NEW APPROACHES TO THE MANAGEMENT OF NATIONAL NATURAL PARKS IN THE CURRENT CONDITIONS OF INCREASING RISKS

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Abstract

The objective of this article is to identify and substantiate new approaches to the management of national parks (NP) under the current conditions of increasing risks. The study demonstrates that in order to preserve ecological capacity and valuable natural heritage, the primary trend in management is shifting towards risk management, particularly concerning climate change and increasing recreational pressures, which adversely affect ecosystem viability. The research conducted in 2023 focused on the territory of the "Curonian Spit" National Park and the adjacent coastal areas of the Curonian Lagoon on the southeastern coast of the Baltic Sea.

The study reveals that in a risk-prone external environment, national park management should be oriented towards ensuring strong sustainability through the use of a Sustainable Ecosystem Design (SED-NP) mechanism. This approach offers a systematic vision, flexible and pragmatic solutions, and methods that help to coordinate disparate efforts in sustainable tourism and biodiversity conservation with the aim of preserving the integrity of ecosystems and their capacity to generate ecosystem services in the face of external threats. The application of SED-NP approaches allows for the integration of data on ecosystem services, depletion/degradation and replenishment/restoration of ecosystems, benefits (income and advantages), and other characteristics into the NP management system.

The research justifies the conclusion that the studied territory – a narrow strip of land washed by the waters of the Baltic Sea and the freshwater Curonian Lagoon – is, due to historical circumstances, a product of the local population's climate and natural risk-reflection. The local population ensured their survival and well-being through continuous and deliberate protective actions to reinforce the spit and preserve the Curonian Lagoon, which sustained them. The analysis of the territory's condition identified two primary groups of risks to ecosystem viability and biodiversity: climate-related risks and recreational pressures, which require focused attention. The spatial localization of areas within the "Curonian Spit" National Park most susceptible to climate risks and recreational degradation was determined. A set of measures was developed to mitigate recreational degradation and climate risks. An ecological, social, and economic assessment of the effectiveness of measures to reduce risks to the ecosystem viability of the Curonian Spit was conducted in monetary terms. A mechanism for the ecological, social, and economic justification of decisions regarding

the development of the territory from the perspective of strong sustainability and reducing risks to ecosystem viability and loss of ecosystem services was developed and tested.

New approaches to managing national parks under the current conditions of increasing risks were developed, which are implemented through a system of restrictions and regulations. The application of a decision-making justification mechanism for NP development, in accordance with the principle of strong sustainability, ensures qualitative control of tourist flows in time and space, the creation of zones for various types of tourism use, and the planning of necessary infrastructure adapted to individual needs, including those beyond the boundaries of specially protected natural areas.

Keywords: sustainability, national park, management, climate risks, tourism, natural capital, ecosystem services, recreational degradation

I. Introduction

In today's world, profound changes in ecosystems are happening in no time, accompanied by a decline in the ecosystem services provided to humans. According to the "Millennium Ecosystem Assessment" (2005), more than 60% of ecosystem services are currently degrading or transforming. The main factors exacerbating the crisis of protected natural areas (PNA) worldwide include: (1) increasing climate risks and their negative impact on biodiversity; (2) growing demand for nature-based recreation in increasingly urbanized societies; and (3) the destruction of relatively untouched natural habitats, transforming into other forms of land use as population grows, wealth increases, and more natural resources are used.

One of the primary contemporary challenges in the development of PNA is to achieve a sustainable balance between tourism development and the necessity of preserving valuable natural and cultural heritage under conditions of increasing climate and anthropogenic risks. According to the World Charter for Sustainable Tourism (UN, 1995), management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems[1]. In Russia, the sustainable development of PNA and the creation of conditions for ecotourism in national parks are considered a key priority for achieving the national goal of "Ecological Well-being" (Clause 5) at the highest state level[2]. In the current context of high risks and uncertainties, national parks[3] represent the most effective form of territorial management aimed at preserving the social and economic significance of the ecosystem services provided by nature.

Many national parks have been established worldwide for the protection of nature. As of the end of 2022, Russia had 67 national parks of federal significance, alongside reserves, with a total area of 31.4 million hectares. However, as Fortin and Gagnon (1999) correctly pointed out, these parks were often created without adequate analysis of the consequences for neighboring communities [1]. Giving unique territories the status of a national park, in addition to strengthening nature conservation, leads to unexpected consequences. Protected scenic landscapes have become magnets attracting not only visitors but also numerous investors. This increases the risk of losing the integrity of natural ecosystems and biodiversity due to recreational degradation

[1] Adopted by the World Tourism Organization (UNWTO), the World Travel and Tourism Council (WTTC) and the Earth Council in 1995.

