

## STUDY OF THE TOURIST AND RECREATIONAL LOAD IN THE “KOLSAI LAKES” STATE NATIONAL NATURE PARK, KAZAKHSTAN

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**Abstract:** The growing popularity of ecological tourism has led to a significant increase in tourist flows and, consequently, a rise in anthropogenic impacts on the ecosystems of natural areas. This phenomenon poses challenges to the delicate balance of these ecosystems, requiring detailed study and intervention. Studying the dynamics of this process is essential to assess its impact and develop effective measures to prevent critical stress that could lead to irreversible negative changes in the natural environment. The transition to circular tourism is also a major challenge. Using the example of the State National Natural Park “Kolsai Lakes,” located in the southeast of the Almaty region of Kazakhstan, the authors proposed a comprehensive approach to determining the maximum permissible tourist and recreational load. This approach includes expert assessments, calculation methods, and systematic monitoring observations to evaluate the capacity of the park's ecological routes and paths. The research focused on ensuring that these natural areas can sustain their ecological integrity while accommodating visitors. The practical outcomes of the research included the development of recommendations aimed at reducing anthropogenic impacts on the park's routes and paths. These recommendations encompass a combination of technical solutions, organizational strategies, and managerial measures designed to balance tourism with environmental preservation. The measures proposed align with global principles of sustainable tourism and reflect the need for integrated approaches to managing natural resources. The main results emphasize the critical importance of sustainable management methods in maintaining the ecological integrity of the “Kolsai Lakes” State National Nature Park. These findings were derived from field research, where the authors conducted on-site evaluations to gather data and analyze the environmental conditions. The insights gained were systematically organized and presented in tabular form within the article. The study underlines the necessity of ongoing monitoring and adaptive management to address the evolving challenges posed by ecological tourism.

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By implementing the recommended measures, the park authorities can mitigate potential environmental risks while fostering a harmonious relationship between tourism and nature conservation. This research contributes valuable knowledge to the field of sustainable tourism, offering practical strategies that can be applied to other natural areas facing similar challenges.

**Keywords:** ecological and curcular tourism, recreation, specially protected natural area, carrying capacity, national natural park, tourist and recreational load

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## INTRODUCTION

Ecotourism, as one of the areas of nature-oriented tourism, has become increasingly popular in recent years. Moreover, despite the fact that this type of tourism conceptually cannot be mass, it is gradually becoming commercially profitable, attracting the attention of the tourism business and forming the basis for further investment. Accordingly, the role of ecotourism in the socio-economic development of territories is increasing (Kropinova et al., 2023).

At the same time, the natural process of urbanization stimulates the population's interest in tourism and recreational activities in the natural environment (Anokhin & Kropinova, 2021), realizing the need for physical and emotional recovery through communication with nature and a positive "aftertaste" this kind of travel. An important component of any ecological tour is environmental education and fostering a responsible attitude towards the environment (Freude, 2019; Zhoya et al., 2024). This is especially important for the younger generation (Bagretsov et al., 2018).

Therefore, the formation of an environmental culture, knowledge of the native land, awareness of problems and understanding of the need to preserve ecosystems and biodiversity is of particular importance today (Dowling & Fennell, 2003), creating the foundation for sustainable development of territories and local communities in the future (Carvache-Franco et al., 2020; Issakov et al., 2023a).

The increased interest in recreation and tourism facilities in specially protected natural areas is due to the limited ability of the population to move within the country and abroad due to the COVID-19 pandemic, with a continuing (and even increased) need for outdoor recreation (Aktymbayeva et al., 2023). However, the implementation of this need entails an increase in the load on the components of the environment and ecosystem, which leads to a disruption of the natural balance, degradation of natural complexes, making them unsuitable over time for the purposes of tourism and recreation (Akiyanova et al., 2020). The closer the object is located to large populated areas, the higher the increase in negative impacts. However, with the improvement of transport infrastructure, the distance barrier is no longer a guarantee of the preservation of a natural site (which can be observed in the example of national natural parks near the city Almaty).

