NATURAL HAZARDS AND ENVIRONMENTAL DECISION-MAKING

Zelimkhan Musostov[1], Albina Berkaeva[2], Isa Basnukaev[3]

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[1]Chechen State University, Grozny named after A.A. Kadyrov, Russia
zmr@hotmail.co.uk
[2]North Ossetian State University named after K.L. Khetagurov, Russia
[3]Grozny State Oil Technical University named after acad. M.D. Millionshchikov, Russia
i.basnukaev@mail.ru
salamova_chgu@mail.ru

Abstract

Natural hazards have been in wait for mankind in all periods of its existence, leading to the destruction of material values and the death of people. Despite significant scientific achievements in the field of forecasting and preventing natural disasters, it is not possible to completely prevent their occurrence. Against the background of active human intervention in the environment and the associated climate change, the number of natural disasters is significantly increasing. This necessitates the transformation of the economic system, the development of new models of "green" growth, which implies harmonious relations between man and the biosphere. The article presents a modern assessment of natural hazards and the risks of their occurrence, as well as developed directions for making environmental decisions to minimize them.

Keywords: natural hazards, natural disasters, environmental solutions, disaster prevention, ecology, green economy.

I. Introduction

Environmental protection is one of the most significant and urgent tasks of our time. As a result of humanity's irresponsible attitude to environmental issues, negative climate changes are observed, pollution of natural environments is steadily increasing, natural resources are being depleted, biological diversity is declining, and people's physical and moral health is deteriorating. But the most serious consequence of human intervention in the biosphere is the rapid increase in natural hazards: according to the UN World Meteorological Organization, over the past 50 years, the number of natural disasters has increased 5 times. Every year, more than 100 million people are forced to turn to the international humanitarian system for help due to storms, floods, droughts and forest fires [1].

In general, natural hazards are hazards associated with natural disasters that pose a direct threat to property, life and health of people [2]. These phenomena (natural disasters) do not depend on a person and go beyond the average natural states in terms of scale, duration and intensity of manifestation. They cause significant and irreversible damage to natural and social systems due to their inability to adapt to rapidly changing environmental conditions.

II. Methods

The key source of natural hazards is the interaction of individual systems of the Earth associated with the flow of physical, physico-chemical and biochemical processes, as well as the exchange of various types of energy. These processes naturally determine the continuous transformation of the face of the planet. Natural disasters follow certain patterns:

- they have a certain spatial attachment (for example, a flood can occur only in the place of a natural reservoir or watercourse, and earthquakes practically do not occur on platform areas that are far from the junctions of lithospheric plates);
- the frequency and power of a natural phenomenon are inversely proportional to each other (the most serious natural disasters happen quite rarely);
- any natural disaster is more or less predictable, because it has specific signs and precursors;

Throughout the entire period of human existence, protective measures against natural disasters have been developed to minimize their damage to society and the economy.

Thus, the forecasting of natural disasters is based on a comprehensive assessment of their frequency and severity in different areas, as well as tracking typical signs of their occurrence.

The classification of natural hazards according to their areas of occurrence is shown in Fig.1.