[2] Decree of the President of the Russian Federation of 07.05.2024 No. 309 "On the national development goals of the Russian Federation for the period up to 2030 and for the perspective up to 2036".

[3] According to the 2013 Guidelines of the International Union for Conservation of Nature, "national parks" refer to "large areas of natural or near-natural areas designed to protect large-scale ecological processes and associated ecosystem species and characteristics.

[2], and heightens the vulnerability of ecosystems to destructive climate impacts.

Our studies in the "Curonian Spit" NP and the adjacent coastal areas of the Curonian Lagoon in the Kaliningrad region on the Baltic Sea have shown that addressing this complex set of problems requires the application of risk-oriented management approaches when justifying decisions on the development of the NP territory and its buffer zone, as well as when refining visitor flow restrictions and regulations. For this, the traditionally collected data on the condition and trends of ecosystem and natural object changes, and visitor flow numbers are insufficient. This underscores the high relevance and practical significance of developing new approaches to NP management under modern conditions of increasing climate risks.

II. Methods and Data

In recent decades, the number of studies on the risks of decreasing ecosystem resilience under increasing external threats has grown. Not only ecological but also socio-economic impacts on national parks have been described [3], as well as the associated losses and benefits [4]. In the context of sustainable development, the view that national parks should be considered as investments in public goods has gained traction. De Groot et al. (2012) conducted the first global assessments of a range of ecosystems and services, including for coastal systems [5]. The multi-faceted consideration of the economic value of national parks has been reflected in the works of many scientists and specialists (R. Constanza, M. Wilson, S.N. Bobylev, G.A. Fomenko, R.A. Perelet, V.M. Zakharov, and others).

Numerous studies have also focused on sustainable tourism development [6-10]. To date, there is consensus on several fundamental issues related to the dependence of NP sustainability on stakeholder interactions, particularly the constructive interaction between NP management and local communities [11-17]. NPs should not be viewed as isolated natural ecosystems requiring unconditional protection, but rather as particularly complex anthropo-natural systems (ANS) that constitute a significant portion of a nation's and region's wealth due to their high proportion of non-depleting natural capital.

To effectively address these challenges, two fundamental aspects should be focused on: (1) ensuring, as much as possible, the resilience of ecosystems in the face of increasing destructive climate impacts; and (2) preventing the destruction and loss of ecosystems due to anthropogenic pressures in the form of increasing visitor numbers and changes in ecosystem use on adjacent lands, the buffer zone, and the NP territory itself by altering conservation status. Actions should be based on sustainable development principles, considering the interests of a wide range of stakeholders and conducting an analysis of the state of ecosystems and the flows of ecosystem services in the protected area and adjacent lands.

The task set in Russia to orient NPs towards sustainable development and create conditions for ecotourism[4] cannot be achieved through technical means alone. Significant adjustments to approaches to planning and spatial development design of protected areas are needed, following the inviolable ethics of Life, which recognizes the intrinsic value of all living things and strives to preserve it in an unstable external environment. Scientific discourse in this aspect is conducted in the context of moving sustainable development methodology towards a goal-oriented synthesis of natural, cultural, and socio-economic values, along with the corresponding system of restrictions and regulations on economic activities [18].

This vision is being implemented in NPs through the methodology of Sustainable Ecosystem Design (SED), which we are developing [19-21], considered as a special type of relationship with the high-risk and uncertain reality. The essence of SED in the context of NPs lies in an ethically-oriented, goal-rational, systematic approach to planning the development of national parks that reduces the likelihood of ecosystem destruction and the loss of natural wealth. The main focus is

[4] Decree of the President of the Russian Federation dated 07.05.2024 No. 309 "On the national development goals of the Russian Federation for the period up to 2030 and for the perspective up to 2036".

on minimizing risks through coordinated actions for biodiversity conservation in conjunction with climate adaptation[5]. A justified system of restrictions is applied based on special zoning of the territory, along with the verification of land-use decisions regarding NP development in accordance with the principles of sustainable development.

