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# ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

# ECONOMIC-GEOGRAPHICAL ASSESSMENT OF ENSURING SUSTAINABLE DEVELOPMENT IN SHAHDAG NATIONAL PARK

Speciality: 5401.01 - Economic geography

Field of science: Geography

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## GENERAL CHARACTERISTIC OF THE WORK

**Relevance of the topic and degree of elaboration.** In the current period, many ecological problems lead to factors that affect regional economic changes and, at the same time, the quality of human life. Under conditions of population growth, the extensive use of land and water resources, and vegetation degradation lead to results that cause ecological tension. Addressing the arising ecological and socio-economic problems, including the management of land and water resources and ensuring the welfare of local communities, remains a priority area in today's context for planning environmental management. The implementation of such management plans is based on fulfilling the requirements of ecological legislation that define the structure and main areas of activity of natural and economic systems.

The elimination of eco-economic problems emerging in our country, while maintaining its high relevance, underscores the importance of planning natural resource use and the efficient implementation of territorial organization of economic activities. It is essential to develop integrated objectives and measures to improve systems for managing the economy and the environment in this field. Considering our country's unique geographical position, the research focuses on the application of modern technologies for spatial planning and the use of leading experts' achievements in the field of natural resource use, which provide a foundation for achieving sustainable development goals. This approach serves as an efficient system for managing socio-economic and ecological activities, contributing to the resolution of economic-geographical problems and the improvement of the population's quality of life.

The topic of the research work lies at the intersection of geography, economics, and ecology, and is scientifically based on the organization of management. The research utilizes the studies of A.M. Hajizadeh, Є.Y. Goychayski, T.G. Hasanov, Z.N. Eminov, N.A. Pashayev, Ch.N. Ismayilov, A.A. Gurbanzada, M.A. Museyibov, B.A. Budagov, A.A. Mikayilov, M.C. Ismayilov, Q.Sh.

Mammadov, A.M. Shikhlinsky, A.A. Madatzadeh, R.N. Mahmudov, S.G. Rustamov, F.A. Imanov, M.Y. Khalilov, and other scholars in studying and assessing natural and socio-economic resources. The theoretical and methodological foundations of spatial planning primarily relied on the works of C. Haaren, D. Bruns, D. Gruen, A.N. Antipov, A.V. Drozdov, E.Y. Kolobovski, R.M. Mammadov, L.A. Ismailova, S.N. Yusifova, and others.

**Object and subject of the research:** The research object of the dissertation is Shahdag National Park, which is considered a complex geosystem, and the residential areas located in its surrounding regions. The subject of the research topic is the economic-geographical assessment of the area and the ecological and socio-economic substantiation of planning organization.

**Purpose and objectives of the research:** The main purpose of the research is to develop a plan of actions and measures for the improvement of socio-economic and ecological management mechanisms in Shahdag National Park and its surrounding areas based on the concept of territorial planning, aiming to ensure sustainable development. To achieve this goal, the following objectives have been set:

- Inventory and mapping of the natural and socio-economic resource potential of Shahdag National Park and its surrounding areas.
- Studying the regularities and dynamics of population distribution according to altitude in the research area.
- Economic-geographical assessment of the resource potential based on categories of significance and sensitivity.
- Assessment of tourism potential and determination of development strategies.
- Environmental safety assessment and establishing a model of its organization in the national park.
- Determining the direction of sustainable development of the research area: defining the sectoral structure of socio-economic development and environmental management, and the integrated system of measures.
- Preparation of recommendations for improving management and territorial organization in the study area.

**Research methods:** The research is based on the principles and procedures of eco-economically oriented planning models for land use management and environmental protection. The study employs comparative geographical, cartographic, and literature analysis methods, as well as remote sensing, structural-functional methods, regional planning, and environmental impact assessment techniques. During the inventory and assessment stages of the research, multispectral images from Landsat and Sentinel satellites were used. The preparation of maps was carried out using ArcGIS and ERDAS software.

**The main provisions of the defense:**

1. Implementation of socio-economic conditions and territorial organization of nature conservation in Shahdag National Park and its surrounding areas according to planning principles and procedures.

2. Organizing planning that encompasses population distribution, economic-geographical and natural resource potential inventory and assessment, and functional zoning in Shahdag National Park and its surrounding areas.

3. Development strategy for tourism and, environmental safety assessment, management, and establishing a model of its organization in Shahdag National Park and its surrounding areas.

4. Identifying socio-economic development goals and determining management functions considering planning elements in Shahdag National Park and its surrounding areas.

**Scientific novelty of the research:**

1. For the first time, planning rules aimed at solving economic-social and ecological problems were developed for Shahdag National Park and surrounding areas with complex mountainous terrain and natural conditions.

2. A digital database consisting of thematic maps, graphs, and tables has been created for structuring the planning and developing functional management mechanisms in the research area. Main planning elements were inventoried, and an economic-geographical assessment were conducted according to criteria of significance and sensitivity.

3. Using analytical multi-criteria decision-making methods, internal and external factors affecting the national park's ecosystems, socio-economic conditions, and the development of tourism have been assessed based on social surveys, and development strategies for the management of the area have been determined.

4. A comparative analysis using satellite data revealed that anthropogenic impacts are more intense in the buffer zone of the national park. Over the last 20 years, a total of 716 hectares of forest area, including trees in household plots, have been lost in the research area, averaging 35.8 hectares per year. This is up to 10 times more than the reforestation process. Within the boundaries of the national park, the implementation of the protection regime is accelerating the natural restoration process. Additionally, the rapid reduction (2.7% annually) of high-altitude glacial ecosystems as a sensitive indicator of climate change has also been observed.

5. Integrated innovative objectives for improving the sectoral and territorial structure of economic activities in the field of managing the socio-economic and ecological aspects of efficient land use have been established, and an action plan that defines the directions of development has been proposed.

**Theoretical and practical significance of the research:** Integrated territorial planning for solving management problems in the use of natural resources provides a foundation for the further development and improvement of scientific-practical and methodological bases in our country.

The practical significance of the work lies in the conceptual approach developed within the framework of the dissertation based on teritorial planning methodology. This approach can be used to optimize management systems in terms of the territorial organization of natural resource use and socio-economic development. The application of the new integrated approach and environmental planning in both existing and planned management systems can become one of the key factors in increasing the efficiency of these systems and enhancing environmental protection. The conceptual approach proposed for optimizing environmental management

systems can be adapted for bringing land into agricultural circulation and other sectors of the economy linked to landscape systems.

In addition, the application of planning mechanisms in organizing management systems can lead to a significant reduction in negative environmental impact and help achieve sustainable socio-economic development goals.

**Approbation and application.** Topics reflecting the results obtained in the research have been presented at scientific-practical conferences and forums held in the country and abroad: "Geographical Problems of the Regions of Azerbaijan" Republican Scientific Conference - Baku, 2016; "New Directions in the Development of Agriculture and Environmental Protection" Republican Scientific Conference - Baku, 2021; "Tourism and Recreation: Innovations and GIS Technologies" Proceedings of the XIII International Scientific-Practical Conference - Astrakhan, 2021; International Demographic Forum - Demography and Global Challenges - Voronezh, 2021; "Heydar Aliyev's Role in the Development of Science and Education in Azerbaijan" Republican Scientific-Practical Conference - Baku, 2023; "Current Problems of Natural Sciences" Proceedings of the XII International Scientific-Practical Conference - Petropavlovsk, 2024.