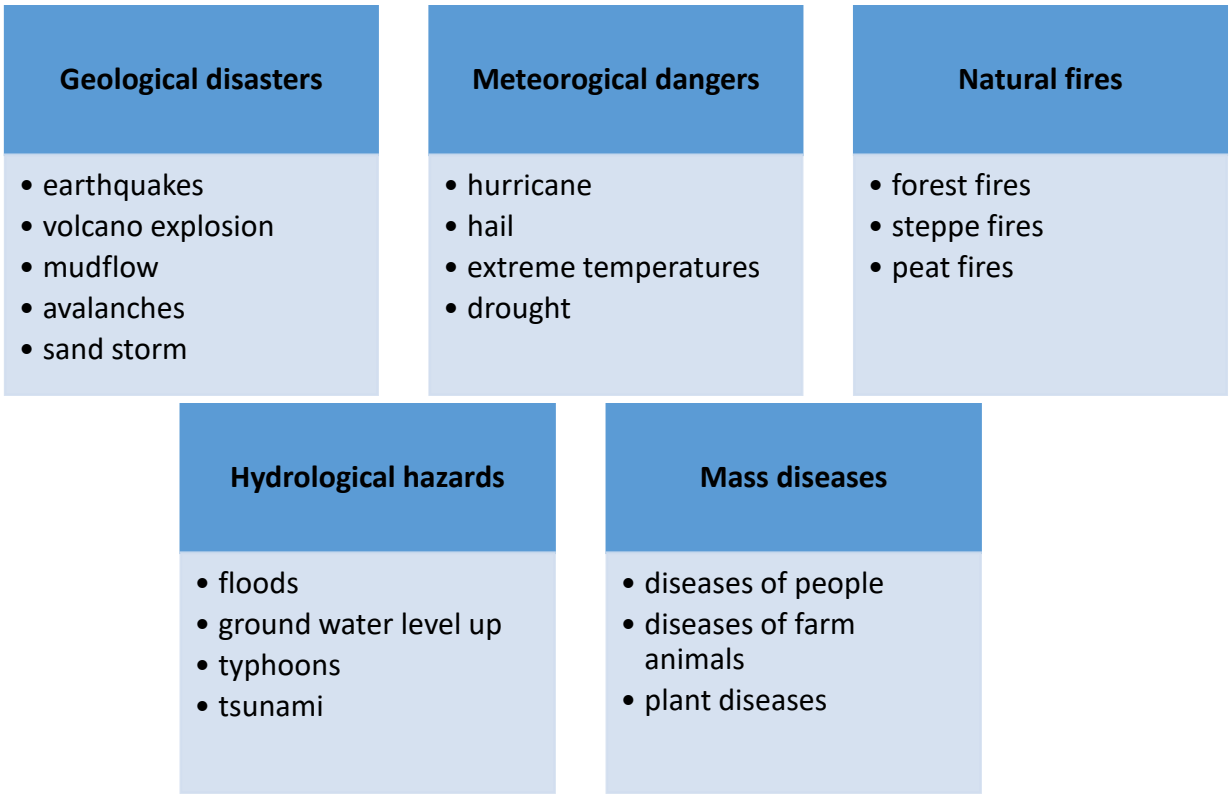

Figure 1: *Classification of natural hazards by areas of occurrence [3]*

III. Results

On the territory of the Russian Federation, due to a significant variety of physical and geographical conditions, there is virtually the entire spectrum of known varieties of natural hazards.

Geological hazards are associated with the structure of the Earth, this category includes earthquakes, volcanic eruptions, mudflows, landslides and collapses. In Russia, the strength of tremors is changed using a 12-point scale, the most common throughout the world. The seismic situation is monitored by the Geophysical Survey of the Russian Academy of Sciences, which has a large number of branches and subordinate organizations in the regions. Most of the country's territory is located in seismically quiet zones, and for this reason there is no need for an extensive system of seismic stations. The largest earthquake in the modern history of Russia is the earthquake on Sakhalin Island, which occurred on May 27, 1995. Its capacity was from 8 to 10 points, as a result, the village of Neftegorsk was completely destroyed, more than 2,000 people died.

Weather hazards include hurricanes, storms, tornadoes, storms, heavy winds, heavy snowfalls, blizzards, droughts, extreme heat or cold. Hurricanes are the movement of winds with a speed of 32 m/s or more, they can cause significant damage to infrastructure and pose a serious threat to the population. In Russia, hurricanes form mainly in August and September, while they are observed in various regions. There is a certain cyclicality in the occurrence of hurricanes, which allows them to be relatively accurate in forecasting. A tornado that occurs in a thundercloud and forms a huge funnel is a rare occurrence for the Russian Federation, but over the past decades, the damage from this natural phenomenon has amounted to about 80 million rubles. Also noted are the problems associated with severe drought, which was observed in 2002 and 2010. In particular,

Natural fires occur when uncontrolled burning of vegetation, they can spread over large areas and cause significant damage to agriculture, as well as residential buildings. Natural fires are divided into forest and peat. In the USSR in 1972, a dry summer led to peat and forest fires on an area of 1.8 million hectares. In 2010, in Russia, abnormal heat led to massive fires in the Central Federal District, and then in other Russian regions.

Massive forest fires were noted in 2022; fires have covered 2.2 million hectares of land since the beginning of the year. A special fire regime has been introduced in 14 regions, including Voronezh, Omsk, Amur and Sverdlovsk Regions, Krasnoyarsk and Khabarovsk Territories, Buryatia and Khakassia. The most tense situation is observed in Siberia, where 776 hectares of forest have been destroyed by fire. Most fires are recorded in the Krasnoyarsk and Altai Territories, Irkutsk, Kemerovo, Omsk, Kurgan regions, where not only the forest, but also agricultural land suffers. Over a few months, more than 1,200 buildings in 80 settlements burned down, of which 730 were residential buildings. About 20 people died, more than 2,000 lost their homes. On May 7, 2022, the Governor of the Krasnoyarsk Territory Alexander Uss declared a state of emergency in the region.

