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SUSTAINABLE UTILISATION OF THE TOURISM AND RECREATIONAL POTENTIAL OF PROTECTED NATURAL AREAS: THE CASE OF JIZZAKH REGION

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Abstract. This article examines the tourism and recreational potential of protected natural areas (PAs) in Jizzakh Region, including Zomin National Nature Park, the Zomin and Nurota State Nature Reserves, and the Arnasoy Wildlife Sanctuary, with particular emphasis on their sustainable utilisation. The study employs an integrated scoring approach, recreational carrying capacity assessment based on the Cifuentes methodology, and SWOT analysis. The findings indicate that Zomin National Nature Park possesses the highest tourism and recreational potential, while improvements in infrastructure and transport accessibility remain priorities for all the areas examined. An illustrative calculation for a hypothetical 50-hectare recreational zone indicates that its effective carrying capacity (ECC ≈ 1,836 visitors per day) is approximately 1.8–2.0 times higher than the indicative ecological benchmark. Accordingly, a daily visitation limit of 20 visitors per hectare (equivalent to 1,000 visitors per day for a 50-hectare area) is recommended. Extending the active tourism season is identified as the principal means of increasing annual visitor numbers while maintaining the recommended daily limit. The study also substantiates organisational and economic mechanisms for sustainable tourism and recreational development within the framework of national legislation.

Keywords: protected natural areas, tourism and recreational potential, sustainable tourism, ecotourism, recreational carrying capacity, Zomin National Nature Park, Jizzakh Region.

Аннотация. В статье исследуется туристско-рекреационный потенциал охраняемых природных территорий (ОПТ) Джизакской области, включая Зааминский национальный природный парк, Зааминский и Нуратинский государственные природные заповедники, а также Арнасайский заказник, с особым акцентом на их устойчивое использование. В исследовании применены методы интегральной балльной оценки, определения рекреационной ёмкости на основе методики Сифуэнтеса (Cifuentes) и SWOT-анализа. Установлено, что наибольшим туристско-рекреационным потенциалом обладает Зааминский национальный природный парк, тогда как совершенствование инфраструктуры и повышение транспортной доступности остаются приоритетными направлениями для всех рассматриваемых территорий. Модельный расчёт для условной рекреационной зоны площадью 50 га показывает, что её эффективная рекреационная ёмкость (ECC ≈ 1 836 посетителей в день) приблизительно в 1,8–2,0 раза превышает ориентировочный экологический норматив. В связи с этим рекомендуется установить суточный лимит посещаемости на уровне 20 человек на гектар (что соответствует 1 000 посетителей в день для территории площадью 50 га). Продление активного туристического сезона рассматривается как основной способ увеличения годового туристического потока при соблюдении рекомендуемого суточного ограничения. Кроме того, в исследовании обоснованы организационно-экономические механизмы устойчивого развития туризма и рекреационной деятельности в рамках национального законодательства.

Ключевые слова: охраняемые природные территории, туристско-рекреационный потенциал, устойчивый туризм, экотуризм, рекреационная ёмкость, Зааминский национальный природный парк, Джизакская область.

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INTRODUCTION

Protected natural areas (hereinafter referred to as PAs) play a significant role in nature-based tourism, including ecotourism, recreational tourism, and health tourism, as they simultaneously conserve unique natural resources, provide recreational opportunities for the population, and raise environmental awareness [16, 19].

The Law of the Republic of Uzbekistan "On Protected Natural Areas" defines nature parks as areas intended for recreational, scientific, and cultural use [1]. However, insufficient regulation of tourist flows may place pressure on ecosystems. Therefore, the guiding principle of PA utilisation is the reconciliation of conservation and recreational interests, thereby ensuring sustainability [16].