18 scientific articles and theses reflecting the theoretical principles and results of the dissertation topic have been published.

The research results can be utilized in practical work conducted by the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan, the Ministry of Economy of the Republic of Azerbaijan, and in the implementation of state programs.

**The name of the organization where the dissertation work was carried out:** The dissertation work was completed at the Institute of Geography named after academician H.A. Aliyev of the Ministry of Science and Education of the Republic of Azerbaijan.

**Volume and structure of the dissertation:** The dissertation work consists of an introduction, 4 chapters, a conclusion, and a list of references. The total volume of the work is 174 pages. Chapter I is 26 pages, Chapter II is 54 pages, Chapter III is 34 pages, and Chapter IV is 31 pages, with the conclusion taking up 3 pages. The research

includes 38 figures, 34 tables, and a reference list of 196 sources. The dissertation comprises 232,197 characters excluding tables, graphs, figures, and reference lists.

## BRIEF CONTENT OF THE DISSERTATION

The introduction provides information on the relevance of the topic, the objectives and tasks, the research methods, the main provisions of the defense, scientific novelty, theoretical and practical significance, and its volume and structure.

The first chapter of the dissertation is titled "**The Main Principles of the Territorial Organization and Planning of National Parks**". This chapter analyzes the geographical principles of organizing national parks worldwide and in Azerbaijan, the scientific-methodological characteristics of their planning, and the role of national parks in management.

The establishment of national parks has been one of the important steps contributing to sustainable development in the preservation of the world's natural resources and the support of tourism. National parks are multi-functional management entities with complex field structures. All types of activities within national park areas are subject to two main tasks: preserving natural, aesthetic, and cultural-historical values, and ensuring that visitors enjoy the natural environment. According to the International Union for Conservation of Nature (IUCN) classification, national parks belong to the second category.

In modern times, one of the key issues facing national parks is related to visitors. With the increasing interest in national parks, the rise in the number of tourists has led to an increase in negative impacts on ecosystems and species of fauna and flora. Such problems highlight the importance of issues related to the management of national parks, making methodological and principled approaches in this field more relevant.

Since 2003, the national parks established in our country have played a highly significant role in the preservation of biodiversity and the support of ecotourism. Currently, there are a total of 10 national parks covering 10.3% of the country's territory[1]. Shahdag National Park is the largest national park in the South Caucasus, including Azerbaijan. Covering the middle and high mountainous areas of the Greater Caucasus mountains, the current area of the national park spans 130,508.1 hectares. In accordance with legislation, a buffer zone 3,000 meters wide has been designated around the perimeter of the national park for the research area. The total area, including the buffer zone, amounts to 381,744 hectares. The national park encompasses the mountainous areas of six administrative districts in the country: Oghuz, Gabala, Ismayilli, Shamakhi, Guba, and Gusar.

In the planning and evaluation implemented in the national park, key considerations include determining the carrying capacity of natural components, taking into account the impact of different forms of natural resource use on nature or vice versa, preparing the development concept of the area, establishing environmental quality criteria, and ultimately planning conservation measures. Maps of functional land use form the basis of spatial planning, along with criteria such as sustainability, significance, sensitivity, environment, natural resources, and socio-economic indicators, which allow for a comprehensive assessment of the area. Ultimately, the main areas of activity and measures conceptualized for the national park and surrounding areas are applied to or integrated into the regional socio-economic development plan for the area. When implementing balanced development in the national park and surrounding areas, socio-economic and natural-ecological factors must be given equal consideration. Key issues include the balanced use of resources, the development of coordination mechanisms for optimizing public and natural systems, the legal and regulatory regulation of land use, the

[1]Ismayılov, M.J., Jabrayilov, E.A. "Landscape-Ecological Diversity and Framework Model of Specially Protected Natural Areas in Azerbaijan." Geography and Natural Resources, Baku, 2019, No. 2(10), pp. 11-19.

search for new alternative resources to support regional development, and scientific and information support for management organizations. Territorial planning is one of the most effective tools aimed at the protection and development of the environment as well as the improvement of socio-economic conditions. This approach is also considered equivalent to sustainable development of the area, combining ecological and economic objectives. Among the scholars and experts who have worked in the field of landscape planning, notable names include Bruns D., Dietz K., Haaren C., Stein C., Albert C., Zimmermann T., Herberg A., Riedel W., Antonov A.N., Kravchenko V.V., Semenov Y.M., Fyodorov V.N., Drozdov A.V., Kolbovskiy Y.Y., Mammadov R.M., Ismailova L.A., Yusifova S.N., and others.

An important aspect of territorial planning is the application of Geographic Information Systems (GIS) as an effective tool for analyzing, integrating, and presenting data collected from various aspects. The gathering and merging of data pertaining to different geographic units in the planned area within the same spatial context are among the main advantages of GIS technologies. Analyses conducted in GIS provide valuable insights into landscape complexity to planners and decision-makers, enabling them to make informed choices that promote sustainable development and natural resource conservation.

The second chapter of the dissertation is dedicated to "**Inventorying the Natural and Socio-Economic Potential in Shahdag National Park and its Surrounding Areas**". This chapter focuses on inventorying the natural and socio-economic resources of the national park. First, the relief characteristics, climate conditions, hydrographic network, soil resources, flora and fauna composition, and landscape cover of the research area were inventoried.

Based on the digital elevation model, hypsometric indicators were calculated, revealing that most of the total area (48.7%) consists of elevations ranging from 1,000 to 2,000 meters. Areas with elevations above 4,000 meters cover the smallest portion (0.2%) of the area.

Based on ***climate*** characteristics, four climate types are typical for the research area[2]. These include: 1. Cold climate type with dry winters, which is prevalent on the northeast slopes of the range at elevations between 1,400 and 2,700 meters above sea level. 2. Mild-warm climate with evenly distributed precipitation throughout all seasons, which is observed on the southern and northeast slopes of the Greater Caucasus. 3. Cold climate with abundant precipitation in all seasons, which is found in the southern zone of the Main Caucasus range in the high mountain-forest and alpine belts. 4. Mountain tundra climate, which is characteristic of high mountain zones with absolute elevations above 2,700 meters.

The Greater Caucasus Mountains, where Shahdag National Park is located, play a significant role in shaping the ***hydrographic*** networks of the country. The main rivers of the southern slope of the Main Caucasus range are Dashagilchay, Filfilichay, Tikanlichay, Demiraparanchay, Goychay, Girdimanchay, Aghsuchay, and their tributaries. The main rivers flowing along the northeast and southeast slopes are Gusarçay, Gudyalçay, Garachay, Aghchay, Velvelechay, Gilgilchay, and Pirsaatçay. The density of the river network on the northeast slope varies from 0.3-0.5 km/km² in the lower mountainous areas to 0.6-0.9 km/km² in the middle and high mountainous areas. On the southern slope, it ranges from 0.5-0.6 km/km² in the lower mountainous areas to 0.6-0.8 km/km² in the middle and high mountainous areas.

