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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

ASSESSMENT OF THE RECREATIONAL POTENTIAL OF THE NATURAL-GEOGRAPHICAL CONDITIONS OF THE SOUTHERN SLOPE OF THE GREATER CAUCASUS (between the Mazym-Shin rivers)

Speciality: 5408.01 - Physical geography and biogeography, soil geography, landscape geophysics, and geochemistry

Field of Science: Geography

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GENERAL CHARACTERISTICS OF THE DISSERTATION

Relevance and research level of the topic: In our contemporary era, the employing of the recreational potential of natural and geographical conditions, considering the material capabilities of natural and socioeconomic geosystems, functions as a supporter of improving the employment level of the population and increasing their quality of life, restoring their health and regional development. By recreational potential, we mean producing unique tourism services of historical or artistic value, aesthetic appeal, and beneficial for human health. This is because one of the perspective indicators of regional socioeconomic development is precisely related to tourism-recreational potential.

The natural and geographical conditions of Azerbaijan, the state's recreational resources, as well as their exploitation are considered one of the important factors in the direction of the organization of recreation and restoration of health and working capacity. As a positive result of the work carried out in this direction, the involvement of tourism and recreational resources in the economic turnover of our republic has increased significantly in recent years. The development of the tourism industry in the research area - the southern slope of the Greater Caucasus - is primarily due to the presence of rich natural, historical, and cultural centers for attracting local and foreign tourists to the region. Nonetheless, in these centers, the organization of targeted tourism planning, regulation of marketing activities, assessment in a neoteric system, development of a tourism strategy based on national ideology, and preparation of an excellent database in a GIS environment are almost not implemented. Solely on the grounds that the study and assessment of the recreational potential of natural and geographical conditions in the studied region of the southern slope of the Greater Caucasus is very relevant. This represents one of the novel and promising directions of the economy, which has recently gained wide momentum in the broader and more comprehensive analysis of multifaceted tourism and recreation resources and brings additional income without bringing about environmental stress.

Experts who put forward the idea of the necessity of recreational resources in the tourism industry believe that the scientific study of natural tourism objects, their involvement in tourism circulation, and substantiation of factors of great importance for regional socioeconomic development are some of the most important conditions. In this regard, the existence of a large recreational potential for the organization of eco-parks in the studied area and the scientific and applied significance of eco-tourism routes based on them are highly appreciated.

The southern slope of the Greater Caucasus has been studied by various researchers. A.T. Asgarov, H.B. Soltanova, Z.T. Imrani, B.A. Bilalov, V.S. Dargahov, K.Z. Zeynalova, Ch.G. Gulaliyev, G.R. Aghakishiyeva, and other researchers have conducted research in the areas of assessment of the recreational potential of natural and geographical conditions, the concept of natural tourism, the distribution areas of tourism and recreation potential, the level of their mastery, and other directions and have obtained relevant results.

Object and subject of the research: The object of the study is the area between the Mazym and Shin rivers on the southern slope of the Greater Caucasus. The area is characterized by considerable richness and diversity of natural and geographical conditions. From a conceptual point of view, the subject of the research is the study of the natural and geographical conditions of the area, as well as the issues of their effective exploitation and protection, to ensure the involvement of recreational resources in the tourism economy cycle.

Objectives and tasks of the research: The studied area is distinguished by its specific geographical and strategic position and is highly valued for its recreational potential. The main objective of the study is to identify and study individual and complex objects that constitute its recreational potential by investigating the characteristics of the natural and geographical conditions of the southern slope of the Greater Caucasus, investigating the issues of their efficient exploitation and protection, and developing and preparing relevant proposals. To achieve the goal, the following tasks were set and solved:

– researching natural and geographical conditions and recreational potential;

– analysis of regional development characteristics related to natural tourism;

– characterization of areas with tourism and recreation potential;

– development and preparation of a classification of ecotourism facilities;

– description of natural monuments and provision of measures and proposals for their effective exploitation and protection for tourism purposes.

Research methods. Historical, statistical, comparative, survey, cartographic, aerospace, field research, etc. methods were applied in the implementation of the research work. The following tools were used to collect the necessary information for the research: aerial photographs, field expeditions, and archival and fund materials.

The information base of the study is based on the materials from the Institute of Geography named after Academician Hasan Aliyev, the Tourism Agency, the State Statistical Committee, and research papers of scientists conducting research in this field.

Main provisions put forward for defense. The essential provisions put forward for defense in the dissertation can be summarized as follows:

1. Classification of natural and recreational facilities and compartmentalizing of their primary characteristics;
2. Diagnostic assessment of natural and geographical conditions and opportunities for exploiting its recreational potential;
3. Tourism significance of recreational potential and zoning of territorial organization.

Scientific novelty of the research. The innovations obtained based on the results of the dissertation work can be summarized as follows:

– for the first time, an assessment of the tourism and recreational potential of the natural conditions of the southern slope of the Greater Caucasus (between the Mazym and Shin rivers) was carried out based on complex natural factors;

– for the first time, a diagnostic analysis of natural and recreational facilities in the area between the Mazym and Shin rivers was conducted, and the recreational potential was assessed;

– as a result of visual interpretation of satellite images based on ArcMap 10.8 software (scale 1:200,000), tourist routes were classified;

– for the first time, the recreational potential of the natural and geographical conditions of the southern slope of the Greater Caucasus (between the Mazym and Shin rivers) were regionalized in ArcMap 10.8 software.