The "Uzbekistan – 2030" Strategy, adopted in a revised version in 2026, sets targets to increase the annual number of foreign tourists to 20 million, the number of domestic tourist trips to 25 million, and exports of tourism services to USD 6 billion by 2030 [2]. The natural recreational potential of the regions, which has not yet been fully utilised, represents an important opportunity for achieving these targets. According to official statistics, as of 2025, the total area of Uzbekistan's PA system amounted to 5,359.3 thousand hectares, representing a 6.5-fold increase compared with 2010 (823.2 thousand hectares) [25]. According to the World Bank, PAs cover 14.1% of the country's land area [27].

The aim of this study is to assess the tourism and recreational potential of the four major PAs in Jizzakh Region and to substantiate mechanisms for their sustainable utilisation.

LITERATURE REVIEW

P. Eagles, S. McCool, and C. Haynes developed international guidelines for planning and managing sustainable tourism in PAs [16]. Visitor management frameworks, including ROS, LAC, VERP, and others, are summarised in these guidelines and in the more recent guidelines edited by Y.-F. Leung et al. [19]. A methodology for the quantitative assessment of recreational carrying capacity was developed by M. Cifuentes [15], subsequently refined in further studies, and systematically reviewed [12].

In Uzbekistan, the physical and geographical characteristics, categories, and protection regimes of PAs have been systematically described by A. Khodjimatov and co-authors [18]. A. Nigmatov and N. Shomurotova divided the territory of Uzbekistan into fourteen ecotourism districts, using the location and resource potential of PAs as key criteria [23]. Z. Toshboyev and co-authors substantiated the scientific, educational, and recreational significance of ecotourism in PAs and described the principal directions of ecotourism routes [26].

For PAs in Iran, the environmental impacts of tourism were assessed using the Delphi method, while recreational carrying capacity was evaluated using the Cifuentes methodology. The relatively short active tourism season was identified as one of the factors limiting visitor numbers [24]. In Katon-Karagay National Park in Kazakhstan, the permissible recreational load was estimated at up to 5 persons per hectare in passive recreation zones and 20–100 persons per hectare in active recreation zones [13]. Meanwhile, in Ile-Alatau National Park, the average recreational carrying capacity was theoretically estimated at 67–70 persons per hectare [14].

Existing domestic studies primarily examine the ecotourism significance of PAs from a descriptive perspective [18, 23, 26]. However, to the best of our knowledge, no quantitative assessment of recreational carrying capacity, comparable to those conducted in previous studies [13-14, 24], has been undertaken for Jizzakh Region. The scientific novelty of this study lies in the integrated assessment of all major PAs in the region, their quantitative analysis based on the Cifuentes methodology, the comparison of recreational carrying capacity with the ecological benchmark, and the substantiation of sustainable utilisation mechanisms within the framework of national legislation.

RESEARCH METHODOLOGY

The information base of the study comprised legislation on PAs [1–11], official statistics [25], data of the National Committee for Ecology and Climate Change [21-22], scientific literature [12–22] and field observations.

Three methods were applied in the study: integral scoring to assess the potential of PAs against seven criteria on a 5-point scale (in the baseline scenario the criteria were equally weighted; the results were tested with alternative weights); the Cifuentes methodology to determine physical (PCC), real (RCC) and effective (ECC) carrying capacity [12, 15]; and SWOT analysis to evaluate strengths, weaknesses, opportunities and threats. The results were compared with the national ecotourism regionalisation [23] and international data [27].