The main ***soil*** types prevalent in the area include primitive and peaty mountain-meadow, grassy mountain-meadow, brown mountain-forest, dark brown mountain-forest, mountain black and flooded alluvial-meadow soils[3]. The higher mountainous areas are covered with rocky outcrops.

The ***vegetation*** in the area is represented by alpine meadows, subalpine meadows and tall grasses, mountain meadows and meadow

[2] National Atlas of the Republic of Azerbaijan [Map] / – Baku: Baku Cartography Factory, – 2014. – 444 p.

[3] Geographical Atlas of the Republic of Azerbaijan [Map] / – Baku: Baku Cartography Factory, – 2018. – 208 p.

steppes, forests, and shrub formations. The main ***animal*** species found in the high mountainous areas include the Caucasian tur (*Capra cylindricornis*), chamois (*Rupicapra rupicapra*), Caucasian snow vole (*Chionomys gud*), Caucasian grouse (*Tetraogallus caucasicus*), griffon vulture (*Gyps fulvus*), falcon (*Falco sp*.), bearded vulture (*Gypaetus barbatus*), rock lizards (*Darevskia sp*.), and others[4].

The main landscape types found in the national park and its designated buffer zone include river-valley landscapes of alluvial plains, alluvial plain landscapes of forests, forest-steppes, meadow-steppes, shrublands, low and middle mountainous forest-steppes, steppes, and mountain-meadow landscapes, arid low and middle mountainous forests and forest-shrubs, middle and partially high mountainous beech-hornbeam and oak-hornbeam forests, subalpine meadows, alpine meadows, and subnival and nival landscapes[5].

As the inventorying phase continued, the socio-economic conditions of the area were studied. The buffer zone of Shahdag National Park includes a total of 110 administrative-territorial units, of which 4 are settlements and 106 are villages. The total number of administrative-territorial circle that encompass the settlements is 48. By district, the study involved 3 villages in Oghuz district, 1 settlement and 6 villages in Gabala district, 1 settlement and 39 villages in Ismayilli district, 1 settlement and 14 villages in Shamakhi district, and 1 settlement and 45 villages in Guba district. The population living in the villages and settlements located in the buffer zone of the national park was calculated based on the 2019 population census[6]. A total of 70,170 people have settled in the research area, representing 0.7% of the population of Azerbaijan. In the research area, 2,736 people reside in the Oghuz district, 11,526 people in the Gabala district, 23,727 people in the Ismayilli district,

[4] Taxonomic Spectrum of the Fauna of Azerbaijan (Vertebrates) / Editor-in-Chief E.I. Ahmedov – Baku: "Science and Education", – 2020. – 144 p.

[5] Landscape Map. Republic of Azerbaijan. [Map] / – Baku: Baku Cartography Factory, Ministry of Ecology and Natural Resources. – 2017.

[6] Population Census in the Republic of Azerbaijan. 2019. / State Statistical Committee of the Republic of Azerbaijan – Volume I, – Baku: – 2022. – 684 p.

6,822 people in the Shamakhi district, and 25,359 people in the Guba district.

One of the economic-geographical indicators is the region's transportation infrastructure. The main transportation network consists of roads of local significance that connect mountain villages with each other or with district centers. The section of the road of national significance passing through the research area is the Mughanli-Ismayilli-Gabala highway from Bizlan village in Ismayilli District to Sumaghalli village (R8 and R9), which has a total length of 47 km. The main roads that pass through the buffer zone of the national park include Guba-Khinalig (51 km), Guba-Gonaqkend-Muchu (69 km), Amsar-Tulekheran-Zeyir (40 km), Shamakhi District's Shamakhi-Chukhuryurd-Zarat Kheibari (44 km), Chukhuryurd-Dadagunash-II Chagan (13 km), Chukhuryurd-Galeybugurd (9 km), Basgal-Sulut (6 km), R8-Lahij-Burovdal (37 km), Lahij-Mudru (15 km), R8-Diyalli-Guyum (8 km), R9-Sumaghalli-Qalaciq (7 km); Qabala District's Gabala-Kusnet-Laza (12 km), Gabala-Bum-Gamervan (16 km), Bum-Tikanli-Abrikh (10 km); Oghuz District's Sinjan-Khachmaz-Filfili (21 km), Oghuz-Khalkhal-Istisu (22 km), Oghuz-Bash Dashagil (22 km), and others, which connect various settlements in the area.

Some socio-economic indicators from certain villages in the research area of Shamakhi District are presented in Table 1. In livestock farming, Galeybugurd village (1,183 heads) stands out for the number of cattle, while Chukhuryurd (6,812 heads), Galeybugurd (4,620 heads), and Demirchi (3,500 heads) villages stand out for the number of sheep and goats. Chukhuryurd and Nagarakhana villages have relatively high indicators in terms of grain cultivation, as they have more land available for farming. In 2022, 1,429.5 tons of grain were harvested from 723 hectares in Chukhuryurd, while 950 tons of grain were harvested from 515 hectares in Nagarakhana (Table 1). The productivity is 18-19 quintals per hectare (Figure 1).

Table 1

Socio-economic indicators in some villages included in the study area of Shamakhi district

| | Settlements | | | | |
|---|---|---|---|---|---|
| | Avakhəl | Naghara-khana | Chukhuryurd | Dadagunash | Damirchi |
| Educational institution | 1 | 1 | 1 | 1 | 1 |
| Healthcare facilities | - | 1 | 1 | 1 | 1 |
| Cultural facilities | 2 | 3 | 2 | 3 | 3 |
| Administration and organizations | - | 10 | 10 | 4 | 4 |
| Number of farms | 110 | 405 | 520 | 65 | 76 |
| Number of houses | 90 | 372 | 437 | 47 | 70 |
| Total number of livestock | 1723 | 3297 | 7792 | 590 | 3900 |
| Cattle | 213 | 375 | 980 | 350 | 400 |
| Sheep and goats | 1510 | 2922 | 6812 | 240 | 3500 |
| Grains (ha/tons) | 20 / 26,6 | 515 / 950 | 723 /1429,5 | 88 / 155,6 | 261/458,6 |
| Vegetables (ha/tons) | 4 / 25,5 | 6 / 45 | 9 / 98,5 | 7 / 53,3 | 4 / 29,9 |
| Potatoes (ha/tons) | 4 / 27,2 | 8 / 54,4 | 46 / 315 | 16 / 108,8 | 6 / 42 |
| Fruits (ha/tons) | 5,5 / 9,6 | 5,1 / 12 | 17,6 / 8,2 | 7,2 / 18,8 | 5,9 / 14,1 |

***Note:*** *The table was prepared based on data from the Shamakhi District Statistics Office. (2022).*

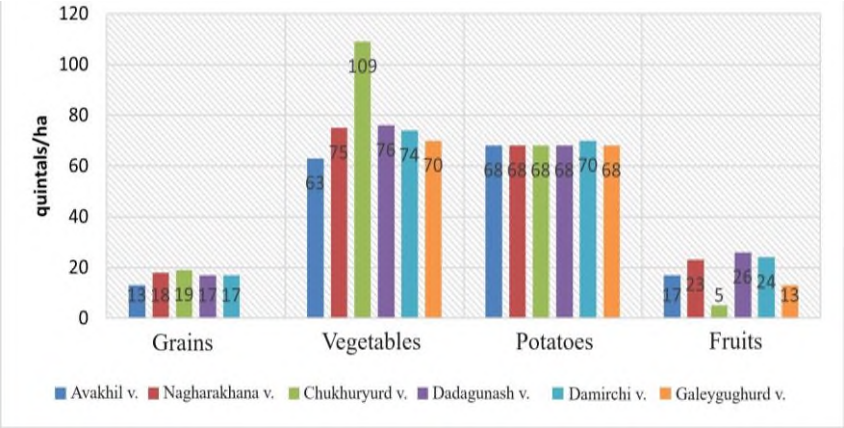


Figure 1. Productivity indicators of agricultural crops in villages of Shamakhi district (quintals/ha)

As part of terrirorial planning, the tourism potential indicators of natural, historical, and cultural monuments in the research area were inventoried, and tourism sites were analyzed according to the administrative districts included in the buffer zone of the national park (Figure 2).

