

Mon22-152

The scientific-methodical approach to the monitoring of national parks and their response to the impact of global challenges

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SUMMARY

The purpose of the study is to develop a scientific and methodological approach to the organization of monitoring the territories of national natural parks under the influence of global challenges (Russian military aggression). It is proposed to carry out an integral assessment of the level of sustainable development of the country's regions, taking into account economic, social and ecological components. A set of factors determining the state of the natural park ecosystem and the emergence of environmental risks under the influence of global challenges is systematized. Certain clusters of regions have been identified, which creates the basis for monitoring and developing appropriate change management mechanisms. A collection of methodical techniques has been developed, taking into account qualitative and quantitative changes in the conditions of the operation of the NNP (before and after military operations). An expert survey of key stakeholders was conducted regarding the scale and nature of the loss of natural parks (on the example of the NPP " Biloberezhzhia Sviatoslava"), who assessed the NNP's response to global challenges. Methods and tools for monitoring the state of the ecological system, assessing environmental risks and hazards have been defined. Reasoned stages of monitoring of the NNP based on a three-level approach to the identification of environmental risks and threats. The expediency of introducing an integrated system of adaptive integrated management of the NNP, as well as the use of the method of zoning the territories most affected by the war, the implementation of enhanced control over their recovery, has been proven.



XVI International Scientific Conference “Monitoring of Geological Processes and Ecological Condition of the Environment”

15–18 November 2022, Kyiv, Ukraine

Introduction

The problems of environmental pollution and irrational use of nature remain for a long time the most acute in the development of mankind. However, the problem of monitoring ecological risks and destruction of ecosystems as a result of war turns out to be the most difficult. Modern studies of national natural parks (NNP) from the standpoint of their reaction to the destructive impact of military actions in Ukraine require the substantiation of scientific and methodological approaches to the organization of monitoring the state of the ecosystem and environmental risks. This approach will be the basis for the development of adaptive management of ecosystems in conditions of global challenges.

Method

The methods of researching NNP and organizing monitoring of their ecosystem and environmental risks are quite diverse. The work uses a systematic approach, methods of deduction and induction, quantitative and qualitative methods, integrated assessment, economic and statistical analysis, express assessments, interviews with environmental experts and ecologists, methods of integration of priority areas, etc.

Results

Environmental risks as a result of human activity are directly related to the safety of people and the environment, and the sources of their occurrence and features of manifestation are extremely diverse. The state of the ecosystem, environmental risks and threats inherent in specific NNPs are systemic processes, the features of which are determined by a combination of both internal and external factors. The strength of influence and the nature of manifestation of such factors can be extremely differentiated. Among the internal factors, economic activity processes prevail (types of economic activity, the scale and dynamics of emissions into the natural environment, their utilization, etc.), innovation and investment resources for the development and preservation of ecosystems, compliance with legislation on environmental protection, the effectiveness of the current multi-level management system of NPP, system features population resettlement, etc. The state and prospects of NNP development are determined by the common interests of various stakeholders and the effectiveness of their implementation mechanisms.

Among the external factors, global challenges associated with changes in geopolitical factors, the level of sustainable development as a comprehensive characteristic of regions and countries of the world, changes in international requirements regarding climate change, and the transition to new "green" models of economic development exert the greatest influence. However, the impact of geopolitical challenges related to Russian military aggression is the most extensive and is not comparable to any of the listed factors. Currently, 812 protected areas are under threat of destruction, which is almost 20% of their total area. There are 12 national nature parks, 8 nature reserves and 2 biosphere reserves of Ukraine in the zone of active hostilities. Ecosystems of the NNP are changing significantly now under the influence of Russian aggression.

NNPs are of particular importance for ensuring the sustainable development of the territories of the regions and the country. They provide protection of natural ecosystems and are an effective tool for preserving the biodiversity of territories, overcoming threats caused by human activity. They have economic, ecological, educational, nature protection, scientific, aesthetic, recreational and other value. Their monitoring makes it possible to assess natural values and the impact on the sustainable development of territories. This approach makes it possible to determine the loss of ecosystems and assess the damage caused to the territories of the NNP. The initial parameters of research on the example of national parks can be the results of an integral assessment of the level of sustainable development of the regions of Ukraine (Fig. 1)



