstan (Art. 233), Azerbaijan (Art. 214), Armenia (Art. 217); Lithuania (Art. 250); Of Moldova (Art. 258). In the criminal codes of Georgia (Art. 323, 324), Latvia (Art. 88) and Estonia (Art. 64), terrorism is classified as a crime against the state. Under the Criminal Code of Uzbekistan (Art. 155), terrorism is classified as a crime against the peace and security of mankind. In the Criminal Code of Belarus there are three sets of terrorist crimes. They are contained: in chapter 17 "Crimes against the peace and security of mankind", art. 126 (international terrorism); Chapter 27 "Crimes against public security", art. 289 (terrorism) and Art. 290 (the threat of an act of terrorism). Analysis of the criminal laws of some countries of the world shows that there are no established views on the definition of the object of crimes related to environmental terrorist activities.

Environmental crimes are not separately defined in the Criminal Code of Ukraine (Section IX "Crimes against public security") and do not apply to crimes against peace, the security of mankind and the interna-

tional legal order: Art. 258 (terrorist act), 258-1 (engaging in the commission of a terrorist act), 258-2 (public calls for a terrorist act), 258-3 (creating a terrorist group or terrorist organization), 258-4 (facilitating the commission of a terrorist act) Criminal Code of Ukraine, Art. 258-5 (terrorist financing) [4].

The current Law of Ukraine "On Combating Terrorism" dated March 20, 2003 No. 638-IV does not contain a specific classification of environmental terrorist acts. Now this Law mentions only two types of terrorism – technological and international. The Law "On the Fundamentals of the National Security of Ukraine" of June 19, 2003 No. 964-IV expands the list of types of terrorism envisaged at the legislative level. Article 7 of this Law points to the danger of Ukraine's national security: in the environmental sphere, from manifestations of man-made, including nuclear and biological, terrorism; in the information sphere, on the part of computer crime and computer terrorism.

It should be noted that the various movements of the Green organization are on the verge of despair when their transition to terror is possible. They have no other effective and state-recognized means of influencing governments and parliaments. They have no other opportunity to draw attention to themselves and to listen to their demands. It is difficult to say what forms the "green terror" will take, what methods it will adopt, but their actions are quite likely.

We believe that today there is a need for the international community to create and adopt a convention on combating "environmental terrorism." In this convention, taking into account international experience in the protection of human rights, the concepts of "environmental terrorism" and "environmental terrorist act" should be defined. A clear procedure for interaction between states and the conditions for the obligatory extradition of terrorists to the country concerned.

Ways and ways to increase the level of environmental safety and prevent environmental terrorism.

In the context of globalization of international relations, the fight against environmental terrorism only within the national framework is ineffective. Today, ecological terrorism must be fought at a systemic, international level. There was a need to coordinate efforts at the level of international organizations in order to prevent "environmental terrorism".

It is known that "security" is the state of protection of individuals, society and the environment from excessive danger. Today, indicators characterizing the state of human health and the state (quality) of the environment are often used as a unit of measure for safety. This is due to the fact that the purpose of safety is not only the protection of public health, but also the protection of the environment. Therefore, it is necessary to determine the indicators that quantitatively allow to assess the state and quality of the environment. Such quantitative characteristics include the degree of proximity of the state of ecosystems to the border of functional stability

(beyond which the predictability of changes in ecosystems will be lost).

For a more accurate assessment of the functional sustainability of ecosystems, use the natural-ecological classification of the destruction of nature (an indicator of the functional sustainability of the ecosystem). For this, the following gradations should be distinguished: the natural state; equilibrium state; crisis condition; critical situation; catastrophic condition; state of collapse.

Studies show that the concept of "environmental risk" is not formalized. Thus, in scientific publications, the term "environmental risk" is often understood as the probability of adverse effects for the environment of any changes in natural objects and factors. Risk is considered as the probability of occurrence of emergency events in a certain period of time. Risk is expressed in quantitative parameters the occurrence of man-made accidents that could cause significant harm to the environment or human health. Some are specific risks, Others cannot be specifically identified. There are occupational risks – the risk of occupational diseases.

"Ecological risk" is the possibility of the appearance of insurmountable environmental phenomena: the development of the greenhouse effect, the destruction of the ozone layer, radioactive contamination, acid precipitation. From the point of view of quantitative assessment, the concept of "environmental risk" can be formulated as the ratio of the magnitude of possible damage from the impact of a harmful environmental factor over a certain time interval to the normalized intensity value of this factor.

"Environmental risk" is the possibility of a dangerous violation of the interaction of living organisms with the environment due to the action of natural or anthropogenic factors. By the nature of the manifestation, "environmental risk" can be sudden (man-made accident, earthquake, etc.) and slow (subsidence of land, water-logging, erosion, etc.).

Environmental risk assessment involves analyzing the causes of its occurrence and the extent of manifestation in a particular situation. The risk of man-made accidents, significant in their consequences, is associated with chemical and petrochemical enterprises, nuclear and thermal power plants, mines, sewage facilities. The probability of man-made accidents is largely determined by the effectiveness of environmental protection activities. The analysis shows that "environmental risk" directly depends on three groups of factors: the effectiveness of the environmental policy of local authorities (effective regulatory decisions governing environmental protection); capital investments in resource-saving and environmental protection equipment (economic incentives for environmental measures); the effectiveness of the implementation of environmental state programs.

To assess the "environmental risk" it is advisable to apply the technology of neural networks, which allows you to provide analytical support for decisions when the use of traditional statistical methods is difficult.

An important feature of neural networks is the ability to self-study in order to improve the quality of functioning. Self-learning is achieved using algorithms that determine how communications should change in response to an input.