Theoretical and practical significance of the research. In terms of improving the living standards of the population, it is extremely necessary to utilize the natural resource potential of the studied area for tourism and recreation purposes. This is because the effective exploitation of the recreational potential of natural conditions plays an important role in solving several socioeconomic problems, as well as in stimulating small and medium-scale businesses and increasing the efficiency of employment, playing an important role in regional development.

In the theoretical part of the research work, progressive ideas and thoughts reflected in literary sources dedicated to the effective exploitation of recreational potential, the provisions put forward in this field, and world experience were widely referenced.

The results of the research work with practical importance, can be applied in conducting research in this direction at the State Tourism Agency of the Republic of Azerbaijan, in relevant departments and institutions of the Ministry of Ecology and Natural Resources, in other regions of the country, in educational programs at relevant faculties of higher educational institutions, in the preparation of textbooks and teaching aids, as well as in writing bachelor's and master's theses.

Approbation and application of the research. The fundamental results and conclusions of the dissertation were presented at the following conferences: International (Azerbaijan-Russia) Scientific Conference of Public Geographers on "Human Geography in Azerbaijan and Russia: Primary methods for its Development in the 21st Century" (Baku, 2019); Republican Scientific Conference on

"New Directions of Agricultural Development and Environmental Protection", (Baku 2021); "The Power of the Unity of the People, State and Army in Azerbaijan" dedicated to the 98th anniversary of the national leader Heydar Aliyev, (Lankaran, 2021); "The Legacy of Heydar Aliyev in the Development Strategy of Azerbaijan", dedicated to the 98th anniversary of the national leader Heydar Alirza Aliyev, (Baku, 2021); Republican Scientific Conference on "Actual Problems of the Turkic World in the Modern Era", (Lankaran, 2021); International Scientific-Practical Conference on "Actual problems in land management and their solving techniques" at the Main Department of the Educational Institution "Belarusian State Agricultural Academy" (Nizhny Novgorod, 2021); International Scientific-Practical Conference on "Modern problems of geography: Integration of science and education" (Baku, 2022); "Silk Road" International Scientific Research Conference (Lankaran 2022); International Scientific Conference on "Towards the preservation of biological diversity and ecologically sustainable socioeconomic development" (Lankaran, 2023). 14 scientific articles and conference materials on the content of the dissertation were published.

The results of the field surveys, as well as the interpretation of the satellite images and base maps developed on the ArcMap 10.8 software, can be widely utilized in the Tourism Agency, Ministry of the Ecology and Natural Resources, and State Programs regarding tourism and recreation issues.

Name of the organization where the dissertation work was conducted: The dissertation was conducted at the Department of "Geography and its Teaching Methods" of Lankaran State University.

Volume, structure, and main content of the dissertation. The dissertation work consists of the introduction - 5 pages, 4 chapters, including I chapter – 15 pages, II chapter – 40 pages, III chapter - 30 pages, IV chapter - 33 pages, conclusion - 3 pages, 120 references, 7 tables, 8 graphs, 19 figures. The volume of the dissertation is 140 computer pages and consists of 199 944 characters.

A BRIEF SUMMARY OF THE DISSERTATION

The introduction defines the relevance of the topic, the research level on the topic, the object and subject, the objectives and tasks, the methods, the main provisions of the defense of the research, provides information on scientific innovation, the practical significance of the theoretical research, approbation and application, the name of the organization where the dissertation work is conducted, the separate volume of the structural sections of the dissertation and the total volume with symbols.

Chapter I is devoted to **"The contemporary state of the natural and geographical conditions of the southern slope of the Greater Caucasus, the scientific-theoretical and methodological foundations of the study of the territory".** Natural and geographical conditions and natural resources form the basis of recreational resources. Various types of recreation, such as the therapeutic use of climate resources associated with short-term recreation, outdoor games, swimming in water bodies, fishing, boating, picking berries in forests, and so on, are factors that stimulate the development of natural recreation. Z.T. Imrani, who extensively studied the concept of natural tourism, noted the importance of its recreational potential on scientific grounds and identified natural tourism as a complex concept with recreational potential. He evaluates the geographical environment as the driving force of natural tourism and, emphasizing its effectiveness in planning natural tourism resources, states that recreational resources play an important role in the development of human health and socioeconomic activity[1]. Notwithstanding, in some literary sources, natural recreational resources are compartmentalized as physical, biological, and information resources. Physical recreational resources refer to components of inanimate nature such as geological, geomorphological, climatic, hydrological, and thermal waters. Biological recreational resources include soil, fauna, and flora, shortly speaking, all components of wildlife. Information recreational resources include nature, which has a positive effect on people's

[1] Imrani, Z.T., Huseynzade, A.I., & Bilalov, B.A. Priority development areas of nature tourism resources in Shaki-Zagatala economic and geographic region // Geojournal of Tourism and Geosites, − 2024. No. 54(2), − pp. 921-926. (In Eng.)

emotional and spiritual relaxation, such as the attractiveness of natural monuments and the charm of the area.