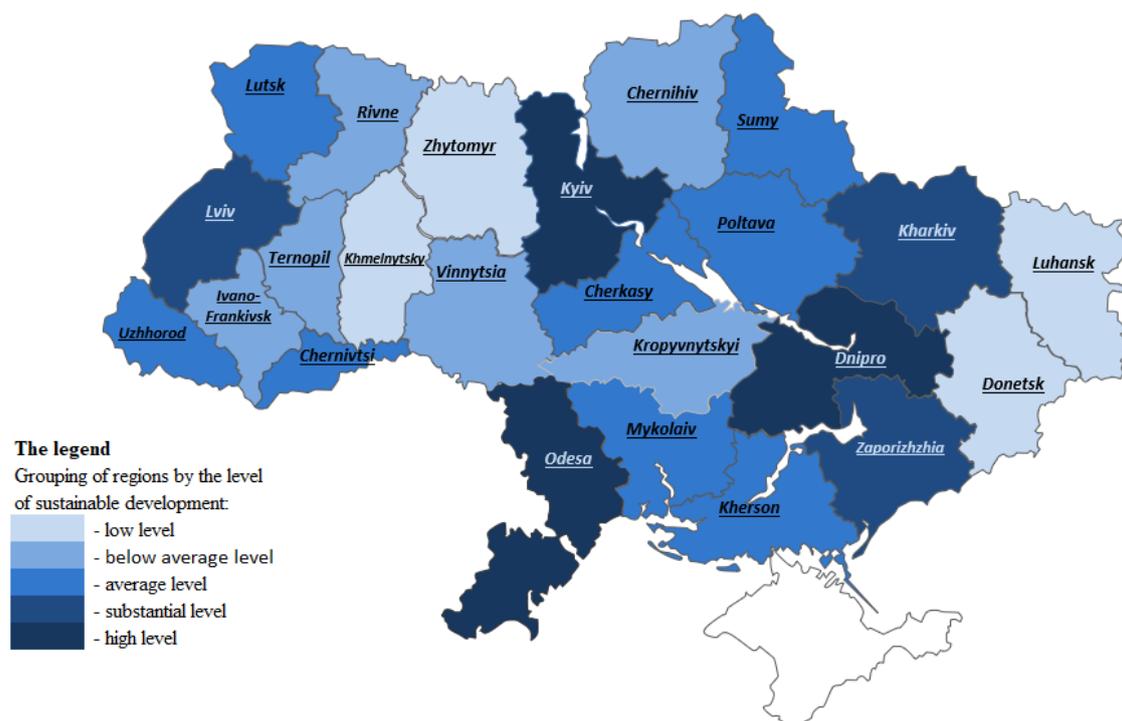


Figure 1 Assessment of the level of sustainable development of the regions of Ukraine in the system of security-oriented goals and priorities, 2019 (O. Komelina, A. Komelina, A. Pluzhnyk)

The proposed approach and the ranking of regions based on the integrated indicator made it possible to identify clusters of regions by level of attractiveness in the context of sustainable development. The obtained results should be considered as a methodical basis for the integration of priority territories within the formed clusters, to determine joint management mechanisms of the territories of the nature reserve fund and national parks within them.

In addition, this approach makes it possible to take into account not only the starting conditions for the sustainable development of the regions of Ukraine (including the level of pressure on the ecological system and the resource possibilities of preserving the environment of the region), as well as to assess the vector and scale of changes in the future (before and after military actions on the territory of the region and NNP).

In modern conditions monitoring of sustainable development of territories should take into account the scale of economic losses; reduction of quality and accessibility of life benefits for the population; violation of the natural environment (specific degradation of ecosystems); influence on demographic processes (depopulation). Modern studies of the sustainable development of regions directly relate to the strategy of preservation and influence of national parks.

The organization of monitoring of the ecosystem of the NNP and environmental risks caused by military actions involves the determination of criteria and indicators of the state of the ecosystem environmental risks (as the probability of negative consequences from a set of harmful effects on the environment, which cause irreversible degradation of the ecosystem); environmental hazards (as actions and processes that can affect the state of the natural environment, which due to excessive pollution limits or excludes the possibility of human life and the implementation of economic activities in these conditions) (State Standard of Ukraine "Safety of Industrial Enterprises").

Monitoring the state of the NNP makes it possible to investigate its response to global challenges (the impact of Russian aggression) and on this basis: determine the dynamics and vector of changes in the components of the ecological system (1); to form an adequate basis for assessing relevant environmental risks and hazards (2); assess the level of management of the NNP as an organization and its activities in conditions of uncertainty (3) (Bundy, 2017, König, 2020); to determine new



innovative and investment tools of the organizational and economic mechanism of the restoration of the NNP as part of the ecological and economic system of the region (4); to form an effective system of research into the ecosystem and environmental risks of the NNP of the region (cluster of regions) as a component of the national and global model of scientific research, which requires the study of foreign experience (5). This approach makes it possible to assess the existing natural values of the NNP, the impact on the sustainable development of the territories.

The conducted expert surveys of various stakeholders of the NNP "Biloberezhzhia Sviatoslava" confirmed the significant scale of losses and changes in its main ecological subsystems due to the influence of military actions and determined the expediency of organizing the monitoring of the affected natural territories (Fig. 2). This national park has the largest losses in Ukraine as a result of hostilities due to large-scale fires, mines, explosions, environmental pollution, etc.