Risk assessment is based on an analysis of environmental factors. "Ecological factors" are factors that are caused by the causes of a natural nature (climatic conditions, physical and chemical characteristics of the atmosphere, water, soil, natural disasters and catastrophes).

You can define the following characteristics of the gradation of the ecological system:

- natural state: only background anthropogenic impact is observed; biomass is maximum, biological productivity is minimal;
- equilibrium state: the rate of recovery processes is higher or equal to the rate of violation; biological productivity is greater than natural, biomass begins to decline;
- crisis state: anthropogenic disturbances exceed natural-recovery processes in speed, but the natural character of ecosystems is preserved; biomass decreases, biological productivity is sharply increased;
- critical state: the deterioration of ecosystems to less productive, the biomass is small and, as a rule, decreases;
- catastrophic condition: difficult reversible process of ecosystem deterioration, biomass and biological productivity are minimal;
- state of collapse: irreversible loss of biological productivity, biomass tends to zero.

In addition to the natural-ecological classification of the extinction (restoration) of an ecosystem, a medico-social scale is also needed, i.e. objective indicators (criteria) of the described classification of the natural environment are classified according to the following gradations: a safe zone (there is a steady increase in life expectancy, the incidence of the population is decreasing) a zone of tense ecological situation (a region within which there is a transition of the state of nature from a crisis to a critical one); environmental emergency zone; ecological disaster zone.

Today, the community has come to understand the impossibility of creating "absolute security". Therefore, one should strive to achieve a level of risk from hazards that can be considered as "acceptable". Its acceptability must be justified on the basis of economic and social considerations. Environmental risk assessment is the only analytical tool to determine the risk factors for human health and determine the priorities of risk minimization activities. Environmental risk management is an analysis of a risk situation, the development and justification of a management decision (often in the form of a legal act) aimed at minimizing environmental risk. In all developed countries there is a steady tendency to apply the concept of "acceptable risk". The social acceptability of environmental risk associated with various activities is determined by economic, social and psychological factors.

Environmental risk management.

Practical activities in the field of environmental risk management should be structured so that society as a whole receives the safest available amount of natural goods. The principles of risk management laid down strategic and tactical goals. For strategic purposes, the desire to achieve the highest possible level of welfare of society as a whole is expressed, and in tactical goals – the desire to increase the safety of the population and life expectancy.

The most important principle of risk management is the provision that the management process should include the entire cumulative spectrum of environmental hazards existing in society. The general risk for any person and for society as a whole cannot exceed the "acceptable" level for it.

"Environmental risk" for people is expressed in two categories: individual risk, defined as the probability that a person is exposed to hazards in the course of their activities; social risk, defined as the ratio between the number of people killed by the accident and the probability of this accident.

In accordance with the basic principles of international legislation in the field of environmental safety and the handling of hazardous substances, the problem of preventing "environmental terrorism" can be solved by:

- improvement of the national legislation on ensuring environmental safety and handling hazardous substances;
- creating and promoting the functioning of the environmental safety system, introducing a continuous assessment of the risk of harm to human life and health and the environment in the process of handling hazardous substances, taking measures to reduce this risk level;
- taking measures to prevent the occurrence of environmental pollution and environmental accidents and disasters;
- raising the level of scientific and technical support for solving environmental safety issues and handling hazardous substances, coordinating scientific and technical activities in this area and ensuring the introduction of new technologies into practice based on the results of these activities;
- the formation of a responsible attitude of citizens to the use of hazardous substances in the process of their life cycle: production, storage, transportation, use, trade, removal from circulation and disposal.

Systemic actions to prevent and combat environmental terrorism should include the following actions:

- coordination of scientific and technical activities in the field of environmental safety and handling of hazardous substances and the introduction of new technologies into practice based on the results of such activities;
- development and support of the activities of research and development institutions and organizations in this area, updating their experimental base;
- equipping the control and analytical laboratories with modern measuring devices and standardized rapid

methods for determining the composition of chemicals in water, soil, air, living environment, food products, consumer goods, biological environment and waste disposal sites of various origin;

– modeling of possible emergencies at technologically hazardous enterprises in order to minimize environmental risk and environmental threats, develop a plan of measures to eliminate the consequences of environmental accidents and disasters;

– development and application of a mechanism for assessing the level of environmental pollution by hazardous substances;

– development of scientific foundations of environmental regulation of environmental loads;

– development of new methods of control in the process of production, storage, transportation, use, trade, removal from circulation and disposal of hazardous substances.

Conclusions. An analysis of the trends in the development of crime, the operational and socio-economic situation in the country suggests that potentially dangerous objects may become targets for possible terrorist actions. The problem of preventing environmental terrorism should be solved in close cooperation of all

segments of society, other countries, with the mandatory coordination of all members of the global community. Ecological terrorism is a potential global threat. Ecological terrorism is the unlawful or intentional infliction of significant damage to the environment in order to intimidate the population or to force the government or an international organization to commit or abstain from any action. Such a definition of this crime, its legal consolidation will contribute to the consolidation of the efforts of members of the world community to counter environmental terrorism – a modern threat to humanity. In order to systematically counteract “environmental threats”, “environmental risks” and “environmental terrorism”, it is proposed: to increase the level of environmental safety and improve the system of handling hazardous substances; reduce the likelihood of environmental pollution, environmental accidents and disasters; remove from disposal and dispose of hazardous substances. Promising are further research on the development of new methods and mechanisms to combat “environmental terrorism” and the consolidation of these developments in the current legislation of Ukraine. It is necessary to focus on creating an environmental safety management system.

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