Carrying capacity is calculated using sequential formulas: PCC = A × (1/Au) × Rf (A – available area, Au – area required per visitor, Rf – daily rotation factor); $RCC = PCC \times (100-Cf_1)/100 \times \ldots \times (100-Cf_n)/100$ (Cf – the limiting share of each correction factor, in per cent); ECC = RCC × MC (MC – management capacity coefficient). As no open data are available on the approved area of the park's recreation zone, the calculation was performed for a notional 50 ha unit. The calculation assumed a recreation zone area of A = 50 ha (500,000 m²), an area per visitor of Au = 100 m² (active recreation zone) and a rotation factor of Rf = 2.25 (9 h of active recreation time / 4 h average stay = 2.25). The values of the correction factors (slope – 25%, soil resistance to erosion – 15%, precipitation during the active season – 20%, biological sensitivity – 20%) were adopted on the basis of literature data and field observations. Seasonality over the year (share of the unfavourable period – 40%) was incorporated not into the daily carrying capacity but only into the calculation of annual visitation (365 × 0.60 = 219 days). In accordance with the Cifuentes methodology [15], the management capacity coefficient (MC) was set at 0.40 based on the author's expert assessment of the park's staffing, monitoring equipment and visitor infrastructure, and was tested in a sensitivity analysis (0.30–0.50). As an ecological reference point, the indicative value of 18–20 visitors per hectare per day given in a textbook for spring recreation on mountain slopes, hills and foothills was adopted [18]; it is not an officially approved standard and is hereinafter conventionally referred to as the "ecological benchmark". This value is lower than the loads estimated for national parks in the region [13-14] and is therefore a conservative value.

Artificial intelligence (AI) tools were used to a limited extent (approximately 10%) to support language editing, grammatical corrections, and technical refinement of the manuscript. AI assistance was restricted to improving the clarity, consistency, and academic presentation of the text. The research methodology, data analysis, interpretation of results, and scientific conclusions were developed independently by the author, who retains full responsibility for the accuracy and integrity of the study.

ANALYSIS AND RESULTS

Natural recreational resources of the PAs of the Jizzakh region. The Jizzakh region contains four large PAs: one national nature park, two state reserves and one wildlife sanctuary (Table 1) [8, 18, 21-22]. Their location across the main landscape zones of the region is shown in Figure 1.

Table 1
Main protected natural areas of the Jizzakh region

Protected area	Category	Area, ha	Year established	Main recreational focus
Zomin National Nature Park	Nature park (national)	23,429.2	1976	Mountain and health tourism
Zomin State Reserve	State reserve	26,921	1926/1960	Scientific and ecological tourism (restricted)
Nurota State Reserve	State reserve	22,017.97	1975	Ecotourism, observation of endemic fauna
Arnasoy Wildlife Sanctuary	Wildlife sanctuary	63,300	1983	Water-based tourism, birdwatching

Source: compiled from official data [8; 15; 25; 26].

Figure 1 illustrates the geographical distribution and key characteristics of four major protected natural areas in Jizzakh Region: Zomin National Nature Park, Zomin State Reserve, Nurota State Reserve, and Arnasoy Wildlife Sanctuary. Together, these areas cover 135,668 hectares and represent diverse natural landscapes, including mountains, foothills, steppes, deserts, lakes, and reservoirs.

Zomin National Nature Park covers 23,429.2 hectares and has the highest tourism and recreational potential, with an integrated assessment score of 31 out of 35 points. Zomin State Reserve occupies 26,921 hectares and received 24 points, while Nurota State Reserve covers 22,017.97 hectares and scored 21 points. Arnasoy Wildlife Sanctuary is the largest of the four areas, covering 63,300 hectares, with an assessment score of 26 points (Figure 1).