Hydrological hazards are storms, tsunamis, floods and floods. In the Russian Federation, about 50-70 major floods are observed every year, 300 cities and tens of thousands of villages and villages are located in areas with a risk of hydrological emergencies. First of all, these are the basins of the Volga, Amur, Terek, Don, Lena and Ob rivers. The average annual damage from floods is approximately 40 billion rubles. In recent decades, the largest floods were the floods in the Krasnodar Territory on July 6-7, 2012, caused by heavy rains and the flood in the Far East in July-October 2013, which affected up to 200 thousand people. The total damage from the flood exceeded 527 billion rubles.

Epidemics and pandemics are distinguished among mass diseases. An epidemic implies an abnormally wide spread of an infectious disease; a pandemic is declared when the disease spreads to a number of countries and entire continents, up to covering the entire globe. Infectious diseases are divided into four groups: respiratory tract infections, intestinal infections, blood and infections of the external integument. In the modern history of Russia, the largest epidemic was the spread of the coronavirus infection COVID-19. Outbreaks of this disease were noted in all Russian regions, as of July 2022, more than 380 thousand people died from coronavirus. The total damage from this pandemic exceeded 35 trillion USD.

Epidemiologically dangerous diseases can affect not only people, but also farm animals and plants. For example, in 2021, the following dangerous animal diseases were registered in Russia: African swine fever, highly pathogenic avian influenza, contagious nodular bovine dermatitis, sheep and goat pox. The development of diseases was stopped at the time of their detection, which made it possible to avoid widespread infection - epizootypes.

Systematization of hazardous natural phenomena and processes can be carried out not only by origin, but also by the nature of the impact on ecosystems and humanity. In this case, there are:

- catastrophic events (earthquakes, floods, tsunamis, landslides, etc.);
- dangerous phenomena (droughts, desertification, ravine erosion, etc.);
- adverse events (glacier movement, swamping, suffusion, etc.).

According to the mechanism of occurrence, it is possible to separate natural hazards that arise in the form of a trend (adverse climate change), extreme (frost, drought, flood) and disruption (storm, tornado, collapse). By temporal regularity, one can single out natural hazards that occur periodically (an eruption of an active volcano, a flood) and at a random moment (an earthquake, a tsunami).

On the basis of research and the construction of physical and mathematical models, it can be argued that a gradual climate change is taking place on Earth. In particular, the findings of the studies indicate that the main territory of the Russian Federation will experience an increase in surface air temperature during the 21st century. This may affect Siberia, the Arctic and the northern regions of the country to the greatest extent. In areas with sufficient water resources, these resources will increase, and in contrast, dry regions may face further reduction in moisture and the risk of drought. In the Central Federal District, a decrease in snow cover is expected, while in the north and in the Asian part, snow cover will increase, which will lead to floods and floods in the spring.

Also, throughout the century, the process of reducing the ice cover of the Arctic Ocean will continue, at the same time, the boundary of permafrost will move and the layer of seasonal thawing will increase. These changes may lead to the risk of emergencies of natural origin:

- increased snowmelt and heavy rains will lead to more major floods;
- sudden changes in temperature will lead to the emergence of hurricanes, tornadoes and typhoons;
- an increase in average air temperature will cause drought and, as a result, large-scale forest fires;
- accelerated melting of snow and glaciers will lead to a rise in the level of the world ocean and flooding of large coastal areas;
- the process of melting permafrost will contribute to landslides and weakening of the foundations of buildings and various structures;
- in flooded areas, the number of ticks will increase, which will lead to the emergence of new foci of infections and an increase in the period of infectious danger;
- abnormally high summer air temperature will lead to an increase in mortality;
- climate change will cause a decrease in the volume of sources of drinking water.

Cardinal climate change will cause multiple natural emergencies that can cause accidents and disasters and cause significant damage, as well as become a threat to the lives of people living in the northern and southern regions.

The ongoing natural and climatic changes require a change in the existing methods of managing and making changes in the economic model and lifestyle of a person. At the level of macroeconomics, these changes should occur when drawing up long-term development programs, which should take into account natural changes in a particular region and in general, at the level of the whole country. At the microeconomic level, changes should affect technological processes, the organization of production and everyday life.