In many cases, the time for making optimal decisions on the conservation of ecosystems and the civilized organization of ecotourism has already been lost, which requires the adoption of more drastic measures and coordinated actions of all interested structures. With the growing responsibility at the global level, ecotourism resource management becomes inevitable for its sustainable requirements (Ashok et al., 2022). The role of eco-tourism is noted in the state program for the development of the tourism industry of the Republic of Kazakhstan for 2019-2025.

The essence of ecotourism is, on the one hand, to satisfy the human need to communicate with nature, solitude, study and knowledge of nature and culture on the other hand, to solve environmental problems, primarily in specially protected natural areas. At the same time, it is also expected to achieve a balance of interests: environmental (consisting in the protection of natural values from the flow of tourists and recreationists); economic (related to the extraction of material benefits from tourists visiting natural areas); social (achieving harmony with nature and providing the population with the opportunity for complete spiritual and physical relaxation in communication with it).

At the same time, maintaining a balance of environmental and social interests is possible only with proper organization and skillful management of the tourist movement (Niyazbekova et al., 2019).

It is important, while preserving the ecological purity of natural areas undisturbed, to ensure access to them for the broad masses of the population. The research underscores the need for a balanced approach that accommodates both the growing demand for ecotourism and the imperative to protect vulnerable natural habitats. The proposed recommendations are not only aimed at mitigating the immediate impacts of tourist activity but also at fostering long-term resilience within the park's ecosystems. By implementing the suggested technical, organizational, and managerial strategies, it is possible to maintain the park's ecological balance while ensuring that it remains an attractive destination for visitors. Furthermore, the approach developed in this study can serve as a model for other protected areas facing similar challenges, contributing to the broader efforts of sustainable tourism and conservation in Kazakhstan and beyond.

## LITERATURE REVIEW

Many experts in the field of ecotourism identify an ecological trail as one of the main tools for ensuring this balance in specially protected natural areas - a specially equipped route passing through various ecological systems, unique natural sites, tourist attractions that have aesthetic, environmental or historical value, on which participants (tourists and excursionists) receive oral (with the help of a guide) or written (stands, sold-out houses, etc.) information about these objects (Chizhova et al., 1989; Koshim et al., 2023). The organization and development of eco-trails allows us to largely solve the problems of regulating tourist flows, redirecting them along a specific route, thereby easing the anthropogenic load on the natural environment and satisfying the needs of tourists to communicate with nature (Ogutu et al., 2023). The

development of ecological tourism in specially protected natural areas (SPNA) has specific features associated with compliance with the requirements of environmental legislation (Hahinan et al., 2022). An important point in fulfilling the environmental function of an ecological trail is the regulation of the recreational load on the trail, which does not exceed the recreational capacity of natural monuments. The recreational capacity of a natural territorial complex is usually defined as the product of the permissible load value and the area of the natural territorial complex (Kolotova, 1998).

The development of norms for recreational loads is aimed at establishing the maximum permissible flows of visitors and the mode of use of the ecological trail, subject to its sustainable functioning. Calculation of permissible loads, as a rule, is an integral part of project documents for the development of environmental areas (Law of the Republic of Kazakhstan On Specially Protected Natural Areas, 2023), but today there is no unified approach (and, moreover, no unified methodology) for regulating recreational loads that would take into account all a complex of factors that determine them and thus corresponded to the real conditions of practice (The Concept for the development and placement of specially protected natural areas of the Republic of Kazakhstan until 2030). Information search, selection and analysis of approaches and methods acceptable for the objects under study, taking into account the natural and socio-economic conditions of natural territories, is a necessary part of any research to determine the impact of tourist and recreational activities on the sustainability of ecosystems. The authors reviewed and analyzed foreign (Butler, 1996; Janeczko & Gucma, 2015; McCool & Lime, 2001; Nakajima & Ortega, 2016; Zhu et al., 2023) and domestic (Aliyeva et al., 2020; Rahimbaev, 2017; Seitimova et al., 2021; Issakov et al., 2023b) approaches to determining the recreational capacity of territories and methods for calculating recreational loads on eco-trails, and identified their optimal combinations for determining permissible loads. In the research case of this article, authors studied the works and scientific materials of authors in one way or another related to the topic of our research (Oborin, 2010; Ermakova, 2009; Kolotova, 1998).

