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Recreational Services of Kazakhstan's National Parks in a Changing Climate: Economic Valuation and Visitor Dynamics

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Abstract: The study evaluates the economic value of recreational services and the association between seasonal weather conditions and national park attendance in Kazakhstan (2014–2023), focusing on Burabai, Sairam-Ogem, and Karkaraly. Using data from 350 survey respondents, it analysed tourist behaviour, willingness to pay for conservation and visitor trends. Results showed visitation peaks in summer (+30%) and declines in winter (-40–50%). The COVID-19 pandemic caused a 45% drop in 2020, with recovery by 2023. Over half (55.5%) are willing to pay USD 22.22 annually for conservation, while tourist spending averages USD 45.56 per trip. Recommendations include infrastructure development, climate adaptation, and sustainable financing mechanisms.

Keywords: ecology; forestry; protected areas; recreation areas; tourism

1. Introduction

The recreational value of natural forests in national parks is a key aspect of their conservation and efficient use. Kazakhstani national parks, namely Burabai, Sairam-Ogem and Karkaraly, are important centres of ecotourism and environmental protection. However, the growth of tourist flows, climate change and economic development are posing new challenges for these natural areas in managing recreational services.

According to Kitaibekova et al.[1)], climate change can cause a shift in the seasonality of tourist activity, which requires a detailed study. In addition, according to Wang et al.[2)], the increase in demand for ecotourism requires an assessment of the ecosystem services of forests, as well as the willingness of the population to finance environmental protection measures.

Research shows that sustainable management of forests and national parks is an important tool for preserving ecosystem services and maintaining ecological balance. Zhilkibayeva et al.[3)], in a study on the Ile-Alatau National Park, determined that the formation of sustainable forest landscapes contributes to the conservation of biodiversity and improves recreational potential. Other protected areas, such as the Sharyn, studied by Kerimbay et al.[4)], demonstrate high recreational value due to unique landscapes and infrastructure facilities that attract tourists. One of the key tasks of modern research is to assess the ability of natural parks to withstand the tourist load. In the Ile-Alatau National Park, Aliyeva et al.[5)] have already assessed the recreational potential accounting for its environmental sustainability. Jones et al.[6)], highlight the growing interest in natural parks in the mountainous regions of Asia and the development of ecotourism as an effective way to engage local communities in the conservation of natural areas. However, aspects of the economic valuation of ecosystem services, such as the willingness of visitors to fund conservation measures, which are critical to ensuring sustainable funding for parks, have not been sufficiently explored.

The growth of tourist activity poses new challenges to national parks that require the implementation of a sustainable management system. Kalikhman[7)], in the study of the Baikal Natural Area, highlighted the importance of planning natural parks to preserve unique ecosystems and minimise the negative impact of tourism activities. This approach is becoming particularly relevant for parks in Kazakhstan, where it is necessary to develop infrastructure in a way that does not disturb the natural balance.

Regional management of tourist areas is also becoming an

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important component of the sustainable development of border-protected areas. For instance, according to Dunets et al.[8)], tourism management in border areas requires coordination of efforts between neighbouring states and the involvement of local communities in the protection of natural resources. However, as demonstrated by Legutko-Kobus et al.[9)], many parks are facing problems due to the growing pressure from investment projects that threaten natural and ecological values.

Another important aspect is the impact of nature parks on the quality of life of the local population. Schröter et al.[10)] note that the relationship between ecosystem services and human well-being requires research in terms of their impact on socio-economic development. This is especially true in the context of Kazakhstan, where national parks not only serve as a place of recreation but also as an important source of income for local communities.

Despite the significant amount of research in the field of ecotourism and sustainable management of natural resources, several gaps require further study. In particular, there is a lack of research on the economic valuation of ecosystem services in the example of national parks in Kazakhstan, as well as an assessment of the impact of climate change on tourism activity in these regions.

Thus, the study aims to assess the recreational potential of natural forests in the national parks of Kazakhstan in the context of climate change. The main tasks are to analyse the economic value of recreational services in these protected areas; to assess the willingness of visitors to finance conservation measures in these areas; and to study how seasonal weather conditions, together with infrastructure and tourism-related factors, are associated with attendance patterns in the national parks of Kazakhstan.