In the course of research we used: (1) materials of functional zoning of the territory of NP "Curonian Spit", information about the boundaries, areas and types of land cover of functional zones, information about the location, length and arrangement of eco-trails and tourist routes; (2) data on quantitative, spatial, temporal and cost characteristics of the flow of visitors, environmental constraints, the stability of the territory of the Curonian Spit to recreational loads; (3) information about existing and planned recreational facilities; about planned works on territory improvement; (4) information about economic entities providing services on the territory of the NP; (5) information about volumes of recreational fishing within the boundaries of the park's protection zone in the Curonian Lagoon and on the Baltic coast, about volumes of non-timber forest resources (mushrooms and berries) harvested by the local population and visitors; (6) information about prices for fish, mushrooms and berries in the markets of Zelenogradsk and Kaliningrad; (7) historical information about the Curonian Spit region.

III. Results

The research was conducted in the "Curonian Spit" National Park (NP) and on the coastal areas of the Curonian Lagoon in the Kaliningrad region, located in the southeastern Baltic region (see Figure 1).

Figure 1: *Situational map-scheme of the "Curonian Spit" NP location*

This coastal area, inhabited by humans for many centuries, is a product of the local population's climate and natural risk-reflection, ensuring their livelihood through thoughtful actions to protect the Curonian Lagoon, which provided their sustenance.

[5] Adapting to climate change means planning for and acting on the expected impacts of climate change. It involves making changes to how we live and what we do before the impacts of climate change occur (anticipatory action), and being prepared to respond to increasingly likely and frequent extreme events (response).

The unique character of the Curonian Spit is the result of various peoples' efforts to preserve it for future generations. The Curonian Spit represents a rare and successful example of the history of coexistence between nature and humans, with an abundance of both natural and cultural assets[6]. It is a unique cultural landscape with a system of protective engineering structures and forest plantations, formed and developed through the interaction of the sea, wind, and human activity. This is an example of the continuous process of self-development of a Living system, within which the activities of the "Curonian Spit" NP are integrated. To preserve the typical coastal communities of the Southeastern Baltic and the unique natural complexes of the Curonian Spit, as well as to protect spawning and nursery areas for commercially valuable fish species, marine mammals, and birds during migrations and breeding from adverse anthropogenic impacts, a protective zone of the national park has been established[7].

An analysis of spatial data from the "Curonian Spit" NP for the period 1991-2021 revealed that the ecosystems as a whole have undergone some changes (see Table 1).

Table 1: *Ecosystem change characteristics in the "Curonian Spit" NP for 1991-2021*

Ecosystems	Factors of Ecosystem Change		Quantitative Change (ha)	Comments on Causes of Change
	Anthropogenic	Climatic		
Forest	↑	—	954	Encroachment of forest on meadow ecosystems due to natural (development of fertile soil layer, natural afforestation, etc.) and anthropogenic processes (reforestation activities by the national park, adherence to restrictions on visiting certain particularly valuable areas)
Meadow	↓	—	-882	Sand movement due to wind, afforestation
Coastal (dunes and beaches)	↘	—	-82	Encroachment of grassy vegetation, including as a result of protective measures
Freshwater Internal (lakes and swamps)	—	—	0	—
Marine (Baltic Sea)	↗	↗	46	Shoreline erosion due to increased storm activity
Freshwater External (Curonian Lagoon)	↘	↘	-71	Expansion of dunes toward the lagoon due to intensified winds
Settlements	↑	—	35	Expansion of built-up area

The data in Table 1 indicate that the most significant changes in ecosystem areas occurred in forest (increase) and meadow (decrease) ecosystems. However, given the importance of stabilizing the sandy body of the Curonian Spit with forest plantations to preserve ecosystem services for beach recreation, these changes do not increase the risk of territorial degradation (reduction in natural capital), but rather contribute to its reduction. Climatic changes, such as the increased frequency of storm events in the southeastern Baltic and wind pressure on coastal areas from the Curonian Lagoon [22], have led to a decrease of the Curonian Spit's landmass by 46 hectares on

[6] The territory of the Kurshskaya Spit NP was included in the UNESCO World Heritage List in 2000 as part of the international Russian-Lithuanian site "Curonian Spit". URL: https://whc.unesco.org/ru/list/994. Date of reference: 12.03.2024.