One of the components of natural recreational resources is the exploitation of natural and geographical conditions for tourism purposes. These include climate, geological and tectonic structure, orography, landscapes, hydrographic network, vegetation, fauna, etc.

The formation of the ***climatic*** conditions of the southern slope of the Greater Caucasus is significantly influenced by solar radiation, the height of the territory above sea level, air masses entering the territory from different directions, as well as mountain slopes, macro and micro atmospheric circulation processes, and surface cover. The recreational potential of the climate is determined by the organization of the process of the healthy recreation of tourists. This is because in certain climatic conditions, it is possible to implement recreational activities such as climate therapy and sunbathing. In this regard, the climatic indicators of the studied area create favorable conditions for the development of natural tourism resources.

The ***geological-tectonic structure*** of the northwestern region of Azerbaijan, which is the study area, has an ancient geological development history and was formed at the contact of various geodynamic units. Since the area has a complex geological-tectonic structure, its recreational potential is highly appreciated as well. ***Orography*** is one of the main components of the attractiveness of natural-tourism resources. The fact that the studied area has a fairly complex geomorphological structure has culminated in the formation of denudation-structural, structural-erosion mountains. The fact that the area is exposed to sharp fragmentation and has a mainly mountainous relief creates convenient conditions for organizing hiking and trekking trips, as well as types of tourism such as mountaineering and ice climbing.

Landscapes, as the primary resource of natural and geographical conditions, are considered to be almost the strongest component of the recreational potential of the territory. An important element when assessing the recreational potential of landscapes is their aesthetic appeal. However, indifference to landscapes and their overloading in the territorial organization of the economy (mainly agriculture) and

the construction of settlements have reduced the recreational potential of the territory.

The hydrographic network is considered to have attractive recreational potential. The river network density of the studied area is 0.49-0.62 km/km^2, decreasing from west to east. Low rainfall and poor development of vegetation in areas above 2500 m have led to a decrease in the river network density. The rivers of the area are large-flowing, floodplain rivers originating from the high mountain peaks of the Main Caucasus Range.

The vegetation of the southern slope of the Greater Caucasus is distinguished by its diversity, depending on the climate, soil cover diversity, and relief. Following the altitudinal zonations, subalpine and alpine meadows, broad-leaved mountain forests, regrown plants in place of shrubs, meadows, and steppe plants are widespread in the study area. In its forests, mainly oak, alder, poplar, and beech trees predominate. The area is distinguished by its richness of ***fauna*** as well. Endemic and relict flora and fauna specimens are preserved in the Zagatala and Ilisu State Nature Reserves. Mountain goats, red deer, roe deer, and other animals significantly affect the recreational potential of the areas.

Chapter II is dedicated to **"Physical-geographical characteristics of the southern slope of the Greater Caucasus and the recreational potential of its natural resources".** This chapter evaluates the recreational potential of various natural components.

When studying ***the impact of climate resources on human health***, it should be definitely refered to the studies of A.J.Ayyubov and G.A.Hajiyev. They divided the territory of Azerbaijan into 5 climatic-landscape regions[2]. According to this division, the studied area belongs to the Greater Caucasus region, and the average annual air temperature in the plain and foothills is 13-14^{0}C, and in the middle mountains - 5-10^{0}C. In the subalpine and alpine belts, the average annual air temperature does not fall below 20C. The absolute minimum air temperature in the plains and foothills of the territory is -21-25^{0}C, and in the areas near the high mountain peaks towards the

[2] Ayyubov, A.J. Climate resources of Azerbaijan SSR / A.J. Ayyubov, G.A. Hajiyev – Baku: Elm, − 1984. − 132 p. (In Aze.)

watershed -45-50^{0}C. According to the atmospheric humidification conditions, 3 large zones are distinguished: arid, semi-humid, and humid. Arid areas (Md<0.25) are mainly areas located 450-500 m above sea level in the Shaki district and 200-300 m below sea level in the western and eastern parts. The annual precipitation in this area is 500 mm, and in July-August, less than 65-100 mm. The border of the semi-humid zone passes through an altitude of 200 m in the Balakan and Zagatala districts, and in other parts, 550-650 m. Areas located above 700-800 m already belong to the humid zone. The amount of solar radiation falling on the territory increases from west to east and from the middle mountainous part to the plain and high mountainous regions. The amount of solar radiation in the foothills fluctuates between 2200-2300 hours, and in the high mountainous part, between 2400-2500 hours[3].

Analysis of climatic resources suggests that the areas with the greatest potential for the creation of climatic and balneoclimatic resorts on the southern slope of the Greater Caucasus include mainly the low and middle mountain zones. The sufficient amount of sunny weather in the cold season creates conditions for continued heliotherapy on special balconies in the winter.