2. Materials and methods

Area of interest

The research was conducted in three national parks of Kazakhstan: Burabai, Sairam-Ogem, and Karkaraly, which are among the country's key protected areas for ecotourism and biodiversity conservation[3,4)] (Figure 1).

Burabai National Park, located in the Akmola region, is renowned for its rugged terrain, lakes including Burabai and Shchuche, and a wealth of hiking and recreational facilities. Mountainous landscape, woods, and distinctive geological formations define Sairam-Ogem National Park, which is located in the southern region close to the border with Uzbekistan. Steppe habitats, wooded regions, and historical sites can be found in Karkaraly National Park in central Kazakhstan. In addition to being important for the preservation of the environment, these parks serve as hubs for area tourism, offering lodging, guided tours, outdoor activities, and cultural experiences. Their role in the national tourism sector includes generating employment in hospitality and transport, supporting local businesses, and contributing to regional economic development through visitor spending[11,12)]. A comparison of recreational use, economic value, and environmental pressures under various climatic and infrastructure circumstances was made possible by the selection of these regions.

a) Data collection

The present study focuses on two interrelated aspects of recreational ecosystem services: their economic valuation and the dynamics of visitor attendance under changing seasonal weather conditions.



Fig. 1: Kazakhstan National Parks (from Atasoy et al, 2022)[11)]

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These aspects were chosen because they accurately represent the need for forest recreation and the ability of national parks to be managed. Determining whether recreational services can support sustainable financing and conservation measures is aided by economic valuation, which takes into account visitors' willingness to pay. In addition, visitor dynamics are crucial for comprehending how seasonal variations brought on by climate change may impact park management priorities, infrastructure requirements, and recreational pressure. Thus, a useful foundation for evaluating the sustainability of forest recreational services in Kazakhstan's national parks is provided by the combined analysis of these two factors.

The valuation of ecosystem services (biodiversity conservation, ecotourism) was carried out using the Travel Cost Method (TCM)[13] and the Contingent Valuation Method (CVM)[1]. Data analysis employed descriptive statistics to characterise visitor demographics, spending patterns, and attendance trends. Seasonal variations were analysed using comparative analysis between different time periods, with percentage changes calculated to quantify the magnitude of fluctuations. The willingness to pay data from the CVM were analysed using measures of central tendency and distribution analysis to determine average values and identify factors influencing payment willingness.

The study was conducted in 2014-2023 in several national parks of Kazakhstan, including: Burabai, Sairam-Ogem, Karkarali. A random sampling approach was employed to ensure representation of various ages, genders, social statuses, and visit durations. A total of 350 respondents were surveyed in the national parks. According to annual park attendance statistics[14], the polled respondents make up between 1% and 2% of all park visitors each year, which is a suitable sample size to evaluate visitor behaviour, spending trends, and willingness to pay for conservation. This ratio allows for a trustworthy evaluation of recreational services and visitor preferences and is in line with common practice in environmental economics surveys employing contingent valuation techniques. The main criteria for inclusion in the sample were:

- respondents' age: 18-100 years old;
- gender: men and women;
- social status: tourists, locals and foreign visitors;
- duration of visit: from 1 day to 30 days.

The respondents were asked to answer questions about the reasons for their visits to parks, the duration of their stay, the costs of services (accommodation, food, transport) and their willingness to pay for recreational services. The expenditure analysis was conducted separately for each season to capture seasonal variations in spending patterns and service pricing. The information was summarized in Appendix A. Data on price changes over the study period, including the impact of inflation and infrastructure improvements, were used for the analysis.

Official statistical reports were used to collect data on visits to national parks in Kazakhstan in 2014-2023. Data on the number of visitors were obtained from the Bureau of National Statistics of Kazakhstan, which annually publishes information on tourist flows and the number of visitors to natural parks and tourist areas[14]. Changes in tourist flows related to climatic factors and infrastructure development were also accounted for.

The economic valuation of recreational services was conducted using the CVM[1], a widely accepted approach for estimating the economic value of non-market environmental goods and services. The CVM implementation involved presenting respondents with hypothetical scenarios regarding park conservation funding and asking them to state their maximum willingness to pay for maintaining and improving park ecosystems and recreational facilities. The CVM questionnaire employed a bidding game format, where respondents were initially presented with a starting bid amount and then asked to indicate whether they would be willing to pay higher or lower amounts until their maximum willingness to pay was determined. This approach helped minimise starting point bias and provided more accurate estimates of economic values. The payment vehicle was framed as an annual conservation fee that would be used specifically for park maintenance, infrastructure improvement, and environmental protection measures. These methods were used to determine the economic benefits of visits to forest ecosystems of national parks and reserves.