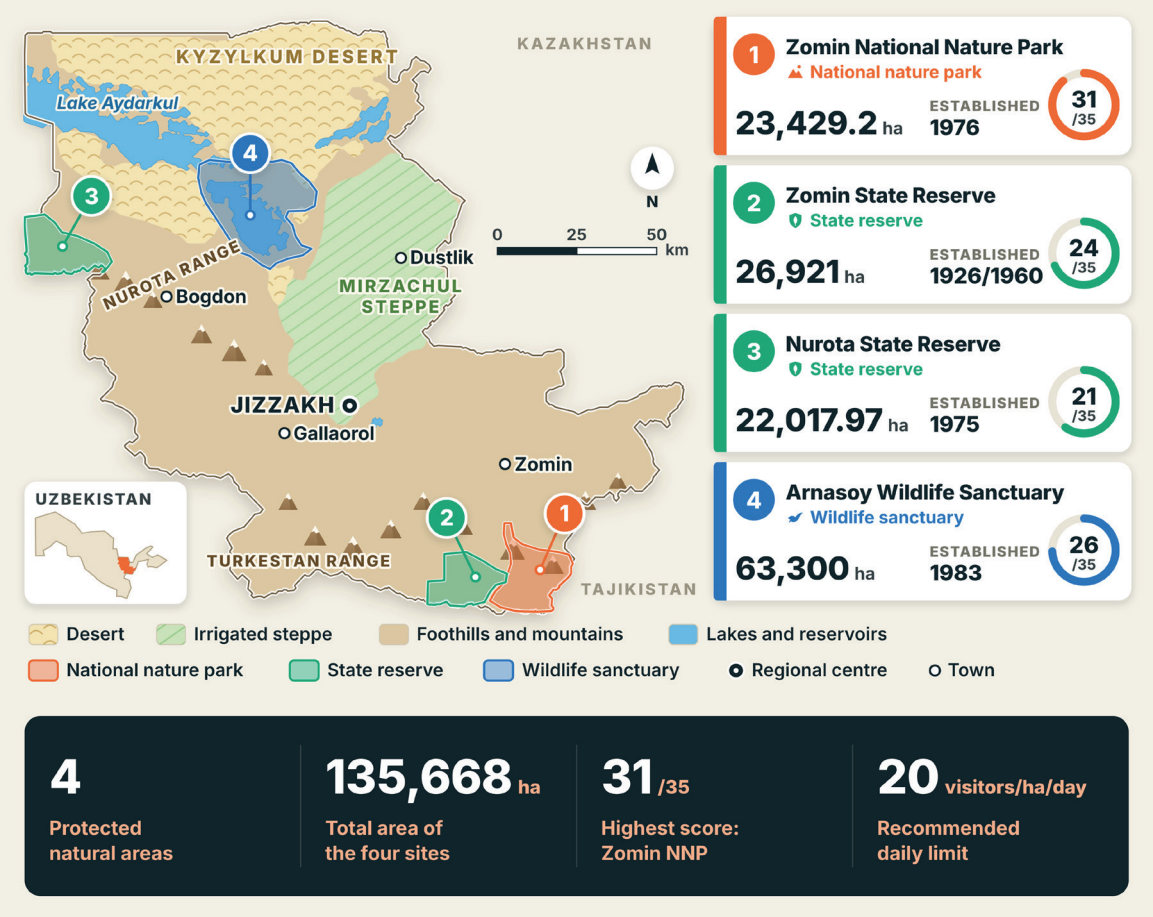


Figure 1. Location of the protected natural areas of the Jizzakh region and their key indicators[1]

Zomin National Nature Park was established in 1976 and is one of the earliest nature parks in Central Asia. It is located on the northern slopes of the Turkestan Range at elevations ranging from 1,000 to 4,033 m [18, 21]. The area is characterised by mountain steppes, juniper forests, and subalpine meadows, as well as rare species such as the snow leopard [18]. The “Zomin” sanatorium and numerous holiday camps located within the area [21] make it an important centre for health tourism, while the “Zomin” tourism and recreation zone has been established on the adjacent Suffa Plateau [5].

Zomin State Reserve was established in 1926 and re-established in 1960. It covers an area of 26,921 ha [22], while its buffer zone extends over 4,016.4 ha [6]. Under the strict protection regime, all activities other than scientific research and monitoring are prohibited, and visits are permitted only with special authorisation [1]. Consequently, tourism activities are primarily possible within the buffer zone and are subject to specific limitations [6].

Nurota State Reserve was established in 1975 in Forish District. In 2025, an additional 4,265.97 ha were incorporated into its territory, increasing its total area to 22,017.97 ha and extending its boundaries to adjoin Samarkand Region [8]. The reserve protects the largest population of Severtsov’s argali and the genetic resources of walnut trees. Tourism activities can be organised primarily within the buffer zone through designated ecological trails and observation platforms [6, 18].