When analyzing the ***recreational potential of the geological-tectonic structure and orography***, it was determined that the area has a rich recreational potential. As a result of using these potential opportunities, it is feasible to organize hiking and trekking trips to the ranges and ridges distinguished by their attractiveness and uniqueness. Thus, when studying the recreational potential of mountainous areas, the sharply dissected relief of the area and exodynamic factors such as intensive erosion, washing, landslides, avalanches, and flood events, as well as high seismicity (up to 8-9 points), were taken into account. As a result, the morphometric indicators of the relief of the southern slope of the Greater Caucasus were mapped in the ArcMap 10.8 software, and the recreational potential was assessed. According to the slope indicators of the relief, 55.1% (0-100) of the studied area is

[3] Geography of the Republic of Azerbaijan, Physical geography: [In 3 Vol.] / Chairman of the editorial board R.M. Mammadov. – Baku: Avropa, − Vol. 1. – 2014. − 530 p. (In Aze.)

suitable for the use of recreational potential, has favorable conditions for the construction of infrastructure and recreational facilities. 6.7% of the area is an area with a slope of more than 400, suitable only for the organization of extreme types of tourism[4]. The higher horizontal and vertical fragmentation of relief in mountainous regions creates certain obstacles for studying recreational potential and organizing tourism infrastructure.

Although the areas with high morphometric indices of the relief of the study area have negative conditions for the development of tourism, the stunning scenery created by the fragmentation of the relief and the attractiveness of the landscapes in this area make short-term recreation and hiking (pasture tourism) interesting for numerous tourists. At the same time, high and steep mountains are favorable for the development of certain types of extreme tourism (sports tourism, mountain tourism, etc.), which are currently very popular and rapidly developing in the world.

When assessing the recreational potential of natural and geographical conditions, ***the recreational significance of landscapes and territorial advantages***, which play a leading role as the basis of a comprehensive approach, must be taken into account. This is because the assessment of the recreational significance of landscapes is carried out based on climate, relief, vegetation, water bodies, aesthetic richness, transport opportunities, the degree of anthropogenic transformation of natural territorial complexes, etc. Mountain-forest and plain landscapes are attributed to landscapes with high recreational potential of the southern slope of the Greater Caucasus. These landscape types are considered suitable for tourism activities such as hiking, health, treatment, trekking, etc., in all seasons of the year. Dry steppe landscapes, semi-desert, and lowland semi-desert landscapes falling into the territory are almost not used for tourism activities, and these areas are considered unsuitable for tourism.

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[4] Mammadov, G.G. The influence of morphometric indicators of relief on the recreational potential between Mazymchay and Shinchay // News of Tula State University “Earth Sciences and Related Environmental Sciences”, − Tula: − 2023. №2, − pp. 17-26. (In Russ.)

When assessing ***the recreational potential of the hydrographic network***, an analysis of the functional dependence of rivers, waterfalls, lakes, thermal and mineral springs, etc., should be performed. The fact that the southern slope of the Greater Caucasus has a relatively densely branched river network has led to a high amount of horizontal fragmentation in the area. The rivers within the area (Mazymchay, Kishchay, Kurmukchay, Katekhchay, Balakanchay, Talachay, Shinchay, etc.) belong to the Kura basin with their numerous tributaries and have obvious characteristics of the mountain type of rivers. These rivers have a typical mountainous character, which is both aesthetically pleasing and suitable for excursion activities. The high speed and shallow depth of the rivers in the mountainous areas provide for extreme tourism and sports. The waterfalls on the rivers, such as Ramramay, Gum, Lakit-Mamyrlı, Ilisu, Uludagh, Ballibulag, Gochyatagh, Shahali (Shali), Gozbulag, Chaykechan, Katekh, etc., are considered one of the most visited places by tourists.

The study area is also distinguished by its richness in thermal and mineral springs, which are analogues of world-famous waters. Thus, the flow rate and mineral content (chlorine, sodium, magnesium, hydrogen sulfide, etc.) of springs in the Gakh district, Oghlanbulag, Gizbulag, Gaynama, Kumrukbulag, and in the Zagatala district Jimjima and other springs play an important role in the treatment of several diseases and are fairly substantial for the development of health tourism. For example, the thermal spring called “Hamam” by the local population contains rhodan-sulfur and is used in health tourism in an artisanal way.

The recreational potential of vegetation cover and fauna should be studied thoroughly. This is because the high altitude amplitude and the difference in the degree of anthropogenic load within the study area have resulted in the uneven distribution of vegetation cover and fauna in this area. Alpine (“Alpine carpets”) and subalpine meadows spread at altitudes of 2000-3200 m in the area consist of low-growing grasses and have an irreplaceable view for tourists who love mountain walks. Subalpine meadows and meadow steppes occupy a large area between the forest belt and alpine meadows. In subalpine meadows, plants from the families of

bellflowers, crucifers, legumes, marigolds, etc. create tall and bush-like grass cover, which has a positive effect on the aesthetic appearance of the area. The forest massif of the study area has aesthetic, resort, and recreational importance, which causes an influx of tourists during the warm periods of the year, especially in the summer months.

The territory is very rich in fauna as well as vegetation. Fauna recreational resources are understood as natural resources that combine the entire diversity of the animal world, have scientific, scientific-cognitive, natural-aesthetic, and medical-biological value, and are used in the process of restoring a person's spiritual and physical strength and activity. For recreational activities, the animal world is mainly valued as an aesthetic background of a certain territory, as well as resources for the development of hunting. The southern slope of the Greater Caucasus hosts valuable prey animals: Caucasian deer, roe deer, bezoar goat, Caucasian mountain goat, wild boar, ibex, etc.; rodents: rock squirrel, hare, squirrel, badger; weevils, forest voles, long-eared hedgehog, etc.