The importance of this paper lies in its contribution to the field of sustainable tourism management within protected natural areas, a subject of increasing global relevance as more people seek nature-based experiences. By focusing on the “Kolsai Lakes” State National Nature Park, a significant ecological and cultural landmark in Kazakhstan, the study addresses the pressing issue of balancing environmental conservation with the economic benefits of tourism. The research not only provides a scientifically grounded methodology for assessing and managing tourist and recreational loads but also offers practical solutions that can be adapted and applied in other national parks and protected areas. This work is particularly vital in the context of Kazakhstan, where the rapid development of the tourism sector presents both opportunities and challenges for conservation. By advancing knowledge in this area, the document supports sustainable development goals, contributes to the implementation of circular tourism and the preservation of natural heritage for future generations.

## MATERIALS AND METHODS

In August 2021, field work was carried out on the project territory of the State National Nature Park “Kolsai Lakes”. RGI State National Nature Park “Kolsai Lakes” was created by a Decree of the Government of the Republic of Kazakhstan dated February 7, 2007 No. 88. Geographically, the main territory of the park is located on the northern macro-slope of the eastern part of the Kungey Alatau ridge, which belongs to the Northern Tien Shan.

The northern border coincides with the border of the forest fund of the Kegen State Forestry Institution and runs along the Shelek River until the Zharbulak River flows into it. The southern border coincides with the state border with Kyrgyzstan, which runs along the watershed of the Kungey Alatau ridge. Generally, the total area of the national park is 161,045 hectares, including 148,238 hectares in the Kegen district and 12,807 hectares in the Talgar district according to the territorial and administrative division of Kazakhstan (Moldagaliyeva et al., 2024).

Figure 1 shows the ratio of the areas of functional zones based on the results of functional zoning: a protected area with 67,962 hectares, a restricted economic activity area - 66,917 hectares, an environmental stabilization area - 16,715 hectares, tourist and recreational activities area - 9,451 hectares.

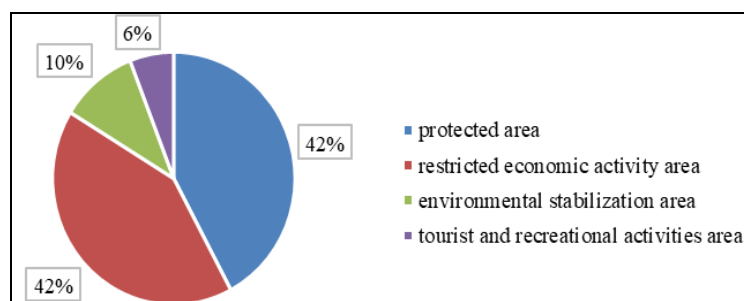


Figure 1. The Ratio of areas of functional zones in SNNP “Kolsai Lakes” (Source: Project / Kazak Zhubalau-Kurylys LLP, 2020)

Field research is due to the need to obtain primary information for calculating the norms of the maximum permissible norms of recreational loads on tourist excursion routes and eco-trails of the project areas, as well as taking into account a set of influencing factors, both objective and subjective, which is necessary to obtain reliable results and develop recommendations for regulation of the flow of tourists, taking into account the standards and arrangement of routes/trails. Of the foreign methods that are used to evaluate recreational development projects of territories of varying degrees of

development, the most common are (Tsaregorodtseva et al., 2014): - Environmental Impact Assessment; - Assessment of Carrying; - Visitor Impact Management; - Limits of Acceptable Change.