The third chapter of the dissertation involves **the assessment of natural and socio-economic resources in Shahdag National Park and its surrounding areas**. In this phase, the patterns of ***population*** distribution according to elevation zones were initially studied (Table 2). It was determined that the majority of settlements (94.5%) and population (95.8%) in the research area are located in foothill areas with elevations between 520 and 1,500 meters[7]. Arable lands and settlements decrease due to the increase in elevation and the harshening of climate conditions. The diversity of the functional structure of rural settlements can be explained by the impact of vertical zonation on the distribution of agricultural crops and differences in farm types across the area. The number of people living above the aforementioned elevation threshold is only 2,937.

[7] Eminov, Z.N., Jabrayilov, E.A. Characteristics of the distribution of population according to elevation zones in the buffer zone of Shahdag National Park // Scientific Works. Series of Natural and Medical Sciences, Nakhchivan State University, Nakhchivan, No. 3 (124), pp. 103-109.

Settlements are observed up to an absolute elevation of 2,200 meters (in Khinalig village). In 54% of the villages, the population is up to 500 people. The highest population density (92 people/km²) is in areas with elevations up to 1,000 meters.

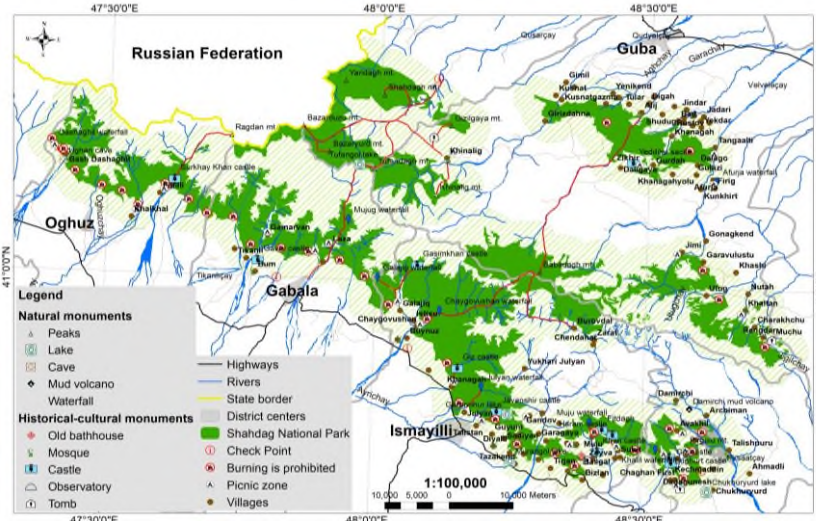


Figure 2. Tourism Potential Map of Shahdag National Park[8]

To track the population dynamics in the settlements within the research area, data from the population censuses conducted in 2009 and 2019 were used[9,10]. A comparative analysis revealed a 7% increase in the total population during the period under review. The settlements that experienced the most population growth include Bum settl. and Tikanli v. in Gabala district, Talistan v., Qalajig v., and Istisu v. in Ismayilli district, Chukhuryurd v. and Nagharakhana v. in Shamakhi district, and Gonaqkand settl., Yukhari Digah v., and Rustov v. in Guba district, among others. The settlements that

[8] Jabrayilov, E.A. Sustainable development of tourism in Shahdag National Park: opportunities and problems // Scientific works, Nakhchivan University, – Nakhchivan: – 2023. – No. 1, – pp. 84-91.

[9] Population Census of the Republic of Azerbaijan. 1999. / State Statistical Committee of the Republic of Azerbaijan – Volume I, Baku: – 2000. – 567 p.

[10] Population Census in the Republic of Azerbaijan. 2019. / State Statistical Committee of the Republic of Azerbaijan – Volume I, Baku: – 2022. – 684 p.

recorded the greatest population decreases include Sulut v. in Ismayilli district, Avakhil v. in Shamakhi district, and Kelebagh v., Shudug v., and Noydun v. in Guba district, among others.

Table 2

The distribution of population and settlements in the buffer zone of Shahdag National Park according to elevation zones

| **Elevations, in meters** | **Area of elevation zones** | | **Number of settlements** | | **Population** | | **Average population in settlements** | **Population density** |
|---|---|---|---|---|---|---|---|---|
| | $km^2$ | % | number | % | people | % | people | people/$km^2$ |
| 520-1000 | 454,8 | 11,9 | 57 | 51,8 | 41932 | 59,7 | 711 | 92 |
| 1000-1500 | 976,2 | 25,6 | 47 | 42,7 | 25301 | 36,1 | 550 | 26 |
| 1500-2000 | 881,47 | 23,1 | 5 | 4,5 | 958 | 1,4 | 192 | 1,1 |
| Above 2000 | 1504,94 | 39,4 | 1 | 0,9 | 1979 | 2,8 | 1979 | 1,3 |
| Total | 3817,44 | 100 | 110 | 100 | 70170 | 100 | 638 | 18,3 |

In accordance with methodological guidelines, the natural resource potential was assessed in this phase of the dissertation based on economic-geographical significance and sensitivity categories. First, the ***agroclimatic*** resources were evaluated. The assessment of agroclimatic conditions according to the category of significance was conducted with consideration of the impact of climate factors on human life activities, including agriculture. The identification of temperature indicators conducive to human habitation and the establishment of criteria were key indicators in the evaluation process. The existing agroclimatic zoning was used for this

purpose[11]. The primary criteria for significance were favorable agroclimatic conditions and the selection of regions conducive to human agricultural activity, which were categorized into high, medium, and low significance levels. Thus, in the southern slope subregion, 2 regions fall under the high significance category: the semi-arid and semi-humid, warm Ganikh-Ayrichay, and the humid, warm Zagatala-Gabala regions. Zones determined to be of medium significance include the humid Istisu-Lahij region with moderate warmth, the semi-arid, moderately warm Guba-Gusar region, and the semi-humid Yenikend-Zeykhur region with moderate to below-average warmth. The remaining 5 agroclimatic zones encompassing the high mountainous areas were classified under the low significance category. These include the moderately warm, humid Gumbashi-Aghbulag and the cold, humid Guton-Babadagh regions on the southern slope; the humid Gizilgaya-Aygedik region with below-average warmth and the cold, humid Shahdag-Tufan region on the northeast slope; and the semi-arid, moderately warm to moderately cold Daghliq Shirvan agroclimatic region, which covers a smaller area.