Chapter III is dedicated to "**Tourism objects of the southern slope of the Greater Caucasus, their classification and characteristics".** In this chapter, the classification of natural monuments was initially carried out, then the natural-tourism attractiveness of geological-geomorphological monuments was investigated, and the advantages of the natural-tourism characteristics of reserves and sanctuaries (protected areas) were explained.

The recreational resources of natural and geographical conditions are understood as natural monuments that serve the spiritual health of a person, natural complexes that form the harmony of the integrity of the landscape, and natural ecosystems that directly and indirectly affect the recreation of tourists and the set of their components. Natural monuments with aesthetic value arouse interest in the places where they are located, causing people to travel and thus play a decisive role in the development of tourism. By natural monuments, we mainly mean geological, geomorphological, hydrological, climatic, flora and fauna, and the area researched is fairly rich in this respect as well. In the complex of natural monuments

of tourism and recreation importance of the studied area, geological, geological-geomorphological, hydrological, and hydrogeological monuments of various origins (endogenous, exogenous, anthropogenic) and of greater aesthetic interest, with great potential for the development of ecotourism, occupy an important place. In the area investigated, these monuments are represented by lakes, waterfalls, mineral springs, antecedent and canyon-like river valleys, karst caves, exotic rocks formed as a result of various exogenous processes (eolian, erosion, abrasion, etc.), natural landscapes, etc. (Table 1).

Table 1

Natural recreational resources of the southern slope of the Greater Caucasus (between the Mazymchay and Shinchay rivers)

Types of natural monuments	Natural monuments
Geomorphological	Zagatala-Govdagh synclinorium, Ganikh-Ayrichay synclinorium, Vandam anticlinorium, Salavat pass, Malarasa pass, Qaflan range, Garaguzey range, Gubakh range, Garagaya peak, Shirak plateau, Mount Masgarek, anticlinal structures, columnar detachments, lithosculpture monuments, Pichigel cave, etc.
Hydrological	Lake Khalakhi, Lake Murana, Lake Gochyataghi (Nohur), Lake Chanakhur, Shahali cascade waterfall, Shahverdi waterfall, Vazichal waterfall, Gum waterfall, Karachay waterfall, Gochyataghi (Sugovushan) waterfall, Ilisu (Ramamay) waterfall, Katekh waterfall, Lakit (Mamyrli) waterfall, Mazymchay, Katekhchay, Shinchay, Balakanchay, Talachay, Garachay (Mukhakhchay), Kurmukchay, Ayrichay, Hamamchay, etc.
Hydrogeological	Gurmukh, Gaynama, Ilisu, Oghlanbulag, Gizbulag, Gakh, Jimjima, Mokhbulag, Kumrukbulag, and other mineral-thermal springs
Natural Reserves and Protected Areas (Sanctuaries)	Zagatala State Nature Reserve, Ilisu State Nature Reserve, Zagatala State Protected Area, Gakh State Protected Area

When studying the natural-tourism attractiveness of geological-geomorphological monuments, the area is first studied from an orographic perspective. Within the study area, the mountain branches separated from the Main Range extend to the south, southwest, and the steepness of the Dingilov, Rochigel, Khalagel, Akhkamal, Gas, etc., mountain branches increases near the Main Watershed Range, which is characterized by sharp-pointed rocky peaks of the mountains.

The most attractive of the geological natural monuments on the southern slope of the Greater Caucasus, which has irreplaceable conditions for mountain tourism enthusiasts, are lithosculpture monuments. These monuments are formed as a result of erosion and denudation of parent rocks and continental sediments due to the widespread distribution of carbonate rocks. Karst caves, which are lithosculpture relief forms, are the most beautiful examples of natural monuments that attract the attention of tourists. In this regard, the Pichigel cave, which has a very large area along the course of the Kilsachay River, located in the Zagatala State Nature Reserve, is very interesting.

There are numerous waterfalls, which represent one of the hydrological natural monuments of the southern slope of the Greater Caucasus. Waterfalls are considered one of the wonders created by nature, attracting attention with their uniqueness and amazing scenery. As a result of frequent floods in mountainous areas, as well as the dominance of intensive erosion processes and denudation processes, rapids and waterfalls have formed on rivers.

Among the most interesting and noteworthy objects of hydrological monuments, natural monuments of lake origin are of great importance. Lakes Khalakhi in the Zagatala district, Gochyatag and Murana in the Gakh district are more popular among tourists, and recreation and entertainment centers have been created around them. However, the activities of these centers do not always justify themselves, and the discrepancy between service and pricing policy always causes dissatisfaction.

Like hydrological monuments, hydrogeological monuments have great attractiveness and economic advantages as well. On the southern slope of the Greater Caucasus, there are thermal and mineral

springs (Gurmukh, Gaynama, Ilisu, Oghlanbulag, Gizbulag, Gakh, Jimjima, Mokhbulag, Kurmukbulag, etc.), which provide natural healing for numerous diseases, as well as recreation areas. In this regard, Gakh district, along with other natural advantages, is distinguished by the abundance of thermal and mineral springs of great therapeutic importance. Thermal springs are more prevalent in the high mountainous areas of the region, where orogeny processes continue. There are 5 thermal and 6 mineral cold springs in this area. The chemical composition, flow rate, temperature, therapeutic properties, etc., indicators of thermal and mineral waters are distinguished not only by their scientific and practical significance, but also by their recreational potential[5].