The essence of our research methodology boils down to finding the boundary of the stable state of various natural complexes against the background of recreational changes or digressions, for which five stages are usually identified, as well as measuring the loads that bring the complex to the boundaries of the stable state. In general, the methodology for assessing current capacity (sometimes translated as assessment of carrying capacity) necessarily specifies the object to be assessed, for example, the current capacity (CC) of the environment. Tourism CC is defined as the ability of an ecosystem to support the viability of organisms, including their productivity, adaptability and ability to regenerate. We can say that CC sets a threshold level of anthropogenic impact, the excess of which leads to deterioration of the resource base of the ecosystem.

In our study, we relied on the well-known interpretation of the definition of recreational load on a territory, which is most often used by domestic researchers, and which has a formula that is simple to describe, but not easy to calculate, without certain conventions. The actual recreational load is determined by measurements, the expected one is calculated using the formula (Chizhova et al., 1989):

$$R = \frac{Ni}{Si} \quad \text{where } R \text{ is the recreational load, } Ni \text{ is the number of visitors to recreational facilities, } Si \text{ is the area of the recreational territory.}$$

It is recommended that the number of visitors simultaneously present in the recreation area be 10-15% of the population living in the accessibility zone of the recreation facility.

## RESULTS AND DISCUSSION

A review of the scientific literature related to CC and visitor loads allows us to identify five main ideas that are important for understanding the nature of recreational loads and which must be combined within any of their management programs. The magnitude of the recreational load in a given territory is associated with various indicators of loads, although their ratio varies quite widely for individual types of loads in accordance with the measure of visitor use and particular situational factors. Therefore, increased exposure is not always linearly related to increased visitor density. Some types of recreational activities lead to a fairly rapid development of stress, unlike other types. Subsequent expansion of such recreational activity may vary depending on factors such as the types of movement or equipment used, the psychology of visitors, and the size and behavior of the group. Recreation impacts vary depending on the nature of the area and seasonal changes, even at certain levels of visitor attitudes for this type of recreation, as a result, recreational use depends significantly on time, place and human activity (Eagles et al., 2006). The main brand of the territory of the national park is the Kolsai Lakes and Lake Kaiyndy. Accordingly, the main flow of tourists and recreationists flocks here, often exceeding the maximum permissible norms of tourist and recreational load and creating an excessive impact on the ecosystem.

Despite the fact that the zone of tourist and recreational activity is relatively small, together with the zone of limited economic activity, currently has the most significant impact on changes in landscape and ecobiodiversity.

By the time of studying and writing the article, the State National Natural Park "Kolsai Lakes" offers 5 hiking and horseback riding routes in their territory: "Village Saty - Lake Kaiyndy" (No. 1), "Village Saty - Saty Pass" (No. 2), "Lake Lower Kolsai - Sarybulak Pass" (No. 3), "Village Kurmety - Lake Middle Kolsai" (No. 4), "Village Kurmety - Mount Kyzemshek" (No. 5) and a water route along the waters of Lake Lower Kolsai. Mountain routes are mainly on foot, but most of them can be covered (in whole or in part) on horseback. The presence of highways in the gorges will allow the delivery/removal of tourists at a distance of up to 15-20 km. On the busiest routes in the directions of lakes Kaiyndy and Kolsai, an increased impact on forest ecosystems is visually observed, expressed in an increase in the network of trails near the main route, the presence of small debris, disturbance of the soil layer and other signs of intense anthropogenic impact. The dirt road to the parking lot (where the trail begins) is intensively used by local drivers working as taxis in non-road vehicles (with a capacity of 5-11 passengers) and others, making, on average, 2 trips per day (on weekends).

With the commissioning of an asphalt access road, the flow of visitors increased significantly (more than 120 000 visitors in August 2021 versus 83 000 in 2020 and 46 000 for the same period in 2018). The situation, in our opinion, requires a response and the establishment of a threshold number visitors over a period of time. At the same time, it is necessary to develop new routes and trails in neighboring gorges, as well as improve the logistics of hiking routes, reducing peak loads by dispersing the flow. The explored gorges of the Taldy River, Kurmety River and Saty River have good potential in this regard. A positive experience of the park is the installation of signs along the route containing information about the distances from the beginning of the trail to its end point, and the approximate time to cover this distance. However, to date, most of the signs have been broken (in most cases, only poles remained, without signs).