The TCM captured actual visitor expenditures, including accommodation, food, transportation, and miscellaneous items such as souvenirs and equipment rental. Spending was analysed separately for each season to account for seasonal variations in attendance and service pricing[13]. Data validation was achieved through collaboration with local service providers to ensure accuracy of reported expenditures.

Tourist spending patterns were analysed through detailed expenditure surveys that categorised visitor costs into four main components: accommodation, food and beverages, transportation, and miscellaneous expenses including souvenirs and equipment rental. Data collection included both direct visitor interviews and collaboration with local service providers to validate reported expenditure amounts and ensure accuracy of economic impact calculations.

To evaluate the influence of weather conditions on visitor numbers, short-term atmospheric variables, including temperature and precipitation, were analysed instead of decadal climate trends. This strategy is in line with recent research showing that weather unpredictability has a direct impact on visiting patterns, affecting both the quantity of visits and the geographical distribution of visitors in protected areas[15,16]. Research suggests that short-term weather impacts on recreation demand are more rapid and

quantifiable than long-term climate change, allowing for a thorough evaluation of current visitor reactions and financial contributions to park administration. The data was obtained from the Interactive Maps and Data[17] platform, supplemented by regional weather station records. Temperature data were collected for both summer and winter seasons across the study period, with particular focus on average seasonal temperatures that influence visitor comfort and park accessibility. The climate analysis examined trends in average summer and winter temperatures for each park location, calculating annual temperature changes and identifying patterns that correlate with visitor attendance fluctuations. These data provided the basis for assessing whether seasonal weather conditions were associated with tourism patterns and recreational demand, without treating temperature change as the sole or primary driver of visitation.

Statistical analysis included the following tests:

- Student's T-test for comparing the average expenditures on services between different groups of respondents[18];
- Mann-Whitney U-test for analysing willingness to pay for recreational services[18];
- correlation analysis to identify dependencies between the number of visitors and climatic factors[19].

b) Materials

The recreational activities and management of Kazakhstan's national parks are regulated by several legal acts that set out rules for the use of natural resources, biodiversity conservation measures and environmental standards for protected areas. The main documents on which this study is based include:

1) Law of the Republic of Kazakhstan No. 175 "On Specially Protected Natural Areas"[20] – defines the legal basis for the creation, functioning and protection of specially protected natural areas, which include national parks and nature reserves.
2) Forest Code of the Republic of Kazakhstan[21] – regulates the management of forest resources, including their recreational use, as well as the conservation of forest ecosystems.
3) Environmental Code of the Republic of Kazakhstan[22] – defines environmental standards and norms of environmental protection that are important for the conservation of ecosystems in national parks and reserves.

These legal acts form the basis for organising recreational activities, environmental monitoring and conservation of natural areas of Kazakhstan in the context of climate change. To collect data, questionnaires (Appendix A) based on standard methods for assessing recreational services were used, as well as software for statistical data processing (SPSS, Excel).

Thus, the study covered both quantitative and qualitative aspects of the recreational use of natural areas, which allowed for a comprehensive assessment of the recreational potential of Kazakhstan's forests in the context of climate change.

3. Results

The study assessed the economic value of recreational services and the relationship between seasonal weather conditions and visitor numbers in these areas. The focus was on assessing the willingness of the population to pay for the conservation of natural resources and analysing changes in the number of visitors. Understanding these dynamics is crucial for developing effective management strategies that balance ecological preservation with sustainable tourism growth[23–25]. The analysis considers seasonal fluctuations, visitor frequency, and external factors such as the COVID-19 pandemic, which significantly influenced visitation patterns in recent years. By evaluating both the economic contributions of tourism and the environmental attitudes of visitors, the study aims to provide comprehensive insights into how natural parks can be maintained and enhanced in the face of evolving environmental and social challenges. These findings are essential for policymakers, park authorities, and local communities seeking to optimize resource allocation, improve visitor experiences, and ensure the long-term sustainability of protected natural areas[25–27].