Arnasoy Wildlife Sanctuary was established in 1983 and covers an area of 63,300 ha. It protects Lake Tuzkon and wetlands that serve as important stopover sites for migratory birds [20, 23]. A hotel has been constructed in the Aydar–Arnasoy Lake System area, and facilities have been developed for water-based tourism and birdwatching [20, 26]. In 2021, the lake system was designated a “recreational lakes area” [7]. The sanctuary’s protection regime regulates activities that could adversely affect its natural features [1].

Since 2019, the state reserves of the region have been under the jurisdiction of the authorised state body responsible for ecology, ensuring the implementation of a unified state policy for PA management [3]. The

1 Source: compiled by the author based on regional atlas maps and the data in Tables 1–2; boundaries of protected areas are approximate.

region's PAs are located within three ecotourism districts: Turkestan (Zomin National Nature Park and Zomin State Reserve), Nurota, and Aydarkul (Arnasoy) [23].

Integral Assessment of Tourism and Recreational Potential. Tourism and recreational potential was assessed using seven criteria on a five-point scale, where 5 indicates very high potential and 1 indicates very low potential. Scores were assigned by the author based on resource descriptions [18, 21-22], regulatory documents, and field observations, using predefined qualitative levels for each criterion. These criteria were based on indicators of landscape diversity, climatic comfort, water bodies, species diversity, road and transport accessibility, infrastructure, and the legal protection regime (Table 2).

Table 2
Integral assessment of the tourism and recreation potential of PAs

Assessment criterion (1–5)	Zomin National Nature Park	Zomin State Reserve	Nurota State Reserve	Arnasoy Wildlife Sanctuary
Natural and aesthetic value	5	4	4	4
Climatic comfort	5	5	4	3
Availability of water resources	4	4	2	5
Biological diversity	5	5	5	4
Transport accessibility	3	2	2	3
State of infrastructure	4	2	2	3
Permissibility of use under the legal regime	5	2	2	4
Total (out of 35)	31	24	21	26

Source: author's assessment based on resource descriptions [18, 21-22].

According to the assessment results, Zomin National Nature Park achieved the highest score (31 points), followed by Arnasoy Wildlife Sanctuary (26 points), Zomin State Reserve (24 points), and Nurota State Reserve (21 points). The park's leading position is attributable to the combined effects of its natural and aesthetic value, favourable climatic conditions, and infrastructure. Although the state reserves received high scores for biological diversity, their scores were lower for transport accessibility, infrastructure, and the legal protection regime. Arnasoy Wildlife Sanctuary was the only site to receive the maximum score (5 points) for water resources. The opening of Zomin Airport in 2023 [17] is expected to improve transport accessibility, although overland connections to the park remain limited.

In alternative scenarios in which a weight of 1.5 was assigned either to the accessibility criteria (transport, infrastructure, and legal protection regime) or to the natural criteria, the ranking of the sites remained unchanged. The respective scores, expressed as percentages of the maximum weighted score, were as follows: Zomin National Nature Park – 87.1% and 90.0%; Arnasoy Wildlife Sanctuary – 72.9% and 75.6%; Zomin State Reserve – 63.5% and 73.3%; and Nurota State Reserve – 56.5% and 63.3%. These findings demonstrate the robustness of the assessment results to alternative weighting schemes.

Recreational Carrying Capacity Calculation. As access to the state reserves is subject to strict protection requirements, recreational carrying capacity was calculated for Zomin National Nature Park, which has a legally designated recreational zone [1] and the highest assessed tourism and recreational potential (Table 3).

Table 3
Carrying capacity calculation for the recreation zone of Zomin National Nature Park (for a notional 50 ha)

Indicator	Calculation	Result
Physical carrying capacity (PCC)	(A / Au) × Rf = (500,000 / 100) × 2.25	≈ 11,250 visitors/day
Real carrying capacity (RCC)	PCC × 0.75 × 0.85 × 0.80 × 0.80	≈ 4,590 visitors/day
Effective carrying capacity (ECC)	RCC × MC (0.40)	≈ 1,836 visitors/day
Check against the ecological benchmark	18–20 visitors/ha/day × 50 ha [15]	900–1,000 visitors/day

Source: author's calculation based on the methodology of [16; 19] and the ecological benchmark [15].