In assessing climate indicators according to the sensitivity category, A.Ayyubov's division titled "Climate-Landscape Zoning of Azerbaijan for Resort Purposes" was utilized[12]. Areas distinguished by relatively dense settlement due to favorable climate and landscape conditions were assigned to the high sensitivity category during the assessment. The areas between the cities of Oghuz and Gabala, the area from Ismayilli city to Basqal settlement and towards Chukhuryurd village in Shamakhi district, and the strip along Tangaalti-Tular villages in Guba district serve as examples of this category. Areas with moderate sensitivity in climate indicators include the Ilisu-Gonaqkand zone. The low sensitivity category was

[11] National Atlas of the Republic of Azerbaijan [Map] / – Baku: Baku Cartography Factory, – 2014. – 444 p.

[12] Ayyubov, A.S. The Climate of Resorts and Recreation Areas in the Azerbaijani SSR / A.S.Ayyubov. – Baku: Azerneshr, – 1987, – 93 p.

assigned to the humid and cold high mountain zone, which extends from altitudes above 2,000 meters to the highest mountain peaks.

The assessment of the significance category of the ***hydrological*** network involves ensuring the optimal adaptation of settlement and economic activity to the processes that create and regulate water flows in the area. The assessment was conducted using satellite imagery based on the Normalized Difference Water Index (NDWI). Mountainous areas distinguished by rivers, lakes, and river network density were classified as highly significant (with an index value of -0.2 to 0.51), while the medium mountainous zone and lowlands subject to intensive irrigation were classified as moderately significant (index value of -0.5 to -0.2). The relatively lower mountainous belt (index value of -0.5 to -1) was recorded as a low significance area. Highly significant areas make up 18% of the total area, moderately significant areas 31%, and low significance areas 51%[13].

The assessment of the sensitivity category of hydrological conditions is carried out based on the flow-regulating function of landscapes. In this case, slope gradients obtained from the digital elevation model for the research area were considered. Areas with slopes of up to 6 degrees were grouped as anthropogenically vulnerable or highly sensitive areas. Areas with slopes from 6 to 15 degrees were classified as moderately sensitive, while areas with slopes above 15 degrees were designated as low sensitivity or less affected areas. Based on the results, highly sensitive areas constitute 6.9% of the research area, moderately sensitive areas account for 22%, and the remaining 71.1% are low sensitivity areas.

The assessment of ***land use*** based on the significance category was conducted according to its purpose of use. Through analysis of satellite imagery, areas were grouped based on surface cover and use, including forests, forest-shrublands, cultivated land, and pastures as

[13] Jabrayilov, E.A. Evaluating economic implications of hydrological conditions in Shahdag National Park's buffer zone. // "Current Issues in Natural Sciences" Proceedings of the XII International Scientific-Practical Conference. – Petropavlovsk: – 2024. – pp. 119-123.

highly significant; areas around river valleys and the upper reaches of rivers as moderately significant; and barren mountains, including rocky areas, as low significance. It is noted that 43% of the analyzed area consists of forest ecosystems, 36.6% of pastures, 9.3% of agricultural land, 7.2% of residential areas, and 3.9% of rocky terrain.

The assesment of ***agro-landscapes*** according to sensitivity categories in the dissertation is based on optimizing the environment and understanding the response of landscapes to anthropogenic impacts. High sensitivity categories include nival and subnival landscapes in high mountainous areas with moderate to intense dissection and steep slopes, where soil and vegetation cover are disturbed, and alpine meadows where moderately and intensely dissected mountain-meadow soils are prevalent. High sensitivity landscapes are characterized by their vulnerability to anthropogenic impacts. Medium sensitivity areas, which are less resilient to human activities, include subalpine meadows in weakly and moderately dissected, moderately sloping mountain-meadow soils; forest landscapes of medium and partially high mountains; and forests, forest-shrublands, forest-steppes, and steppes in low and medium mountains. Low sensitivity categories, which are relatively resilient to anthropogenic impacts, include forest-steppes, meadow-steppes, and meadow-shrub landscapes of accumulative plains with gentle slopes and weak dissection.

The research uses the Multi-Criteria Decision Making (MCDM) method[14], including a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), to evaluate ***economic-geographical*** and tourism potential and to establish development strategies. Through the analysis, strengths and weaknesses were classified as internal factors, while opportunities and threats were categorized as external factors. Each factor was effectively assessed, and local and global weights were calculated. In the algebraic matrix,

[14] Babalola, M. A. A multi-criteria decision analysis of waste treatment options for food and biodegradable waste management in Japan // Environments, – 2015. – № 2(4), – p. 471-488

the sum of the weights of internal and external factors was taken as equal to 1 (Table 3).

In this section, factors such as rich biodiversity in ecosystems (G1), seasonal ecotourism opportunities (G2), and others received high effectiveness scores. During the research, the factors set for the national park were grouped in pairs, resulting in the identification of 22 development directions. These include conducting planning to preserve ancient culture and local traditions, developing rural tourism plans, increasing conservation regimes for ecosystems, promoting ecotourism, organizing optimal economic activities for local residents and entrepreneurs, and others[15].

Table 3

SWOT factors evaluation matrix and weights in Shahdag National Park

| **Groups and factors** | **Effec-tiveness scores** | **Local weights** | **Global weights** |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| **Internal factors** | | | |
| Strengths (S) | | | |
| Mountain ecosystem diversity, rich biodiversity (S1) | 5 | 0.139 | 0.072 |
| Ecotourism opportunities for summer and winter seasons (S2) | 4 | 0.111 | 0.056 |
| Historical-cultural and natural monuments (S3) | 4 | 0.111 | 0.056 |
| Ancient culture, local traditions, and craftsmanship (S4) | 4 | 0.111 | 0.056 |
| Proximity to the capital and transport infrastructure (S5) | 3 | 0.083 | 0.042 |
| Weaknesses (W) | | | |
| Lack of sufficient resources for conservation, scientific research, and advocacy in the region (W1) | 4 | 0.111 | 0.056 |

[15] Jabrayilov, E.A. A'WOT analysis for sustainability of biodiversity and tourism in Shahdagh National Park, Azerbaijan // Journal of Geology, Geography and Geo-ecology, – Dnipro: – 2022. – №2 (31), – pp. 302-310