To prevent emergencies and effectively respond, the following activities are required:

- creation of a centralized system that monitors potentially dangerous natural phenomena;
- establishing areas of greatest risk and determining the frequency of occurrence of hazardous situations;
- limitation of economic activity in permafrost thawing zones;
- creation of a new technical regulation providing for the operation of equipment in new conditions;
- increasing measures to protect the population living in potentially dangerous regions.

So, the current ecological crisis threatens the possibility of sustainable development of human civilization. The degradation and destruction of ecosystems leads to the destabilization of the biosphere, the loss of its integrity and the ability to maintain the qualities of the environment necessary for life. Overcoming the crisis is possible only on the basis of the formation of a new, harmonious type of relationship between man and nature.

IV. Discussion

Under these conditions, Russia, as a country with the largest territory in the world, as well as a huge natural resource, economic and intellectual potential, must take responsibility for the comprehensive protection of the environment and the maintenance of the global functions of the biosphere. Meanwhile, very little attention is paid to the issues of ensuring national and global environmental security in the country, which, together with the irrational use of natural resources by the largest commercial corporations, leads to active degradation of the natural environment.

According to the current Environmental Doctrine of the Russian Federation, the main factors of such degradation in the Russian Federation include:

- the predominance of resource-producing and resource-intensive sectors in the structure of the economy, which leads to the rapid depletion of natural resources and degradation of the natural environment;
- low efficiency of nature management and environmental protection mechanisms, including the absence of rent payments for the use of natural resources;
- a sharp weakening of the managerial and control functions of the state in the field of nature management and environmental protection;
- a high share of the shadow economy in the use of natural resources;
- low technological and organizational level of the economy, high degree of depreciation of fixed assets;
- the consequences of the economic crisis and the low standard of living of the population;
- low level of ecological consciousness and ecological culture of the population of the country.

These factors have a significant impact on the state of the environment in the Russian Federation.

In developed countries, the scientific community, governments and corporations are gradually beginning to unite in order to jointly confront global environmental challenges. This trend finds expression in the tightening of responsibility for environmental pollution, the development and implementation of new environmental standards, the formation of an ecological culture of the population and business. The largest companies make commitments in the field of social and environmental responsibility, integrating them into the structure of their corporate strategy.

In Russia, the problems of environmental protection are largely ignored, which confirms the lack of appropriate legal regulation, the widespread use of irrational forms of nature, the low authority of environmental organizations and the steady dominance of economic interests over environmental ones.

Meanwhile, ensuring environmental protection, rational use and reproduction of natural resources is one of the key constitutionally significant benefits that form the basis of long-term socio-economic development, determine the material basis for the development of future generations.

The most serious damage to the environment is currently caused by the activities of large corporations operating in the mining, petrochemical, metallurgical, pulp and paper, and leather industries.

These enterprises have huge profits, which, in conditions of high corruption, allows them to successfully circumvent environmental prohibitions and carry out activities that pose a serious danger to the environment and public health.

Despite the tendency taken from Western countries to develop codes of corporate social responsibility and the formation of annual reports that include paragraphs on environmental protection, the actual environmental activity of corporations in Russia remains extremely low. Meanwhile, the effectiveness of ensuring environmental safety as one of the most important factors in the development of Russia as a legal and social state depends on the environmental responsibility of business.

So, the adoption of environmental decisions at the level of individual corporations is of fundamental importance for ensuring the sustainability of ecosystems and reducing natural hazards. The environmental responsibility of business is one of the areas of social responsibility, which involves:

- awareness by the subjects of entrepreneurial activity of their direct functions in the system "society - nature";
- understanding of the need to recognize and comply with societal norms regarding environmental protection;
- assessment of one's own activities in the context of its environmental consequences for the company and its employees, as well as for the local community, the state and the world as a whole;
- willingness to modify their activities in order to avoid adverse environmental consequences of their implementation.

The creation of a system for making environmental decisions and protecting the environment within the framework of the social responsibility of business should begin with a comprehensive analysis of the current situation, which can be carried out at various levels.

The result of such an analysis should be methods that ensure a reduction in the discharge of harmful substances into the natural environment, as well as a higher level of solid waste processing. These measures will stop the growing environmental crisis and reduce the level of natural hazards around the world.

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