[7] Order of the Ministry of Natural Resources of Russia No. 306 of 27.04.2022 "On establishing the boundaries of the protection zone of the Kurshskaya Spit National Park along the border with the Baltic Sea water area, as well as on approval of the Regulations on this protection zone".

the sea side and 71 hectares on the lagoon side. Retrospectively, the condition and characteristics of ecosystem assets (natural capital) fluctuated within acceptable levels, maintaining the potential to generate ecosystem services during the specified period and up to the present day.

The main climatic and anthropogenic vulnerabilities of the Curonian Spit's ecosystems and the coastal areas of the Curonian Lagoon. They include the increased frequency of storms, which damage economic and infrastructure facilities due to periodic breaches of the spit (when Baltic saltwater breaks into the freshwater Curonian Lagoon), and negatively impact biodiversity by disrupting ecosystem conditions. Another significant threat is the increase in the annual flow of tourists to the "Curonian Spit" NP, which rose from 200,000 visits in 2010 to 809,415 visits in 2021, more than fourfold[8]. This has substantially increased the threat of ecosystem degradation on the Curonian Spit, loss of biodiversity, and deterioration of the ecological integrity of the area.

In the "Curonian Spit" NP, its protective zone, and the coastal areas of the Curonian Lagoon, opportunities, methods, and means of organizing the activities of the "Curonian Spit" NP were explored using the Sustainable Ecosystem Design (SED) mechanism, with the aim of aligning current management practices with the task of preserving particularly valuable natural complexes of biodiversity and quality of life for people.

From this perspective, several conclusions were drawn that are important for reducing the risks of ecosystem integrity disruption on the Curonian Spit, the Curonian Lagoon, and its coastal areas, and for maintaining ecosystem service flows.

First, two main groups of risks were identified – climate and recreational – which require primary attention for mitigation. Climate risks are associated with changes in temperature regimes[9], precipitation patterns[10], increased storm frequency[11], and other factors. Recreational risks are linked to the growing number of visitors, recreational degradation, loss of habitats, and invasive species aggression.

Second, the spatial localization of areas within the "Curonian Spit" NP most susceptible to climatic risks and recreational degradation was determined. The areas identified as most vulnerable to climate (intensified storm events and wind pressure) and recreational (increasing tourist flow) impacts include:

- Areas of greatest vulnerability to tourist and natural-climatic impacts (foredunes, dune ridges, flat areas with pine forest plantations);
- Areas of concern for biodiversity (critical habitats for populations, locations of rare plant species, etc.).

Third, a comprehensive set of measures was developed to mitigate the risks of recreational degradation and climatic impacts. As part of the recreational activities plan of the "Curonian Spit" NP, a comprehensive set of measures was designed to reduce recreational degradation and climatic risks, including:

- Reducing recreational degradation risks, which involves (1) refining the zoning of the "Curonian Spit" NP to more fully encompass restrictions and prohibitions on visiting areas most vulnerable to recreational impacts and valuable for biodiversity conservation (foredunes, dune ridges, flat areas with pine forest plantations, critical habitats for populations, locations of rare plants, etc.); (2) constructing recreational infrastructure to prevent negative impacts from tourist flows on ecosystems (arranging parking lots,

[8] Information report of the FGBU "Kurshskaya Spit National Park" for 2021.

[9] Climate warming is felt in the Kaliningrad region, first of all, due to the increase in surface air temperature: for Kaliningrad - over a long period (168 years) at a rate of 0.01 °C per year, and for some other settlements of the region (Baltiysk, Sovetsk, Zheleznodorozhny) and Kaliningrad together - over a shortened period (56 years) at a rate of 0.03 °C per year [23].

[10] Average annual precipitation has been increasing by 4 mm every 10 years for the last 60 years; during the period of greatest warming (1980-2018), the rate of increase in precipitation has especially increased in July, with July precipitation increasing by 12.53 mm every 10 years; in the last 10 years, anomalous rainstorms have been occurring annually, with one or two days of monthly precipitation [24].

[11] Between 1966 and 1985, there was an average of 26 storm events per year; between 2004 and 2014, there were 254 storms, with an average of 28 storms per year; the number of days with high winds (>15 m/s) increased annually by 0.7 days and the average annual wind speed by 0.1 m/s [24].

sanitation sites, waste collection, and removal points).

- Reducing climatic risks, including constructing pathways across the foredune, reinforcing the foredune body, planting trees on dunes, and building shoreline protection structures in coastal areas most vulnerable to storm and surge impacts (foredunes, beach areas on the sea side).