According to preliminary data, 70% of the population of the village of Saty provides hospitality services to visitors to the area. In addition to the existing ones, new guest houses, hotels and glampings are appearing (including in the neighboring villages of Karabulak and Kurmety), providing more comfortable conditions, which allows us to predict an increase in the duration of the tourist season and an improvement in the quality of service for tourists as a result of increased competition (in the village of Saty at present 81 guest houses are currently operating). The situation of systemic coordination of the activities of local communities interested in the development of domestic and inbound tourism.

As scientific research for materials for the article, the authors organized a trip to this location for a detailed analysis of the data, during which the necessary materials were collected for each route: field observations were carried out, a visual assessment of the current ecological state of the trails was carried out, photographs of characteristic sections of

the routes were taken and trails, as well as linking characteristic points of the route to the terrain using GPS. The received primary information, as the methodology for calculating the maximum permissible loads on project sites (routes and trails) is developed, will be supplemented based on the monitoring results.

In the case of scientific observation, authors prepared a generalized description of the certified routes and trails of the State National Natural Park “Kolsai Lakes”, which is shown in Table 1.

Table 1. Routes of the State National Nature Park “Kolsai Lakes”

No.	Name of the route/trail	Current state	Recommendations for improvement
1	“Village Saty - Lake Kaiyndy”	From the village of Saty to the lake Kaiyndy. Dirt road from the highway to the parking lot below the lake (trailhead). The condition is satisfactory. Vegetation degradation is observed. The entire route is quite comfortable for tourists. There are equipped areas (entrance area and the end point of the route). The horse trail is separated from the walking trail.	Update signs and information boards during the whole journey. Develop a technological map of the excursion. Make a rope descent. Threat: the entry of organic substances into the aquatic environment of the lake, which leads to a decrease in oxygen in the water and increases the process of eutrophication.
2	“Village Saty – Saty Pass”	A picturesque, accessible for various categories of visitors, radial route up the Saty River gorge. No degradation of the vegetation cover is visually observed.	The route is equipped. It is necessary to carry out monitoring, update signs and information boards, and equip parking areas.
3	“Lake Lower Kolsai – Sarybulak Pass”	The most popular direction, in some places there are equipped areas for recreation, benches, signs and full resthouses (which requires updating). Degradation of the vegetation cover is observed, in some places significant, with the formation of “fans” of paths, exposure of the root system of trees, erosion and swamping of individual areas.	It is necessary to change the logistics of flows (separation of hiking and horse trails), engineering equipment and safe plowing of individual areas (flooring, railings, fences, etc.), updating infrastructure, equipping recreation areas, installing waste bins, toilets, signs, limiters of dangerous directions, etc. It is necessary to separately consider the areas below the 1st lake (area use) and the path (route) network.
4	“Village Kurmety - Lake Middle Kolsai”	A picturesque but unpopular route. In the initial part of the route, behind the barrier, there is an equipped clearing for rest. No vegetation degradation is observed.	The route is partially equipped. Signs should be restored /repaired, rest areas should be equipped, and notice boards, information boards and awnings should be provided.
5	“Village Kurmety - Mount Kyzemshek”	A promising scenic route partially equipped. No vegetation degradation is observed. Campsites are equipped with fire pits and recreation areas.	The route is partially equipped and not popular. The logistics of the route should be changed (start from the Kurmety gorge). Infrastructure equipment is required with the equipment of short-term recreation areas and bivouac clearings, taking into account the predominant use of equestrian tourists.

In addition to providing services on tourist routes, the national park provides services to visitors with transport, hotel services, escort services by an inspector-guide, provision of horses, consultations, etc. At the same time, it is not possible to trace the dynamics of visits to routes and trails due to the lack of statistical data in the State National Park. This is partly due to the fact that the arrangement and maintenance of the trails, and, consequently, the collection of fees for their operation, is leased to LLP “J.S. Travel”. Although the “Kolsai” post states that checks are “payment is processed” for each individual route. According to the results of a survey of park employees, almost the entire volume of visits falls on Lower Lake Kolsai and Lake Kaiyndy. Demand for other routes is sporadic (1-2 groups per season). The most popular route is along the Kolsai gorge, in particular, the section of the trail between the First and Second Lakes.