One of the key aspects of the study was to examine the frequency of visits to Kazakhstan's national parks in different seasons during the period 2014-2023. The survey data shows that the category of visitors who have visited the parks 1-2 times prevails among the respondents. This group accounts for 57% of the total number of respondents. At the same time, 43% of respondents are regular visitors who have visited the park more than twice. Similar trends are observed in the parks of Sairam-Ogem and Karkaraly – 40% and 44% respectively (Table 1).

The analysis of attendance also revealed significant seasonal fluctuations. The largest influx of tourists is observed in the summer months (June-August) when the number of visitors can exceed the annual average by 25-30%. This is due to attractive climatic conditions and infrastructure that ensures a comfortable stay during the warm season. Spring and autumn are also popular seasons, although visitor arrivals during these periods are 15-20% lower than in summer. In winter, visitor numbers drop by 40-50% as cold conditions make natural sites less attractive to mass tourism (Table 2). At the same time, in the winter months, park visitors are mostly interested in specialised types of recreation, such as winter sports or recreation at the bases that provide services for this season.

Table 1: Frequency of visits to national parks

Frequency of visits	Number of respondents (Burabai)	% of the total sample (Burabai)	Number of respondents (Sairam-Ogem)	% of the total sample (Sairam-Ogem)	Number of respondents (Karkaraly)	% of the total sample (Karkaraly)
1-2 times	199	57%	210	60%	192	55%
More than 2	151	43%	140	40%	158	45%
Overall	350	100%	350	100%	350	100%

Source: compiled by the authors.

Table 2: Seasonal distribution of visitors (2014-2023)

Season	Sayram-Ogem – Average number of visitors per month	Karkaraly – Average number of visitors per month	Burabai – Average number of visitors per month	Sayram-Ogem (%)	Karkaraly (%)	Burabai (%)
Spring	10,250	8,000	15,000	18%	16%	20%
Summer	24,860	22,500	37,500	50%	52%	50%
Autumn	8,100	7,550	11,250	16%	15%	15%
Winter	5,220	3,540	7,500	10%	8%	10%

Source: compiled by the authors.

Over the past ten years, visits to Burabai, Karkaraly and Sairam-Ogem National Parks have shown steady growth, but due to the COVID-19 pandemic, in 2020 the number of visitors to Burabai decreased by 45%, and to Sairam-Ogem and Karkaraly by about 35% due to quarantine restrictions. After the restrictions were partially lifted in 2021, the recovery in tourist activity was noticeable in all parks, although the pace of recovery in Karkaraly was somewhat slower due to less tourist infrastructure. According to 2020 data, the number of visitors to Burabai Park decreased by 45% compared to 2019. This is reflected in a decline in the number of domestic and international tourists, as many people avoided travelling due to fear of infection and travel restrictions. In 2020, approximately 21,000 tourists visited the park, compared to 37,500 in 2019[14]. This sharp drop was the result of restrictions, including the closure of public places and tourist attractions at the beginning of the pandemic.

After the restrictions were partially lifted in 2021, tourism activity recovered. The number of visitors to Burabai Park increased to 28,500 for the year, still 24% less than in 2019, but showing a positive trend towards a recovery in tourism. In 2022, the number of visitors to Burabai Park reached 35,000, almost reaching pre-pandemic levels[14].

One of the key aspects of the study was to assess the respondents' willingness to pay for the conservation of national park ecosystems, using the CVM. In particular, the survey in the Sairam-Ogem and Karkaraly parks showed that approximately 52% of visitors to Sairam-Ogem and 47% of visitors to Karkaraly are ready to make financial contributions to support conservation activities. As for Burabai Park, 55.5% of visitors agree to financially support the development of the park, while 19.7% are not ready to pay, and 5.7% of respondents indicated that they have not visited the park at all (Table 3). The high proportion of respondents willing to make contributions underlines the level of environmental awareness of the population, as well as the understanding of the need for financial support for the conservation of natural resources.

Table 3: Willingness to pay for park preservation among respondents

Willingness to pay category	Number of respondents (Burabai)	% (Burabai)	Number of respondents (Sairam-Ogem)	% (Sayram-Ogem)	Number of respondents (Karkaraly)	% (Karkaraly)
Ready to pay	195	55.5%	182	52%	165	47%
Not ready to	69	19.7%	105	30%	85	24%
Did not visit the	20	5.7%	18	5%	23	6%
Uncertain	66	19.1%	45	13%	77	22%
Overall	350	100%	350	100%	350	100%

Source: compiled by the authors.