**Table 3 (continued)**

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Shortage of highly skilled specialist staff (W2) | 3 | 0.083 | 0.042 |
| Weak communication with local communities regarding ecological awareness and sustainable tourism development (W3) | 4 | 0.111 | 0.056 |
| Weak promotion for attracting foreign tourists (W4) | 2 | 0.056 | 0.029 |
| Lack of fencing around the national park (W5) | 3 | 0.083 | 0.042 |
| **External factors** | | | |
| Opportunities (O) | | | |
| High potential for the development of national tourism (O1) | 4 | 0.114 | 0.056 |
| Supporting the creation of ecological awareness as people's demand for recreation and ecotourism increases (O2) | 3 | 0.086 | 0.042 |
| Employment opportunities and direct benefits for local communities (O3) | 4 | 0.114 | 0.056 |
| Research and education potential by establishing connections with scientific institutions and NGOs (O4) | 3 | 0.086 | 0.042 |
| Ensuring increased conservation of natural ecosystems and boosting tourism revenue by enhancing infrastructure and reducing negative impacts (O5) | 5 | 0.143 | 0.072 |
| Threats (T) | | | |
| Climate change and current drought conditions (T1) | 4 | 0.114 | 0.056 |
| Ecosystem sensitivity and environmental risk factors (T2) | 4 | 0.114 | 0.056 |
| Environmental impacts during the implementation of infrastructure projects (T3) | 2 | 0.057 | 0.029 |
| Conflicts with local businesspeople and community groups (T4) | 3 | 0.086 | 0.042 |
| Limited awareness of the park in national and international tourism (T5) | 3 | 0.086 | 0.042 |

The fourth chapter of the dissertation explores "**Eco-economic Security and Sustainable Development Directions of Shahdag National Park**." The evaluation of ecological security utilized multispectral indices to monitor changes in the environment and identify sensitive ecosystems. Processing and comparing Sentinel 2A MSI satellite data revealed degradation processes in the buffer zone of the national park, particularly in low mountainous areas and plains. The results of anthropogenic impact manifest in the surrounding areas of the national park, especially around settlements and mountain meadows. The application of special protection regimes within the national park accelerates natural restoration processes. The next phase of analysis identified a decrease in water volume in mountain rivers and lakes in recent years. This increases ecological stress in foothill areas, including plains, due to the rising demand for irrigation[16].

An ecological network model encompassing core areas, ecological corridors, buffer zones, and restoration areas was established to ensure ecological security in the national park. The focus was on the portion of Shahdag National Park falling within the Shamakhi district and encompassing 15 administrative territorial units. In the research, areas covered by the national park were designated as core areas. The “least-cost” model was applied for determining ecological corridors, optimizing landscape connectivity[17]. Several optimal directions were selected, and corridors were identified between core areas along existing roads. Restoration areas were established along the northern and southern boundaries of the national park and within its structure, especially in areas critical for the restoration of natural ecosystems. The presented ecological network model is highly suitable for facilitating

[16] Jabrayilov, E.A. Monitoring of Fragile Ecosystems with Spectral Indices Using Sentinel-2A MSI Data in Shahdagh National park // Geography, Environment, Sustainability, Moscow: – 2022. – №1, – pp. 70-77.

[17] Adriaensen, F. The application of ‘‘least cost’’ modelling as a functional landscape model / F. Adriaensen, J.P. Chardon, G. De Blust [et al.] // Landscape and Urban Planning, – 2003. – № 64(4), – p. 233–247.

environmental protection by conserving ecosystem functions and promoting sustainable use of natural resources.

To assess the impact of the dynamics of high mountain ecosystems on ecological balance and living conditions in the research area, changes in mountain glaciers were studied. An analysis of multispectral satellite imagery revealed a sharp decline in glaciers. According to the results, the total area of mountain glaciers was observed to be 4.5 km² in 1990, 2.41 km² in 2006, 1.33 km² in 2019, and finally 0.62 km² in 2021 (Table 4). As a result, the glacier area decreased by up to 86% over 31 years[18].

Table 4

Dynamics of glaciers over the years

| Glaciers | Area, $km^2$ | | | |
|---|---|---|---|---|
| | 1990 | 2006 | 2019 | 2021 |
| Bazarduzu | 1,84 | 1,14 | 0,70 | 0,28 |
| Shahdag | 0,97 | 0,55 | 0,19 | 0,17 |
| Bazaryurd | 0,66 | 0,30 | 0,19 | 0,11 |
| Tufandag | 0,22 | 0,12 | 0,03 | 0,0 |
| Ragdan | 0,14 | 0,03 | 0,001 | 0,0 |
| Other intermontane glaciers | 0,36 | 0,07 | 0,12 | 0,03 |
| Total | 4,5 | 2,41 | 1,33 | 0,62 |

In territorial planning, the next step following the assessment phase is the determination of sectoral structure and integration objectives aimed at the development of the economy and ecosystems. When determining sectoral structure objectives, three main directions are designated: conservation, enhancement, and development[19] (Figure 3).

[18] Ismayilov, M.C., Jabrayilov, E.A. "Dynamics of Nival-Glacial Ecosystems in Azerbaijan under Climate Change Conditions and Its Expected Consequences" // Geography and Natural Resources, Baku, 2022, No. 1(16), pp. 14-21.

[19] Mammadov, R.M. "Landscape Planning: Essence and Application" / R.M. Mammadov – Baku: Science and Knowledge, 2016, 292 p.

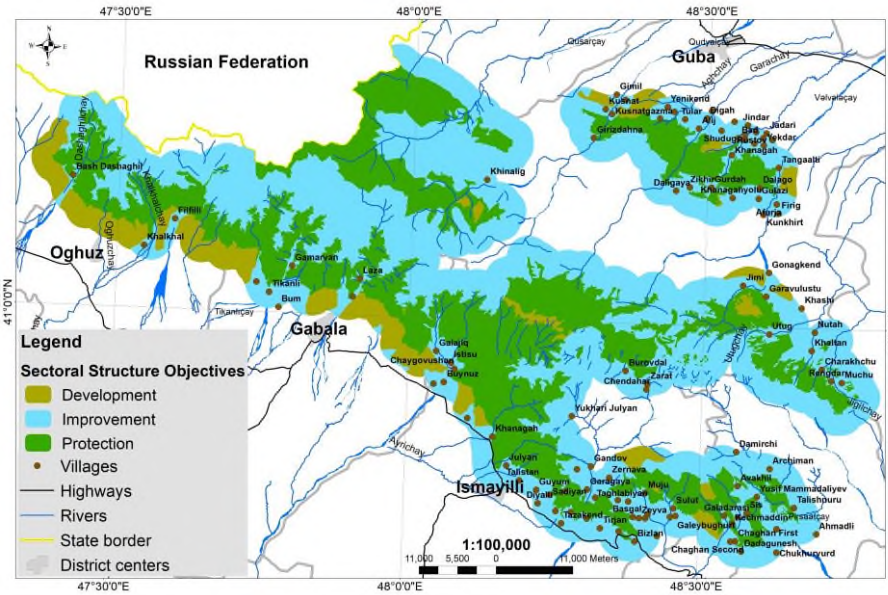


Figure 3. Sectoral Structure Objective Map for the Development of Shahdag National Park and its Buffer Zone

For the sectoral structure objectives of development, the first direction focuses on preserving the current state of natural ecosystems, requiring a regime of natural environment protection. In the research zone, the area of Shahdag National Park falls under the conservation category. The next category pertains to the development objectives of ecosystems. In the research area, such zones include forests and forest-shrub geocomplexes with high sensitivity within the buffer zone of the national park. These areas are primarily located in the Oghuz, Gabala, and Ismayilli districts within the buffer area of the national park. Another objective is related to measures for the improvement of the economy and natural geocomplexes in the surrounding zone of the national park. These areas include middle and high mountainous zones, sparse forests, shrublands and meadows, landslide areas, and areas surrounding settlements in the districts of Ismayilli, Shamakhi, and Guba.