Fourth, an ecological-social-economic justification mechanism for decision-making in the field of preserving natural complexes, unique and reference natural sites, and reducing the risks of their degradation was developed and tested. This mechanism is aimed at evaluating the ecological-social-economic consequences of various projects or specific intentions, documented as decisions that could be implemented in the "Curonian Spit" NP. The mechanism is based on the principle of "result-based management," widely used in public administration as an adequate and transparent method for assessing the implementation of state programs, mainly of a humanitarian nature, where purely financial assessment mechanisms have very limited use.

The developed mechanism is formulated as a sequence of actions, the results of which complement standard environmental impact assessment (EIA) procedures. The outcome provides comparable quantitative assessment indicators of the evaluated project's/program's/investment intention's impact on ecosystems, social and economic spheres, and summarizes these assessment data for compliance with the principles of strong sustainability.

The assessment is conducted using three evaluative characteristics: impact on (1) ecosystems, (2) the social sphere, and (3) the economic sphere. Each of the evaluative characteristics is specified by a group of corresponding assessment indicators (see Table 2). During the assessment, the projected state data (project line), expected as a result of the project's/intention's implementation, is compared with the baseline state (baseline) of the territory, without the project but under the influence of existing change factors (in our case, climatic and anthropogenic).

Table 2: *Evaluative Characteristics and Indicators for Assessing the Socio-Economic Significance of the Project*

No.	Evaluative Characteristics	Assessment Indicators
1	Impact on Ecosystems	1.1 Total area of ecosystems not significantly transformed by anthropogenic activity, ha
		1.2 Anthropogenic transformation coefficient of ecosystems, %
		1.3 Threat of anthropogenic degradation of ecosystem areas and objects, points
		1.4 Recreational load on the territory, person-days/day
		1.5 Maximum allowable recreational capacity of the territory, persons/day
2	Impact on Social Sphere	2.1 Approximate number of users of ecosystem services in the territory, broken down by types of ecosystem services, persons/year
		2.2 Number of visitors to the territory, including people with limited physical abilities, persons/year
		2.3 Number and list of main beneficiaries of ecosystem services in the territory, units/year
		2.4 Employment provided by ecosystem services in the territory, including for people with disabilities and local residents, persons/year
3	Impact on Economic Sphere	3.1 Potential gross income from the provision of ecosystem services, RUB/year
		3.2 Potential gross income from the provision of ecosystem services related to the tourism industry, RUB/year
		3.3 Approximate tax revenues to the budgets of all levels from the provision of ecosystem services and their use, RUB/year

Positive results were obtained from testing the Mechanism for Assessing the Compliance of Actions for the Development of the Curonian Spit National Park (NP) with the Principle of Strong Sustainability when developing activities for the recreational plan of the Curonian Spit NP. The assessment of activities showed that the projects with the highest ecological, social, and economic

significance include the construction of pathways across the foredune near the tourist base (by reducing the risk of foredune destruction and degradation of the adjacent coastal ecosystems), the creation of a parking area at the park entrance (by reducing the risks of uncontrolled use of the territory by visitors), and the establishment of recreational routes in areas adjacent to the NP, which helps to reduce the recreational load on the protected areas of the Curonian Spit and significantly lowers the risks of recreational degradation.

The results confirmed the effectiveness of the proposed Mechanism in the development of programs and plans for the national park's territory, in decision-making regarding land use, and in reducing the risks of ecosystem degradation and loss of ecosystem services.

Fifth, an ecological, social, and economic assessment of the effectiveness of measures to reduce the risks to the viability of the Curonian Spit ecosystems was carried out in monetary terms. The viability of ecosystems is determined by the flow of ecosystem services they provide, its sustainable nature, and its value in ecological, social, and economic terms. From an economic efficiency standpoint, this value is expressed in monetary terms. In the case of the Curonian Spit, the key role in maintaining its integrity – and therefore the state and properties of ecosystems and the value of ecosystem services – is played by the activities of the Curonian Spit NP.