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The group of respondents who are ready to financially support the conservation of park ecosystems cite the following as their main motivations for doing so:

- preserving natural resources for future generations;
- supporting recreational opportunities in national parks, which promotes sustainable tourism;
- improving the ecological state and preventing degradation of natural landscapes.

Respondents who do not consider it necessary to make financial contributions to support environmental protection measures mentioned the following main reasons: insufficient income for additional expenses; distrust in the efficiency of the use of the funds raised; and the belief that nature protection should be funded by the state.

Respondents who had no experience of visiting parks were therefore unable to assess the importance of the park for recreation and were not ready to make contributions. There was also a group of respondents who could not answer the question about their willingness to pay for the preservation of the park. Many of them expressed an interest in supporting conservation efforts but lacked clear information about how their contributions would be used.

Respondents were also asked to identify the maximum amount they would be willing to pay to support park conservation. The study determined that the average amount that respondents were willing to pay in Burabai Park was USD 22.22 per year. For Sairam-Ogem, the average amount that respondents were willing to pay per year was USD 17.78, while for Karkarala this amount was approximately USD 16.67 per year. Among the main motivations for financial support, respondents indicated a desire to preserve unique natural resources that have not only recreational but also environmental and cultural value.

The analysis demonstrated that the main factors that influence respondents' willingness to pay for park conservation is: income level: respondents with higher income are more likely to be financially ready to support the conservation of natural resources. Education: people with higher education are more likely to be willing to support conservation measures. Frequency of visits: regular visitors to parks are more interested in their conservation and infrastructure development. Environmental awareness: respondents who are aware of the importance of preserving the natural environment are more likely to make financial contributions.

The results of the study show a high level of environmental awareness among the population of Kazakhstan, which is supported by the willingness of a significant number of respondents to financially support environmental protection measures. Given these results, the introduction of paid ecosystem services can be an effective tool to ensure sustainable financing of national parks. This will not only preserve natural resources but also improve the quality of recreational services for visitors.

The analysis showed that average expenditures per trip to national parks include several main categories: accommodation (the main component of expenditures, especially for tourists staying in hotels or recreation centres) (Table 4). Food (this includes expenditures on restaurants, cafes, and food for self-catering). Transport costs include the cost of travelling to the park and moving around the park. Other expenditures are the funds spent by visitors on souvenirs, and equipment rental (for example, for fishing or tourism).

Thus, the total average cost per trip to Burabai Park was USD 45.56, Sairam Ogem – USD 38.89, and Karkaraly – USD 35.56 per person. This data is relevant for an assessment of the economic value of parks, as it reflects not only expenditures on tourism services but also the overall contribution of recreational services to the local economy.

The contingent valuation method was used to determine how much tourists are willing to pay to visit the parks and maintain their natural resources. On average, respondents were willing to pay about USD 22.22 per year to preserve the parks and maintain their ecosystems. This Figure was derived from surveys in which respondents were asked to determine the maximum amount they would be willing to pay for recreational services and conservation of the natural environment.

Tourist spending related to visiting parks has a significant impact on the local economy. Most parks are located in regions where tourism is a key source of income for local communities. In particular, in Burabai, Karkaraly and Sairam-Ogem parks, the recreational sector provides jobs in hospitality, catering and transport. On average, visitors spend money on the services of local businesses, which

Table 4: The average cost of visiting national parks

Value	Average value (USD) – Burabai	Average value (USD) – Sairam-Ogem	Average value (USD) – Karkaraly
Accommodation	22.22	17.78	16.67
Food	11.11	10.00	9.33
Transport costs	6.67	6.22	5.56
Other expenses	5.56	4.89	4.00
Total costs	45.56	38.89	35.56

Source: compiled by the authors.

Table 5: Seasonal distribution of tourist spending in parks (average values per month)

Season	Costs per trip – Burabai (USD)	Costs per trip – Sayram-Ogem (USD)	Costs per trip – Karkaraly (USD)
Summer (June-August)	55.56	44.44	41.11
Spring (March-May)	40.00	34.44	31.11
Autumn (September-November)	35.56	28.89	27.78
Winter (December-February)	26.67	22.22	20.00

Source: compiled by the authors.

contributes to the development of infrastructure and improves living standards in the region, including jobs in the hospitality, travel services, transport and trade sectors in the regions around the parks. Tourists stimulate the development of small and medium-sized businesses, including restaurants, cafes, souvenir shops and rental of tourist equipment, which generates additional revenue for local budgets from taxes paid by tourism-related businesses.