As a result of our research, it can be concluded that the thermal and mineral waters of the study area are analogues of the world's most famous Izhovsky, Minegorsk, Medzhi, Ugum, Matesta, Talgy, Saaki, Parnaus, etc. waters in terms of their quantity, debit, treatment possibilities for numerous diseases, and balneological significance, and so far they have not been effectively used.

While talking about the natural-tourism features of reserves and sanctuaries, we mean taking several measures related to nature conservation. One of these measures is the creation of reserves and sanctuaries, national parks to protect endangered and sharply reduced species of fauna and flora. There are two state nature reserves (Zagatala, Ilisu) and two sanctuaries (Zagatala, Gakh) in the study area. Although the reserves are prohibited areas for carrying out natural-tourism activities, they have a very high recreational potential since they are outside anthropogenic impacts.

The reserves and their buffer zones are distinguished by the richness of the fauna and flora. Although tourism activity is limited in these areas, this activity is partially allowed in buffer zones. In buffer zones, where ecotourism is mainly developed, medicinal plants such as rose hips, white yarrow, thyme, yarrows etc., are widely used in folk

[5] Mammadova, G.G. Ecotourism potential of the Gakh district // − Nakhchivan State University, Scientific News, Nakhchivan: − 2022. № 7 (120), − pp. 108-114 (In Azc.)

medicine. Currently, while preserving their integrity, a large number of mammals, bird species, and reptiles have settled in the reserves. This may result in the development of a type of tourism such as birdwatching.

Sanctuaries are protected areas created to protect the ecological state of the environment and natural complexes. Like reserves, behaviors or activities that could harm any natural complex or its components are prohibited in sanctuaries. Naturally, people or tourists coming for recreation should follow certain rules and behave carefully with the environment. In sanctuaries, hunting, fishing, cattle grazing, plowing of arable land, and picking fruits and berries may be allowed, albeit partially. By implementing this type of activity in the Zagatala and Gakh State Nature Protected Areas (Sanctuaries), it is possible to achieve positive results in environmental protection and the organization of tourism activities.

Chapter IV is devoted to **"Assessment of the recreational potential of the southern slope of the Greater Caucasus"**. The assessment of the recreational potential is fulfilled based on a specific natural-territorial complex. At the same time, the main requirements characterized by recreational needs are determined. When assessing the recreational potential, the crucial factors affecting the development of the territory are studied fully. Only in this case is it feasible to assess the recreational potential, optimize the development vectors and socioeconomic goals of the territory.

The economic usage of territories for recreational purposes is characterized by high specificity: in various territories, the same components of the natural and anthropogenic environment can play different roles in organizing the recreational process. The characteristics of recreational resources are:

– area: recreation is related to the recreational potential within a specific area;

– uniqueness: reflects a specific recreational activity that is distinguished from the surrounding areas by its characteristics and level of significance.

One of the most important elements of recreational potential is the satisfaction of people's biological (i.e., affecting their physical

health) needs. This can be implemented in two ways: initially, when a person is at rest, and secondly, when a person changes his type of activity. This creates opportunities for people's spiritual enrichment, expansion of their activities, and acquisition of new knowledge and skills. Large-scale, even short-term changes in people's lifestyle in recreational areas, their movement and stay in recreation areas cannot be implemented spontaneously. One of the primary factors for this is the development of rural tourism and ecotourism.

In our contemporary era, rural tourism and ecotourism are promising areas and have great potential for our research area. There are several villages with tourism and recreation potential in the mountainous regions (Yukhari Chardakhlar, Mahamalar, Talalar, Bash Shabalid, Gum, Lakit, Jar, Katekh, Saribash, etc.), which should be analyzed, and their usage techniques should be determined (Figure 1).

Rural tourism and ecotourism activities depend on recreational potential and consist of objects created as a result of natural and anthropogenic resources, which have recreational properties and their usage possibility for recreational purposes. Recreational potential in this case, as a rule, refers to the existing natural and sociocultural objects related to the recreation zone and recreational activities.

While evaluating the recreational potential of natural and geographical conditions: the relief of the territory, climatic conditions, hydrographic network, landscapes, soil-vegetation, and fauna are considered.

When assessing the relief as a natural recreational factor, its morphometric characteristics are mainly taken into account: the degree of horizontal and vertical fragmentation, the inclination of the slopes, the intensity of the erosion of the relief, the amplitude of relative heights, the morphological characteristics of the relief (the shape of river valleys, the longitudinal profile of the slopes, the shape of the coast, etc.), etc. Natural monuments in the study area attract attention with their diverse origin, rare aesthetics, and exotic landscapes and are of particular interest due to their great tourist importance. In this regard, the studied area has a greater natural-tourism potential compared to other regions of the country.

Figure 1. Villages with rural tourism and ecotourism potential of the southern slope of the Greater Caucasus (between the Mazym-Shin rivers)

Natural resources, distinguished by their complex geological-geomorphological and tectonic structure, attract the attention and interest of tourists due to their importance, diversity, and richness.

When assessing the climatic conditions of the area, the number of sunny days (2200-2300 hours) falling on the study area throughout the year plays a key role. This is because the high number of sunny days creates bening conditions for a longer tourism season. Considering that tourism in our republic has developed mainly in the summer months, the warm season of the year should be considered as an important factor. The climate of the study area is mainly mildly humid and has much precipitation (right after the Lankaran region), and the fact that the wind is weak in this area also increases the recreational potential.