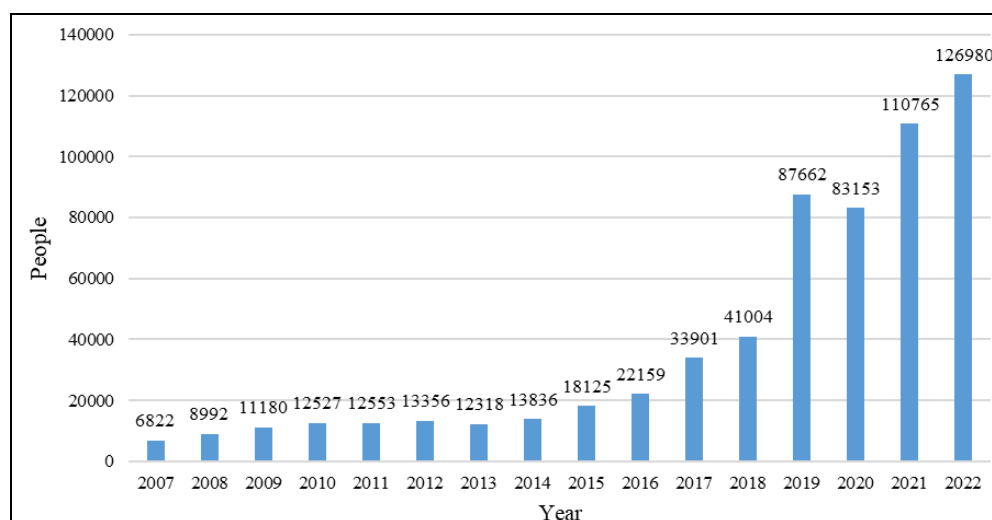


Figure 2. Dynamics of visits to the State National Nature Park “Kolsai Lakes”

From the materials of the adjustment of the master plan (2009), routes of the State National Natural Park “Kolsai Lakes” in the case of 100% demand can serve 2,600 people per month and 7,800 per year. The same document states that “the routes of the State National Natural Park “Kolsai Lakes” of different directions can accommodate 4,600 people monthly with the demand for routes at 100%.” At the same time, taking into account international recommendations and the peculiarities of the territory of the State National Park, it is advisable to observe the load on the routes of no more than 1-2 groups (up to 20-25 people) per day. These loads are acceptable when carrying out improvement of routes, especially in that part where tourists travel on foot and on horseback, especially at sightseeing stops. However, the real load on routes and trails today significantly exceeds the standards determined by the Park Management Plan (calculated by the “Terra” company), as well as those obtained as a result of calculations by a group of UNDP experts (2019) (Artemyev et al., 2020). Dynamics of the total number of visitors according to the State National Natural Park “Kolsai Lakes” looks like this (Figure 2).

The multiple increase in the number of visitors, provoked by improved transport accessibility, requires the adoption of urgent comprehensive measures to regulate the tourist flow. At the stage of developing a methodology for determining maximum permissible loads, in order to avoid a vacuum of action that could lead to irreversible consequences, the authors recommended a number of priority measures to reduce anthropogenic influence.

During the scientific and applied analysis, as part of the authors’ visit and conducting field research directly in the park itself, in order to qualitatively solve the research problems, we proposed recommendations for improving the situation regarding tourist congestion of the trails, which are given in Table 2.