Tourist spending varies depending on the season. The summer months, when there is a peak in visitor numbers, generate the highest revenues from recreational services. In autumn and spring, expenditures decline slightly due to a lower flow of visitors, but tourists continue to use park services for hiking, sightseeing and recreation (Table 5).

Seasonality is significant in the distribution of tourist spending, with revenues peaking in the summer season when the park's visitor numbers are highest. The study also highlighted that the cost of visiting Burabai Park is higher compared to other parks in Kazakhstan, such as Sairam-Ogem and Karkaraly. This may be due to the more developed infrastructure, higher level of services and better conditions for recreation in Burabai.

The results obtained indicate the high economic value of the recreational services of the national parks of Kazakhstan. Tourist expenditures associated with visiting parks have a significant positive impact on the local economy. Importantly, the willingness of tourists to pay for ecosystem conservation and infrastructure development can become an important source of funding for national parks, ensuring their sustainable functioning in the face of increasing tourist flows and climate change.

In the context of the study, which covered Burabai, Karkaraly and Sairam-Ogem National Parks from 2014 to 2023, several key trends related to climate change and its impact on park visits were identified. One of the main factors affecting visits to national parks is the temperature change. In recent years, an increase in average summer temperatures of 1-2°C has been recorded (Table 6).

As shown in the Table, the average temperature in the summer months has been gradually rising according to the data collected over the past 10 years. The gradual increase in average summer temperatures may have contributed to the attractiveness of the parks during summer, particularly when visitors sought recreation in mountainous, forested, and lake areas. However, this pattern should also be interpreted in relation to other factors, including improved infrastructure, growing domestic interest in nature-based tourism, post-pandemic recovery, accessibility, and broader changes in tourist preferences. Natural reservoirs such as Burabai and Shchuche lakes have become key summer recreation points in Burabai Park. Over the past five years, the number of summer visitors has increased by 15%. In 2023, approximately 37,500 people visited the park during the summer season.

Table 6: Comparison of average temperatures in national parks (2014-2023)

Year	Average summer temperature (°C) – Burabai	Average winter temperature (°C) – Burabai	Average summer temperature (°C) – Sayram-Ogem	Average winter temperature (°C) – Sayram-Ogem	Average summer temperature (°C) – Karkaraly	Average winter temperature (°C) – Karkaraly
2014	24.5	-9.0	23.5	-8.0	22.5	-8.5
2015	24.8	-9.5	23.8	-8.5	23.0	-8.8
2016	25.2	-10.0	24.0	-9.0	23.2	-9.0
2017	25.5	-10.2	24.5	-9.2	23.5	-9.2
2018	25.7	-9.8	24.8	-8.8	24.0	-8.9
2019	26.0	-9.3	25.0	-8.5	24.3	-8.5
2020	26.3	-8.5	25.5	-8.0	24.5	-8.2
2021	26.5	-8.7	25.7	-8.2	25.0	-8.0
2022	26.7	-9.1	26.0	-8.5	25.2	-8.1
2023	27.0	-8.2	26.5	-7.8	25.5	-7.9

Source: compiled by the authors based on Interactive Maps and Data[17].

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This number of visitors has increased the load on the park's infrastructure, including hiking trails, camping areas, and sanitary areas.

To preserve the ecosystem and maintain the tourist attractiveness of the park, a series of infrastructure projects were implemented, the main of which was the improvement of hiking trails: in 2021-2023, more than 20 km of trails were reconstructed in Burabai Park, which allowed to distribute tourist flows and reduce soil erosion on the most popular routes. Another area of focus was the introduction of eco-friendly campsites to reduce the negative impact on natural landscapes, with new eco-friendly campsites with minimal environmental impact being set up in locations that allow tourists to enjoy nature without harming ecosystems. Last but not least, sanitary zones and waste recycling systems were introduced. In 2022, new dry closets and waste collection systems were installed at key tourist locations. This helped reduce pollution and improve the sanitary condition of the park during peak periods.