The concept of integrated use purposes for Shahdag National Park and its buffer zone was developed through the integration of

land use, natural and socio-economic resource potential, anthropogenic factors, and economic objectives. Opportunities for activity in the direction of protecting ecosystems, ensuring sustainable socio-economic development, identifying areas as well as ecological problems, and forming and regulating the base structure for management were studied and mapped. A comparative analysis of the opportunities for using natural conditions and socio-economic indicators was conducted. By integrating these indicators, ecological and socio-economic development and conservation zones were designated, making it possible to determine optimal directions for activity.

As shown in Figure 4, at the end of the analysis, zones were identified according to eight categories. These are: 1. Areas serving a core function; 2. Forest ecosystems prevalent in the surrounding zones of the national park; 3. Conservation zone for river and stream ecosystems and surface waters; 4. Pastures; 5. Agricultural fields and settlement zones; 6. Sparse forest areas on medium and lower mountain slopes; 7. Areas where forests are affected by both natural and human factors; 8. Rocky geocomplexes of high mountainous areas.

To prepare an action plan for the sustainable development and management of Shahdag National Park, several directions are proposed:

*Recreation-oriented activities*:

- Organizing scientific-informative, sports, scenic hiking, mountaineering, and equestrian tourism activities in a regulated manner.
- Regulating the transit flow of tourists according to the recreational capacity of the landscape, and installing information boards about the area's protection regime.
- Protecting, improving, or renovating existing tourist trails and observation decks.
- Organizing informational events and seminars for the local population in the direction of the sustainable development of tourism.

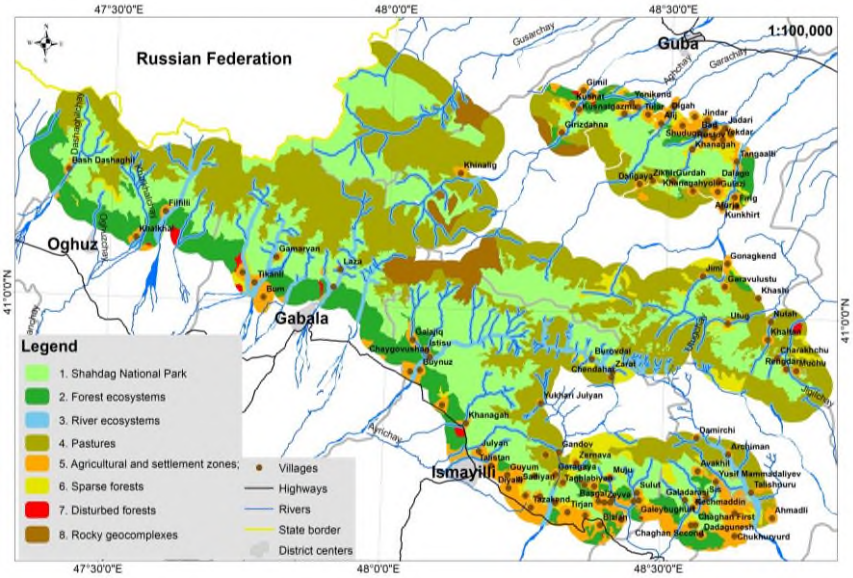


Figure 4. Integrated Use Map of Shahdag National Park and its Buffer Zone

*Forestry-oriented activities:*

- Preparing a catalog of valuable, rare, and endemic plant and animal species.

- Banning hunting activities in the area and imposing hefty fines in this field.

- Implementing comprehensive forestry measures aimed at protecting local communities.

- Enhancing the material base for combating forest fires, illegal logging, diseases, and pests.

- Regulating the harvesting of wild plants.

*Agriculture-oriented activities:*

- Strictly regulating pasture loading (inventorying, justifying usage norms, conducting ecological and economic assessments).

- Adopting 5-year plans for the restoration or revitalization of agricultural fields.

- Strengthening management mechanisms for land and water use.

- Developing scientific, informative, and communicative agricultural services.

- Enhancing measures to combat natural disasters and ensure food security.

*Other activities:*

- Preserving existing usage types with ecological justification.

- Conducting ecological assessments of existing activities and discontinuing all usage types that do not comply with environmental management principles.

- Justifying recreation loading and infrastructure according to environmental management principles.

- Avoiding the construction of new engineering structures and adhering to ecological standards in the existing road network.

- Designating specific areas for the propagation of rare and valuable plant and animal species.

- Creating investment opportunities and simplifying tax policies in the buffer zone to increase the income of the local population.

Thus, in the dissertation, procedures for organizing societal activities in Shahdag National Park and its surrounding areas were carried out using methodological approaches that align with economic-geographical and ecological-oriented territorial planning principles.

## CONCLUSION

1. The natural and socio-economic conditions of Shahdag National Park and its buffer zones, as well as tourism potential indicators, have been inventoried. Important elements of the area's land use systems, including hypsometric, slope, and aspect indicators, landscape types, soil types, as well as the socio-economic indicators of 106 villages and 4 settlements, have been mapped. A series of thematic maps created within the unified platform has enabled synergistic effects, promoting sustainable development based on the integration of various aspects (social, economic, ecological).

2. The highest productivity indicators for cereal crops in residential areas within the research area were recorded in the following settlements: Khalkhal village (34 quintals/ha) in Oghuz district, Bum settlement (33 quintals/ha) and Gamarvan village (33 quintals/ha) in Gabala district, Gonagkend settlement (32 quintals/ha), Rustov village (32 quintals/ha), and Tulekeran village (32 quintals/ha) in Guba district. Regarding vegetable productivity, the villages of Khinalig (110 quintals/ha) and Rustov (102 quintals/ha) in Guba district, Chukhuryurd village (109 quintals/ha) in Shamakhi district, Khalkhal (93 quintals/ha), and Bash Dashaghil (92 quintals/ha) villages in Oghuz district showed distinctive results. In terms of fruit production, the highest productivity was observed in Khaltan village (66 quintals/ha) and Rustov village (62 quintals/ha) in Guba district, as well as in Abrikh village (52 quintals/ha) and Gamarvan village (41 quintals/ha) in Gabala district.

3. According to administrative regions it was determined that 6% of the population living in Oguz district, 10.5% of the population of Gabala district, 26.9% of the population of Ismayilli district, 6.3% of the population of Shamakhi district and 14.4% of the population of Guba district resides in the buffer zone of the national park. The majority of residential areas (94.5%) and populations (95.8%) are concentrated in areas with elevations ranging from 520 to 1500 meters. 54% of villages have populations of up to 500 people. The highest population density (92 people/km2) is observed in areas with elevations up to 1000 meters. A comparative analysis revealed a 7% increase in the total population residing in villages within the research area from 2009 to 2019.

4. The natural resource potential of the research area was evaluated in terms of economic-geographical significance and sensitivity categories. Assessment of hydrological conditions' sensitivity category was conducted based on the landscape's role in regulating water flow, considering the slope degrees derived from the digital elevation model. Evaluation of the significance category of the hydrological network, aimed at locating and optimizing human activities, which create and regulate water flows, determined that

high significance areas comprise 18%, moderate significance areas 31%, and low significance areas 51% of the territory.