Table 2. Preliminary recommendations for regulating the tourist flow and infrastructural equipment of routes and ecological trails of the State National Nature Park “Kolsai Lakes”

Load control	Security and information support	Environmental education and cooperation
<ul style="list-style-type: none"> <li>– Limitation of flow within the limits of the calculated recreational capacity (for sites) / maximum recreational load (for routes and trails) up to the introduction of a temporary ban on visiting certain areas and trails (with the proposal of alternative options for the duration of the ban);</li> <li>– Monitoring (at least three times a season, but preferably monthly);</li> <li>– Removal of the parking lot behind the barrier/checkpoint (organization of delivery to the lake: equipment of an eco-trail for hikers; eco-taxi /shuttles; equestrian route. In the future, a cable car option similar to the Shymbulak ski resort);</li> <li>– Identification and arrangement of parking and rest areas (sale of only guaranteed free places/sites);</li> <li>– Advance electronic booking (50/50);</li> <li>– Changing route logistics;</li> <li>– Separation of walking and equestrian areas.</li> </ul>	<ul style="list-style-type: none"> <li>– Installation of decking and fencing in areas of expansion/branching of the main trail (recommendations for choosing locations - after processing GPS tracks and photo recording data, in agreement with park specialists);</li> <li>– Installation of tourist navigation signs (including prohibition signs) (style and design - according to the design concept);</li> <li>– Development of tourist maps and guides (including electronic versions), “reading” information offline via QR code;</li> <li>– Linking to the area and setting up notices (information about the park, routes, visiting rules, measures against violators of the Rules, etc.);</li> <li>– Development of leaflets with valuable information (as a type of souvenir, so that this does not cause additional litter);</li> <li>– Organization of a tourist police station (consultations, control, administrative impact on violators - emphasis on behavior in places where tourists gather);</li> <li>– Initiation and creation of a ranger service (functions similar to tourist police with an emphasis on enforcing environmental legislation, mainly on routes);</li> <li>– Medical aid and rescue station (seasonally, possibly at the visitor center);</li> <li>– Hire of trekkers for tourists going on routes;</li> <li>– Limitation of the number of swimming facilities in the waters of Lake Kolsai, movement between piers - strictly according to the route, according to the approved passport.</li> </ul>	<ul style="list-style-type: none"> <li>– Organization of a visitor center</li> <li>– Production and installation of small architectural forms on sites and along routes, united by the idea of environmental education and training;</li> <li>– Organization of volunteer work (Regulations, rights and responsibilities, etc.);</li> <li>– Organization of environmental actions;</li> <li>– Agreements with universities, colleges, schools and other organizations (to streamline the flow, load the off-season, etc.);</li> <li>– Development of a general design code (design concept) for the park;</li> <li>– Search and attraction of partners (including foreign ones);</li> <li>– Preparation of applications for grants through international organizations/funds.</li> </ul>

In recent years, there has been an increase in negative impacts on the ecosystem of the park’s mountain lakes. Thus, over the past 15 years, the water level in Lake Kaiyndy has decreased by almost 8 meters. The process of destruction of the natural dam is underway, which threatens to worsen the mudflow danger for downstream objects, including the village of Algabas, and also threatens the existence of the unique lake itself.

The use of the water area of Lake Nizhny Kolsai for tourist and recreational purposes has led to a deterioration in water quality, its pollution, and the creation of preconditions for silt formation. The degradation of the soil cover around the lake is visually noted, which requires a comprehensive survey of the territory in order to determine the dangerous effects on vegetation, wildlife, and aquatic biosystems. It should be noted that there is an increased load on the trail between the Lower and Middle Kolsai lakes. The situation is aggravated by the use of this section for parallel movement of both pedestrian and horse-riding tourists, which, in the presence of waterlogged sections of the trail and soft soils, leads to an expansion of the width of its surface and damage to the adjacent territory. The sharp increase in overnight visitors to complexes located in close proximity to the coast is also a cause for concern.

Disposal of waste generated as a result of serving visitors is not always possible without damaging the environment (in particular, the used waste collection and removal system, the quality of septic tanks and the availability of a sufficient number of toilets have repeatedly raised questions among specialists). One of the primary tasks is to determine the permissible tourist and recreational load (both on routes and on recreational sites), as well as organizing monitoring in order to quickly respond to changes in the environmental situation and take adequate measures.