The final stages of the optimisation included the reconstruction of recreation areas near the lakes: new beach areas with seating, boat rental and other water equipment were built, additional trees were planted, and sheds were installed at tourist locations. All implemented measures are in line with the requirements of the Law of the Republic of Kazakhstan No. 175[20], Forest Code of the Republic of Kazakhstan[21], as well as the Environmental Code of the Republic of Kazakhstan[22], which ensures support for sustainable development and protection of Kazakhstan's environmental heritage.

4. Discussion

The results of the study confirm that the conservation of natural forests in Kazakhstan's national parks is key to ensuring the sustainable development of ecotourism and the economic stability of the regions. The willingness of respondents to financially support environmental protection measures indicates an increased environmental awareness of the population, which is consistent with the findings of Abalakov and Pankeeva[28], point out the importance of managing recreational pressure on natural areas to preserve their ecological stability. In the study, more than half of the respondents are ready to make financial contributions to support conservation measures, which indicates the potential for the introduction of paid ecosystem services in national parks.

The increase in park attendance in the summer, which was recorded in the study, is in line with the general trends identified by Aktymbayeva et al.[29]. This study showed that the growing interest in national parks can lead to the overloading of tourist routes, which requires clear regulation of recreational flows to maintain a natural balance. Similar problems with the management of tourist flows were identified in the present study, especially in the context of seasonal fluctuations in the number of visitors.

Despite a 40-50% reduction in visitor numbers during winter months, specialised recreational activities maintain seasonal tourism in all three parks. Skiing, snow-based outdoor activities, and lodging at seasonal bases are winter options that draw a smaller but steady group of tourists. In Burabai, Sairam-Ogem, and Karkaraly, the average winter expenditures per trip are roughly USD 26.67, USD 22.22, and USD 20.00, respectively, indicating decreased tourism but ongoing economic support for the local populations. In order to promote year-round ecotourism and maximise the parks' economic and conservation benefits, winter amenities like lodges, ski trails, and guided tour services must be maintained[30].

In addition, the findings confirm the importance of developing recreational infrastructure, including hiking trails and recreation areas, to reduce the negative impact of tourism on natural resources. The conclusions of Chen and Li[31], regarding the importance of urbanised forest areas for recreation, indicate that the development of appropriate infrastructure can reduce the negative impact on natural resources and improve the ecological balance in national parks.

Analysis of visitor responses indicated that financing for recreational services in Burabai, Sairam-Ogem, and Karkaraly national parks is supported through a combination of state funding and voluntary contributions from visitors. Particularly, 55.5% of visitors to Burabai, 52% of visitors to Sairam-Ogem, and 47% of visitors to Karkaraly indicated that they would be willing to pay an annual fee to support infrastructure maintenance and conservation; the average annual contribution ranged from roughly USD 22.22 in Burabai, USD 17.78 in Sairam-Ogem, and USD 16.67 in Karkaraly. This demonstrates how government resources could be supplemented by compensated ecosystem services[11,32]. Together with state assistance, these donations offer a long-term source of money for park administration, guaranteeing the upkeep of recreational facilities and the preservation of natural resources.

The willingness of visitors to Kazakhstan's national parks to pay for the conservation of natural resources is an important indicator that was also identified in other international studies. For instance, Doli et al.[33] note that tourists are willing to financially support the sustainable management of forest parks, which is consistent with the results obtained. This confirms that the development of paid ecosystem services can become an important source of funding for the sustainable development of national parks in Kazakhstan.

The results of the study also indicate the importance of sustainable management of recreational areas and the introduction of systems for regulating tourist flows in national parks, which is in line with the findings of

Šodková et al.[34] who, in their study in the Czech Republic, showed that the frequency of visits to forest parks depends on several factors, such as accessibility, infrastructure and environmental attractiveness of the territories. In addition, a study by Chlachula et al.[35] on ecotourism in Eastern Kazakhstan indicates that areas with high ecological value have the potential to develop sustainable tourism if appropriate management strategies are implemented. This is confirmed by the data obtained on the national parks of Kazakhstan, where effective management of natural resources contributes to the conservation of biodiversity and improves the economic situation for local communities.

An important aspect of the sustainable development of ecotourism is the involvement of residents in the management of protected areas, which is emphasised by Koshim et al.[36] in the example of the Altynemel National Park. The study also showed that the participation of local communities in the conservation of national parks contributes to raising their environmental awareness and willingness to support environmental initiatives.