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The effective carrying capacity (ECC) exceeds the ecological benchmark (900–1,000 visitors per day) by a factor of 1.8–2.0 [18]. Consequently, visitor numbers are constrained by the ecological benchmark rather than by management capacity. Therefore, the upper value of the benchmark—20 visitors per hectare (equivalent to 1,000 visitors per day for the hypothetical 50-hectare area)—was adopted as the daily visitation limit. During ecologically sensitive periods, it is recommended that this limit be reduced to 900 visitors per day. Given the daily visitation limit, annual visitor numbers can be increased primarily by extending the active tourism season beyond ecologically sensitive periods, particularly through the development of autumn and winter tourism products.

In the sensitivity analysis, the management capacity coefficient (MC) was varied within the range of 0.30–0.50, while the four correction factors were varied by ±5 percentage points. Under these conditions, ECC ranged from 1,063 to 2,926 visitors per day, compared with the baseline value of 1,836 visitors per day. Even under the least favourable scenario, ECC remained above 1,000 visitors per day, indicating that the recommended visitation limit is not sensitive to the selected MC values and correction factors within the ranges examined. However, this conclusion applies when Au = 100 m². If the area required per visitor (Au) exceeds approximately 184 m², ECC becomes the limiting factor.

SWOT Analysis of Sustainable Utilisation. The sustainable utilisation of the region's protected natural areas was assessed using a SWOT matrix (Table 4).

Table 4

SWOT analysis of the sustainable use of PAs in the Jizzakh region

STRENGTHS (S) – four diverse PAs: mountain, desert and aquatic landscapes – rare and endemic flora and fauna – unified state policy on PAs – expanded transport access owing to the new Zomin Airport – designation of buffer zones	**WEAKNESSES (W)** – insufficient tourism infrastructure – pronounced seasonality of visitation – shortage of qualified personnel and weak marketing – weak monitoring and carrying capacity management systems
OPPORTUNITIES (O) – growing demand for domestic tourism and ecotourism – public–private partnership and investment – adaptation of international management experience (IUCN guidelines) – priority given to tourism in state policy	**THREATS (T)** – ecological pressure from uncontrolled visitor flows – climate change and changes in the water regime – conflict between protection regimes and tourism interests – landscape degradation due to unplanned construction

Source: compiled by the author.

According to the SWOT analysis, unique natural resources (S) and government support for tourism development (O) provide a foundation for addressing infrastructure and staffing challenges (W), while the need to regulate visitor flows (T) highlights the importance of carrying-capacity-based management.

Discussion of Results and Mechanisms for Sustainable Utilisation. International visitor management frameworks (ROS, LAC, and VERP) emphasise not the unlimited growth of visitor flows but their adjustment to the carrying capacity of protected areas [16, 19]. According to the World Bank, Uzbekistan ranks second in Central Asia in terms of the proportion of terrestrial protected natural areas (14.1%), following Tajikistan (22.6%). The corresponding figures are 10.1% for Kazakhstan, 6.8% for Kyrgyzstan, and 4.3% for Turkmenistan [27]. The figure of 14.1% for Uzbekistan is also used in the "Uzbekistan – 2030" Strategy as the baseline indicator for 2025, with a target of increasing it to 15% by 2030 [2]. By comparison, the proportion calculated using Statistics Agency data is approximately 11.9% [25]. This difference may be attributable to variations in the categories of protected natural areas included in the calculations and the reporting dates.

The economic implications of carrying-capacity-based management were assessed using the visitor fee system as an example (Table 5). The daily fee for visiting protected natural areas is set at 5% of the base calculation amount (BCA) [4]. Based on a daily visitation limit of 1,000 visitors for the hypothetical 50-hectare area and an active season of 219 days per year (365 × 0.60), annual visitation would amount to 219,000 visitors. At the current entry fee of UZS 22,000, the theoretical maximum annual revenue would reach UZS 4.82 billion. This calculation assumes that the daily visitation limit is reached on every day of the active season and does not account for concessionary visitor categories [4]. Consequently, actual revenue would be lower.