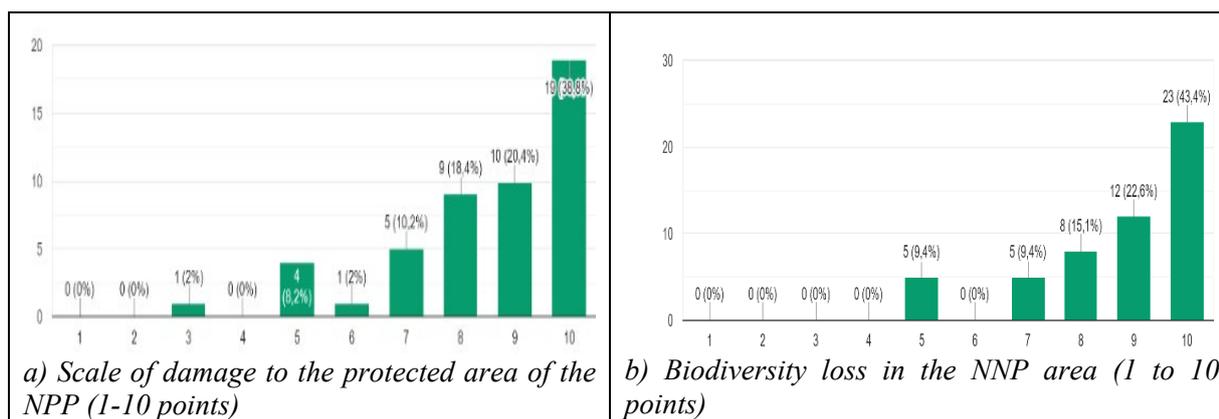


Figure 2 Expert estimation of losses NNP " Biloberezhzhia Sviatoslava " (Mykolaiv region, March - August, 2022) (A. Kasinska, A. Komelina)

The scientific support of the NNP monitoring organization should include the following main blocks. Block 1. Assessment of existing contradictions between the state of the NNP as an ecological system, the existing potential of spatial development, the level of implementation of the security-oriented goals of sustainable development of the region and the natural park (before and after military operations) (Komelina, 2019). As a rule, the NNP ecosystem contains various natural complexes and within them legally defined zones of regulation of its activity (protected zone, zone of regulated recreation, zones of stationary regulation, zones of economic activity). They require an assessment of changes in the state of the main ecological subsystems of the NNP and their components (burning area, destruction of valuable natural complexes as a result of artillery and missile attacks, contamination of the soil surface and groundwater by military equipment and ammunition fragments, pollution of the water area). The most effective research methods are: existing methods and tools for organizing monitoring of the NNP ecosystem, established by law; indicator and functional analysis of the assessment of the state of the ecosystem, ecological security of the region, integrated assessment of interdependent indicators of spatial development and relationships of the components of the ecological system of the NNP; evaluation of the effectiveness of the organizational activities of the NNP.

Block 2. Requirements and approaches to the evaluation of socio-economic processes in the territory of the NNP as a complex system with a multifunctional purpose. The most effective research methods are: mostly qualitative (with the involvement of experts, which make it possible to determine the level of damage to the biodiversity of territories (from the movement of vehicles, explosions, fires, environmental pollution, mining, etc. on an appropriate scale); express assessments (identification of the most influential factors and vulnerability of recipients – enterprises, society, objects of social infrastructure, objects of park infrastructure, etc.) (Horoshkova, Khlobystov, 2022); complex (on the basis of special scientific studies of environmental, economic, social risks) (Taraniuk, 2013);



systematization of factors (stimulators and destimulators) causing economic and social threats now and in the future and the corresponding assessment of their impact according to various strategies of the development of the NNP.

Block 3. Requirements and approaches to completeness, reliability, accessibility of monitoring results for all NNP stakeholders. The results of NNP monitoring allow for the zoning of the territories most affected by the war and control over their recovery (Kohll, 2021). One of the results of information monitoring is the preparation of recommendations aimed at overcoming negative trends, supporting positive ones and bringing them to the attention of regional authorities.

At this stage, prompt response to the most critical risks and appropriate management decisions in critical situations are possible; The main stages of monitoring of NNP in the conditions of crisis: 1) carrying out initial assessments regarding the identification of all environmental risks and threats to systematize them according to various criteria; 2) secondary assessment (selective) of the most extensive environmental risks in terms of manifestation and impact (makes it possible to determine activity priorities under conditions of limited resources and taking into account probable consequences); 3) comprehensive assessment of the most significant rapidly changing environmental risks (a more detailed approach, which involves an in-depth assessment of environmental risks), which are accompanied by rapid changes in the ecosystem and its possible destruction.

Conclusions

Approach to monitoring the response of Ukrainian national parks to global challenges developed. It has been found that the large-scale military actions of the Russian army on the territory of national parks are accompanied by the destruction of ecological systems, the emergence of new environmental risks by their sources and nature of impact on the environment. It has been proven that the results of the organization of monitoring studies and the formed information base make it possible to determine the processes of reconstruction and restoration of NNP ecosystems and their protection in the long term. Thus, the proposed approach to the organization of such monitoring in combination with the results of an expert assessment of the involved stakeholders of the NNP makes it possible to define new tools for managing ecological systems and ecological risks.

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