Assessment of the hydrographic network as a climatic factor is one of the important factors as well. As a recreational source that combines several tourism activities such as boating on rivers, hunting, fishing, and swimming, it is very important for organizing people's recreation. The studied area of the southern slope of the Greater Caucasus is very rich in water resources, which increases its tourism potential. Rivers such as Katekh, Shin, Kurmukchay, etc., are the most rivers with abundant flow of our republic. These mountain rivers can be widely used in extreme sports and tourism. However, due to the lack of some technical equipment and specialists, interest in this area is very low. One of the substantial factors affecting the tourism and recreation potential of natural resources is the thermal and mineral springs, which play an important role in the development of tourism. The thermal and mineral springs of JimJima, Oghlanbulag, Gizbulag, Hamambulag, Gakh, etc., located in the area are indispensable in the treatment of several diseases - cardiovascular, muscular, joint, nervous, skin, etc.

While evaluating natural and geographical conditions, one of the major criteria is the level of suitability and aesthetics of landscape components. When assessing the recreational potential of landscapes, along with their aesthetics, tourism attractiveness also plays a key role. This is because landscapes are one of the main factors in the sustainable development of tourism.

The result of assessing the recreational potential of areas is usually the development of various regional zoning schemes. As a rule, in domestic and foreign research works, there are two main directions of recreational zoning. The first is based on the allocation of recreational zones, where the main object is recreation, and service infrastructure, tourist routes, and other features are taken into account. This approach is traditionally adopted in economic-geographical zoning. In another case, the recreational area is considered as an element of a special recreational zone; that is, it is a territory that is more or less homogeneous in terms of recreational use.

As a result of the above-mentioned assessment criteria and long-term research, a map of the zoning of the southern slope of the Greater Caucasus (between the Mazym-Shin rivers) according to the natural-tourism potential was prepared. The area was assessed based on the zoning of the natural-tourism potential of the study area based on the density of points (natural monuments) in the ArcMap 10.8 software (Figure 2).

When assessing the tourism potential of the natural-geographical conditions of the studied area, 5 regions were distinguished: with weak natural-tourism potential; with medium natural-tourism potential; high, but poorly used; high, attractive areas; high, usable areas. Within these degrees, the natural factors affecting the natural-tourism potential of each region were investigated.

1. Areas with weak natural tourism potential cover 6% (223 km^2) of the study area. Although the natural conditions of the area are not favorable for tourism, there are springs in some areas. Although the morphometric indicators of the relief are convenient for the construction of tourist facilities, the vegetation cover in these areas is weak, and mainly desert and semi-desert landscapes prevail. For this reason, the recreational potential of the area is quite weak, but in some places, it is possible to engage in hiking activities along the river banks.

2. Areas with medium natural tourism potential cover 57% (2055 km^2) of the total area (Table 2). Since the morphometric indicators of the relief are favorable for the construction of infrastructure, it is feasible to place tourist facilities (hotels and recreation facilities) in

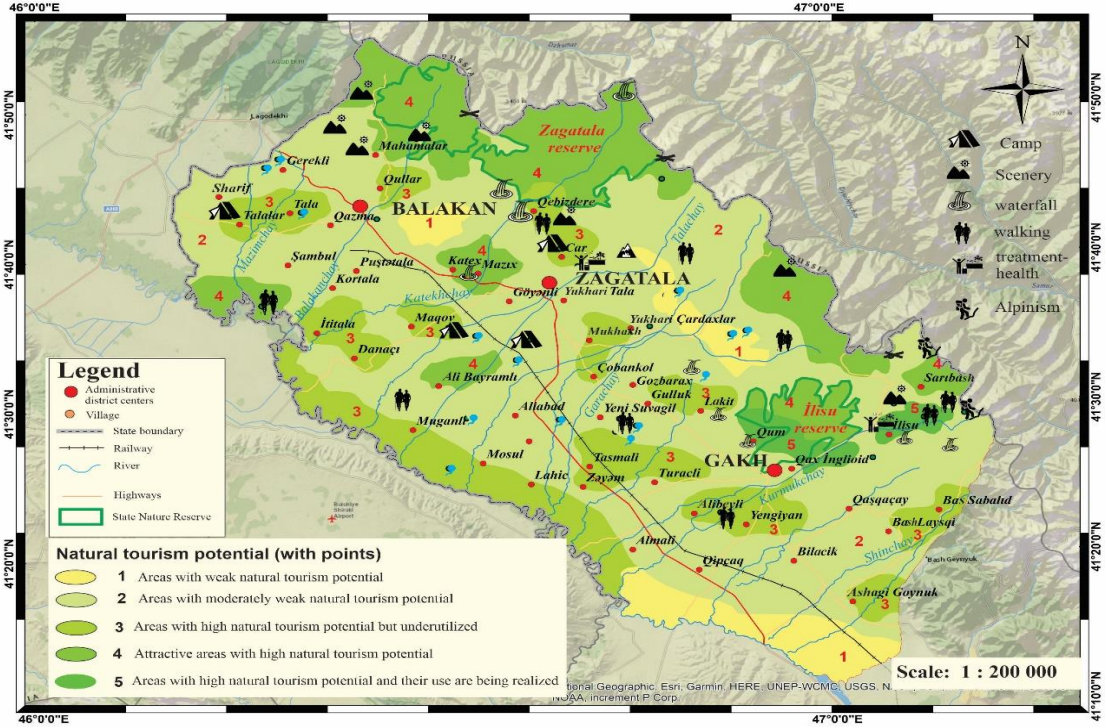

Figure 2. Zoning of the natural-tourism potential of the southern slope of the Greater Caucasus (between the Mazym-Shin rivers)