5. For the first time, the significance category of agro-climatic resources were assessed for the research area. It was determined that 27.3% of the territory has high, 40.5% has moderate, and 32.2% has low levels of climate indicators affecting human life activities. Utilizing multispectral satellite images, based on land use method, 53.6% of the area was categorized as high significance, 12.7% as moderate significance, and 33.7% as low significance zones. The response of agrolandscapes to anthropogenic influences were studied, revealing that 50.3% of the area is highly sensitive, 47.3% is moderately sensitive, and 2.4% is less sensitive to such impacts.

6. The Multi-criteria Decision-Making Method was utilized, and SWOT analysis was conducted to assess the economic-geographical and tourism potential of the area and to develop an advancement strategy. Internal and external factors were identified through the analysis, and effective evaluation was implemented. In the evaluation, factors such as rich biodiversity in ecosystems, seasonal ecotourism opportunities, historical landmarks, ancient culture, and local traditions received high scores. Development directions were identified, including planning for rural tourism development, enhancing the conservation regime of ecosystems, fostering ecotourism development, and organizing other economic activities.

7. In assessing ecological safety, multispectral indices were utilized, and based on the processing and comparison of Sentinel 2A MSI satellite data, degradation processes were identified in the buffer zones of the national park, particularly in low mountainous and plain areas. An ecological network model was established for ensuring ecological safety in the national park, which holds significant importance in conserving ecosystems, ensuring sustainable use of natural resources, and reducing the impact of human activities on biodiversity. Analysis of multispectral satellite images revealed a decrease in the total area of mountain glaciers from 4.5 $km^2$ in 1990 to 0.62 $km^2$ in 2021, representing an 86% reduction.

8. The sectoral structural objectives for the development of natural and economic systems in the study area have been analyzed, and relevant zones have been identified. Based on the analysis, the following zones have been determined: core function areas (34.4%), forests located in the buffer zone of the national park (9.7%), surface water ecosystems (9.8%), summer pastures (35.4%), cultivated lands (3.5%), sparse forest-shrub areas (4%), areas where forests are affected by natural and human factors (0.3%), and high-mountain rocky ecosystems (2.9%). By grouping integrated objectives, socio-economic opportunities have been identified, and an action plan has been developed in the directions of management, tourism, agricultural development, and nature conservation.

**The scientific works published in accordance with the topic of the dissertation:**

1. Jabrayilov, E.A. "The Organization and Management of National Parks: World Experience and Its Application in the Republic of Azerbaijan" // Proceedings of the Republican Scientific Conference "Geographical Problems of the Regions of Azerbaijan". Baku, 2016, pp. 55-60. (Co-author: Ismayilov, M.J.).

2. Jabrayilov, E.A. "The Study of the Creation of Geoinformation Data of the Shahdagh National Park in the Section of Oguz Region" // Works of Young Scientists, Baku, 2016, pp. 93-100.

3. Jabrayilov, E.A. "The Study of Sustainable Development in Mountainous Areas (Case Study of Shamakhi District)" // Geography and Natural Resources, Baku, 2017, No. 2 (6), pp. 80-86. (Co-authors: Imamverdiyev, N.S. and Huseynova, Kh.T.).

4. Jabrayilov, E.A. "Landscape-Ecological Diversity and Framework Model of Specially Protected Natural Areas in Azerbaijan" // Geography and Natural Resources, Baku, 2019, No. 2(10), pp. 11-19. (Co-author: Ismayilov, M.J.).

5. Jabrayilov, E.A. "On the Landscape-Ecological Diversity of National Parks" // Republican Scientific Conference "New Directions

in the Development of Agriculture and Environmental Protection," Baku, 2021, pp. 152-155. (Co-author: Ismayilov, M.J.).

6. Jabrayilov, E.A. "Tourism Opportunities of Shahdag National Park and its Buffer Zone" // Tourism and Recreation: Innovations and GIS Technologies, Proceedings of the XIII International Scientific-Practical Conference. Astrakhan State University, Astrakhan: "Astrakhan University," 2021, pp. 50-53.

7. Jabrayilov, E.A. "Ecological Network Model in Shahdagh National Park" // Bulletin of Voronezh State University. Series: Geography, Geoecology. Voronezh: 2021, No. 2, pp. 61-69.

8. Jabrayilov, E.A. "Distribution of Human Population in the Surrounding Areas of Shahdag National Park" // International Demographic Forum "Demography and Global Challenges," Voronezh: 2021, pp. 364-368.

9. Jabrayilov, E.A. Monitoring of Fragile Ecosystems with Spectral Indices Using Sentinel-2A MSI Data in Shahdagh National park // Geography, Environment, Sustainability, Moscow: – 2022. – №1, – pp. 70-77.

10. Jabrayilov, E.A. "Dynamics of Nival-Glacial Ecosystems in Azerbaijan under Climate Change Conditions and its Expected Consequences" // Geography and Natural Resources, Baku, 2022, No. 1(16), pp. 14-21. (Co-author: Ismayilov, M.J.).

11. Jabrayilov, E.A. "Assessment of Sensitivity Potential of Landscapes in Shahdag National Park" // Young Researcher, Baku, 2022, No. 1, pp. 92-99.

12. Jabrayilov, E.A. "Management of Nature Conservation and Land Use in Mountainous Areas (Case Study of Shahdag National Park)" // Proceedings of the Pedagogical University, Mathematics and Natural Sciences Series, Baku, 2022, No. 3, pp. 185-194.

13. Jabrayilov, E.A. A'WOT analysis for sustainability of biodiversity and tourism in Shahdagh National Park, Azerbaijan // Journal of Geology, Geography and Geoecology, – Dnipro: – 2022. – №2 (31), – pp. 302-310.

14. Jabrayilov, E.A. "Sustainable Tourism Development in Shahdag National Park: Opportunities and Challenges" // Scientific Works, Nakhchivan University, Nakhchivan, 2023, No. 1, pp. 84-91.

15. Jabrayilov, E.A. "Nature Conservation and Settlement Problems in the Surrounding Areas of Shahdag National Park." "H. Aliyev's Role in the Development of Science and Education in Azerbaijan" Republican Scientific-Practical Conference, Baku, 2023, pp. 156-160.

16. Jabrayilov, E.A. "Characteristics of the Distribution of Population According to Elevation Zones in the Buffer Zone of Shahdag National Park" // Scientific Works. Series of Natural and Medical Sciences, Nakhchivan State University, Nakhchivan, 2023, No. 3 (124), pp. 103-109. (Co-author: Eminov, Z.N.).

17. Jabrayilov, E.A. "Analyzing Socio-Economic Conditions in the Buffer Zone of Shahdag National Park: A Case Study of Guba District" // Geography and Natural Resources, Baku, No. 1 (21), 2024, pp. 76-82.

18. Jabrayilov, E.A. "Evaluating Economic Implications of Hydrological Conditions in Shahdag National Park's Buffer Zone" // "Current Issues in Natural Sciences" Materials of the XII International Scientific and Practical Conference dedicated to the 125th anniversary of the birth of the first president of the Academy of Sciences of Kazakhstan K.I. Satpayeva. Petropavlovsk, 2024, pp. 119-123.

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