Thus, the effectiveness of measures to reduce climate and recreational risks was assessed based on the value of the existing flows of ecosystem services, which are largely ensured by the continuous efforts of the Curonian Spit NP to mitigate risks to ecosystems from climate and anthropogenic factors. The total value of ecosystem services in the Curonian Spit and the surrounding coastal and lagoon waters was estimated at 222.4 million rubles per year. The highest value is attributed to cultural ecosystem services for excursions and beach recreation – 71.3 and 72.8 million rubles per year, respectively; provisioning ecosystem services related to commercial fishing have a slightly lower value – 59.1 million rubles per year; the values of other provisioning services (amateur and sport fishing, mushroom and berry gathering, hay and wood harvesting), as well as regulating services (CO2 absorption by the Curonian Spit ecosystems), range from 0.5 to 6.6 million rubles per year.

Additionally, the results of the ecosystem services assessment also reflect the contribution of the Curonian Spit ecosystems to the resilience capital of the region and the Russian Federation as a whole.

IV. Discussion and Conclusions

The study of potential directions for implementing the Curonian Spit National Park (NP) ecosystem services assessment (ESA) methodology to reduce climate and anthropogenic risks in the Curonian Spit and Curonian Lagoon has led to several important generalizations and conclusions.

Theoretical Considerations: In the face of increasing climate and recreational pressures, overcoming negative trends in regions that are attractive from a natural environment standpoint has shown that tourism management must be holistic. It must satisfy economic, social, and aesthetic needs while preserving cultural integrity, essential ecological processes, biodiversity, and life-support systems. This work should be based on the principles of the Charter for Sustainable Tourism, adapted to the geographical conditions of each region in the country.

It is essential to measure the impact of various human activities on protected ecosystems. Measuring the sustainability of a national park is the foundation of its management. However, monitoring the processes and phenomena occurring within the territory remains a significant challenge due to outdated approaches to measuring economic activity efficiency. The application of System of Environmental-Economic Accounting (SEEA) [12] can address this problem by

[12] Statistical Standard Central Framework of the System of Environmental Economic Accounting 2012 (System of Environmental Economic Accounting 2012 - Central Framework), in official translation 2017. URL: https://seea.un.org/sites/seea.un.org/files/seea_cf_final_ru_0.pdf Date of reference 12.07.2024

providing a comprehensive approach that aligns with existing data from state statistics and government funding structures. A key advantage of SEEA is its ability to understand the relationships between territorial development activities and the state of ecosystems through the flow of ecosystem services.

Managing the development of all forms of sustainable tourism in areas of high ecological value should primarily be based on the proper organization and control of tourist flows over time and space, the creation of zones for different types of tourism use, and the planning of necessary infrastructure. This infrastructure must support the viability of ecosystems and the flow of ecosystem services while being adapted to individual needs. Significant potential in this direction lies in the development of educational tourism in areas adjacent to the NP, with the possibility of integrating them into a single cluster. This approach allows for the diversification of tourist flows and reduces the risks of recreational degradation in protected areas.

For comprehensive analysis and comparative evaluation of potential directions and targets for the development of recreational flows, the results-oriented management[13] method and the Rapid Impact Assessment Matrix (RIAM) have proven highly effective. In our view, using this method in various geographical contexts will allow for determining the depth of analysis needed at different stages of spatial planning. This will provide government authorities, investors, and all stakeholders with timely and reliable information about the feasibility and priority of utilizing natural and cultural heritage sites in developing recreational flows.

Practical Considerations: A set of specific measures has been identified to reduce climate and anthropogenic risks to ecosystem viability and maintain ecosystem service flows. These measures include, first and foremost, refining the zoning of protected areas by identifying the most vulnerable sections to climate and anthropogenic impacts, with mandatory actions to mitigate these impacts (such as restrictions and access limitations, protective measures, etc.). In terms of preventing and avoiding future risks, the environmental, social, and economic justification mechanism for proposed projects, in addition to Environmental Impact Assessments (EIA), has proven effective. Additionally, it is important to develop tourism activities in areas adjacent to the national park.

In terms of monitoring, additional characteristics are important to reflect new risks and vulnerabilities, showing which actual services and in what quantities may be lost. The growing importance of sustainable monitoring of ecosystems in protected areas must be noted, as it forms the basis for creating ecological, economic, and social value through information and knowledge for public benefit. Monitoring should include not only the state and observed trends of ecosystems but also tourist flows. Moreover, accounting for the socio-economic conditions of the population living around the NP is increasingly recognized as essential for achieving ecosystem protection goals, as it facilitates constructive interaction between the NP and local communities.

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