Under the law, revenues generated from visitor fees are allocated to the conservation and restoration of natural sites [1]. If, hypothetically, 30% of the revenue were allocated to conservation and monitoring activities, up to UZS 1.45 billion per year could be made available for these purposes (Table 5).

Table 5
Estimated potential revenue from the visitor fee system in Zomin National Nature Park (for a notional 50 ha recreation zone)

Effective from	BCA, UZS	Entry fee (5% of BCA), UZS	Upper bound of annual revenue, billion UZS	Allocated to protection and monitoring (notional 30%), billion UZS
October 2024	375,000	18,750	4.11	1.23
August 2025	412,000	20,600	4.51	1.35
September 2026	440,000	22,000	4.82	1.45

Source: author's calculation based on data from [4; 9–11] (annual visitation: 1,000 visitors/day × 219 days = 219 thousand visitors).

Based on the analysis, the following mechanisms for sustainable utilisation have been substantiated, each grounded in the relevant provisions of national legislation:

1. Functional zoning. Clear delineation of strict protection, recreation, and active tourism zones within the nature park, with tourism activities in state reserves restricted to their buffer zones [1]. Under the law, nature parks, including national nature parks [1], are divided into reserve, recreation, economic, and resort zones [1].

2. Carrying-capacity-based management. For each zone, a daily visitation limit should be established based on the lower of the effective carrying capacity (ECC) and the ecological benchmark and incorporated into the PA management plan [1]. Seasonality can be addressed through visitor rotation, discounted off-season prices, and year-round tourism products [23]. The legal provisions permitting managed ecological tourism in buffer zones [6] provide a basis for implementing this mechanism.

3. Public–private partnership. Tourism infrastructure around PAs should be developed through public–private partnerships in compliance with environmental standards and in accordance with state policy priorities [2].

4. Involvement of local communities. Through agritourism, guesthouses, and guiding services around PAs, local residents can generate income from tourism, thereby strengthening positive attitudes towards nature conservation [16, 18].

5. Visitor fees and reinvestment. It is advisable to allocate a certain proportion of revenue generated from existing visitor fees [4] to conservation and monitoring activities, as provided for by law [1].

CONCLUSION AND RECOMMENDATIONS

The four major PAs of Jizzakh Region belong to three ecotourism districts (Turkestan, Nurota, and Aydarkul) and offer considerable opportunities for mountain, scientific and ecological, and water–desert tourism.

In the integrated assessment, Zomin National Nature Park achieved the highest score (31 points), and its leading position remained unchanged under alternative weighting schemes. Improving infrastructure and transport accessibility remains a priority for all the areas examined.

For a hypothetical 50-hectare recreational zone, the effective carrying capacity (ECC ≈ 1,836 visitors per day, equivalent to approximately 37 visitors per hectare) exceeds the ecological benchmark by a factor of 1.8–2.0. Accordingly, a daily visitation limit of 20 visitors per hectare (1,000 visitors per day for 50 ha) is recommended. This limit remains applicable across all scenarios examined in the sensitivity analysis. The principal means of increasing annual visitation is to extend the active tourism season.

Five mechanisms for sustainable utilisation, ranging from functional zoning to the reinvestment of visitor fees, have been substantiated within the framework of national legislation [1].

At the current entry fee of UZS 22,000, the visitor fee system could generate up to UZS 4.82 billion annually from a hypothetical 50-hectare recreational zone (theoretical maximum), of which a hypothetical 30% (UZS 1.45 billion) could be allocated to conservation and monitoring activities.

The findings of this study can be used by the regional khokimiyat (administration), tourism authorities, and environmental protection agencies to substantiate PA development programmes, functional zoning projects, and investment proposals, as well as to develop new tourism development concepts [2] for the "Zomin" tourism and recreation zone and the Aydar–Arnasoy Lake System.

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