Wengel et al.[37] in Myanmar confirm that protected areas in mountainous areas have great potential for ecotourism development if their infrastructure is adapted to the conditions of the area and growing tourist demand, which is consistent with the data of the study, namely that the development of infrastructure in national parks in Kazakhstan allows for an increase in tourist flows while maintaining the natural balance.

A study by Atasoy et al.[11] on the Burabai National Park shows that this region has significant tourism potential due to its natural resources but requires further development of tourism infrastructure to reduce the negative impact of tourism on the environment. Our results are consistent with these findings, emphasising the importance of implementing environmentally sustainable management practices to ensure the long-term conservation of natural resources. Hena et al.[32] studied ecological parks in arid regions of Pakistan and found that ecotourism can contribute to biodiversity conservation while improving economic performance in local communities. Similar trends were observed in the study of national parks in Kazakhstan, where recreational services not only contribute to the conservation of natural resources but also provide an important economic contribution to the region.

The study also confirmed that infrastructure development and management of tourist flows are key factors affecting the conservation of park ecosystems and increasing their economic efficiency, which is in line with the research of Ali[38], who showed that ecotourism in mountainous areas, as in the case of national parks in Kazakhstan, has significant potential for sustainable development, provided that natural resources are effectively managed.

Another important aspect of the study is the impact of ecotourism on local communities, as the results confirmed this conclusion: the participation of local communities in the conservation of national parks in Kazakhstan not only contributes to the maintenance of natural resources but also provides economic benefits for the regions. In line with this, Shishany et al.[12] emphasise that local communities play an important role in the conservation of natural areas and have significant potential for ecotourism development through their links with natural areas. Iskakova et al.[39] also highlighted the importance of ecotourism development in Kazakhstan for the sustainable use of natural resources and biodiversity conservation. The study complements these findings, confirming that improving the tourism infrastructure in the national parks of Kazakhstan has a positive impact on the conservation of natural resources, especially in the context of climate change. Wildlife conservation is also an important factor in sustainable development, as discussed by Blank and Li[40], who investigated a sustainable approach to the use of natural resources in Central Asia. The findings confirm these data.

Another key factor in the study is changes in land use, which is confirmed by the findings of Chrastina et al.[41] who emphasise the need to protect historical landscapes and develop sustainable ecotourism. The results show that significant changes in land management are taking place in the national parks of Kazakhstan, which require adaptation to maintain environmental sustainability.

5. Conclusions

A study conducted in Kazakhstan's Burabai, Karkaraly and Sairam-Ogem national parks from 2014 to 2023 identified several important aspects related to visitor numbers, the economic value of recreational services and the impact of climate change. The study determined that visitors' willingness to financially support conservation measures is an important factor in the development of paid ecosystem services. Most respondents (55.5%) expressed their willingness to pay for the conservation of natural resources, which opens up prospects for the introduction of effective mechanisms for financing parks through environmental payments. This will ensure the sustainable development of parks and improve the quality of recreational services.

The economic analysis also showed that tourist spending has a significant impact on the local economy. The average expenditure per trip to Burabai Park was USD 45.56, Sairam-Ogem – USD 38.89, and Karkaraly – USD 35.56, which includes accommodation, food, transport and other services. This contributes to the development of small and medium-sized businesses in the regions adjacent to the parks, creating jobs and supporting local communities.

The analysis showed a gradual increase in park attendance, despite the impact of the COVID-19 pandemic, which temporarily reduced tourist flows. In 2022-2023, attendance stabilised, reaching pre-pandemic levels.

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Seasonal weather conditions were also relevant to tourism activity. Increased average summer temperatures may have been one of several factors associated with higher summer visitation, alongside infrastructure development, recovery of domestic tourism after COVID-19 restrictions, increased interest in nature-based travel, and the attractiveness of lake and mountain recreation areas. Therefore, the observed increase in visitors should not be attributed exclusively to climate change. In this context, parks must adapt their infrastructure to ensure its resilience to climate change.

The study had certain limitations in the form of statistical data availability and seasonal changes, which makes it difficult to accurately assess the economic and climate impacts on recreational activities in the long term. Further research should focus on improving the mechanisms for financing environmental protection measures through environmental payments, developing infrastructure to cover seasonal changes and climate impacts, and expanding winter tourism offerings.

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