As a result of the research conducted to study the tourist and recreational load in the natural park, a number of important aspects were identified that influence the natural environment and the level of comfort of visitors (Figure 3).

As a result of the study conducted to study the tourist and recreational load in the State National Natural Park, a number of important aspects were identified that influence the natural environment and the level of comfort of visitors. Based on the data obtained, the following scientific conclusions can be drawn:

**Dynamics of tourist flow:** The study revealed significant fluctuations in tourist flow over time, which warns against possible overload and the need to balance the popularity of the park with its sustainability.

**Impact on Biodiversity:** Data analysis confirmed that tourism activity has an impact on local biodiversity. This highlights the importance of implementing effective management strategies aimed at preserving the natural park ecosystem.

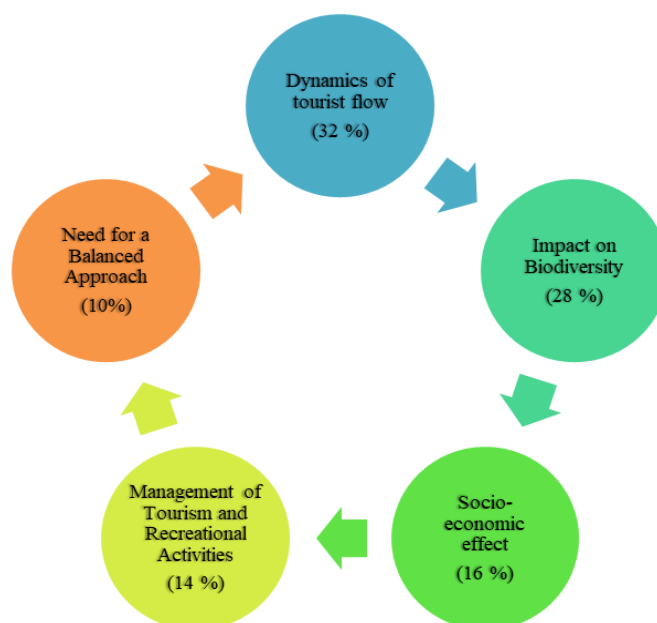


Figure 3. Aspects influencing the level of comfort of visitors of the State National Nature Park “Kolsai Lakes”

**Socio-economic effect:** The identified positive contribution of tourism to the regional economy indicates the importance of tourism development in state national natural parks as a tool for socio-economic development. **Management of Tourism and Recreational Activities:** The scientific study provides valuable recommendations for managing tourism activities in a natural park, including the implementation of restrictions, educational programs and modern monitoring technologies.

**Need for a Balanced Approach:** For long-term sustainability, it is important to develop and implement a balanced approach that considers the needs of tourists while also protecting the natural environment and cultural heritage of the park.

## CONCLUSIONS

The preservation of tourist and recreational attractiveness directly depends on the characteristics of environmental management in a given territory and the results to which it leads. In a case of the research preliminary assessment actions were carried out and recommendations were prepared for regulating the loads on the routes and trails of the State National Nature Park “Kolsai Lakes”. Subsequent work involves monitoring and clarification of preliminary data through comprehensive problem solving using refined and supplemented interpretation data from field research, including cartographic material, survey data, comparative analysis and testing of various methods for determining permissible loads, etc. The results obtained are planned to be replicated for similar operating conditions of ecological trails. The resulting scientific conclusion allows for a better understanding of the relationships between tourism and recreational activities and the natural environment in state-owned national natural parks, and also provides a basis for the development of effective tourism management and development strategies to achieve circular tourism in this context.

To achieve sustainable tourism development in the region, it is necessary to continue research aimed at studying the long-term effects of recreational load on ecosystems. An important aspect is the introduction of innovative monitoring methods, such as the use of drones and satellite data, for more accurate and timely collection of information. It is also necessary to consider the possibility of integrating local communities into the management and decision-making process, which will take into account their interests and increase the effectiveness of the implemented strategies. These measures will help not only to preserve the natural heritage, but also to promote the socio-economic development of the region.

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