this area.There are also adequate conditions for tourists to relax in the forests and along the rivers. Tourists mainly visit this place in the summer months for hiking. The presence of waterfalls, thermal and mineral springs, and river valleys in various places is opportune for tourists to relax. There are also areas for hunting and camping. In mountainous areas, steep rocks and highly dissected relief are indispensable places for lovers of extreme tourism.

3. Areas with high natural tourism potential but poorly used cover 18% (646 km^2) of the study area. The presence of mineral springs, rich vegetation, forests, scenic relief, and rivers within the area attract tourists. Although there are suitable places for organizing camping, hiking, and trekking trips in this area, the tourism potential is poorly used. There are numerous thermal and mineral springs in the area, and the suitable climate is an invaluable potential for medical and health tourism.

4. Attractive areas with high natural tourism potential cover 17% (618 km^2) of the study area. There are hydrological and geomorphological natural monuments in this area, as well as forests with rich fauna and flora. The sharp fragmentation of the relief, the landscapes, and the passes created by high morphometric indicators increase the natural tourism potential of the area. The location of state nature reserves in some of these areas with high natural tourism potential hinders the flow of tourists to the area. In high mountainous areas, there are rocks and steep slopes that are fertile conditions for the development of mountaineering, which is an extreme type of tourism. Hiking, medical and health tourism, and water sports tourism are typical for the area as well. These areas are also selected for their rural tourism potential in the republic. Villages such as Katekh, Mazikh, Saribash, etc., are favorite places for tourists.

5. Areas with high natural tourism potential and their use are realized, covering 2% (75 km^2) of the study area. These areas are distinguished by the development of rural tourism throughout the republic, mainly covering the villages of Gum, Gakh Ingiloy, Ilisu, and surrounding areas. These areas, where natural tourism is most developed, are also distinguished by the number of local and foreign

Table 2.

Assessment of the natural tourism potential indicators of the southern slope of the Greater Caucasus (between the Mazym-Shin rivers)

Assessment of natural tourism potential (points)	Zoning	Factors Affecting Recreational Potential	Types of natural tourism activities	Area (km^2)	Area (%)
1	Areas with weak natural tourism potential	Weak vegetation, river valleys, mineral springs	Hiking	223	6
2	Areas with moderately weak natural tourism potential	Steep cliffs, highly dissected relief, alpine-subalpine meadows, mineral springs, river valleys, waterfalls	Extreme tourism, mountaineering, hiking, walking, health treatment, camping	2055	57
3	Areas with high natural tourism potential but underutilized	River valleys, mineral springs, forests	Mainly hiking (river valley) tourism, camping, hunting, health treatment, hiking	646	18
4	Attractive areas with high natural tourism potential	Rural tourism (Katekh, Mazikh, Saribash, etc.), Zagatala and Ilisu State Nature Reserves, rivers, mineral springs, waterfalls	Travel, health and wellness, extreme tourism, mountaineering, hiking, trekking trips, water sports tourism, camping	618	17
5	Areas with high natural tourism potential and their use are being realized	Rural tourism (Gum, Ilisu, Gakh Ingiloy villages), mineral springs, waterfalls, rich forest cover, river valleys	Medical (health), hiking, trekking, camping, ecotourism trips	75	2

tourists. In addition to this, the passage of the Kurmukchay, Hamamchay and Gum rivers through the area, unique relief forms, forests with rare flora and fauna species, as well as their richness in mineral springs, attract tourists to the area. This area, which attracts a large number of tourists, has high recreational potential and has very favorable conditions for ecotourism trips organized by nature lovers. This place is also suitable for natural tourism activities such as medical and health tourism, walking, hiking, and trekking trips.

CONCLUSION

1. For the first time, scrutinizing the contemporary state of the natural and geographical conditions of the southern slope of the Greater Caucasus (A case study for the Mazym-Shin rivers), the areas where natural and recreational resources are unevenly distributed within the territory and the exploitation of recreational potential for tourism purposes is favorable in terms of inclination (0-100 slopes - 55.1%), exposure slopes (northern and western exposure slopes - 25%), vertical fragmentation (0-100 m/km^2 - 33.0%) and horizontal fragmentation (1.5-2 km/km^2 - 29.0%) were calculated, and it was unraveled that a total of 35.5% of the territory has high recreational potential.

2. The recreational potential of the landscapes of the area between the Mazym-Shin rivers were researched and determined within each landscape type, as follows: mountain-forest landscapes are very favorable; xerophyte and steppe landscapes of the front highlands are favorable; nival-subnival and mountain-meadow landscapes are partially favorable; and the tourism-recreational potential of dry steppe and semi-desert landscapes is unfavorable. There are wide potential opportunities for developing mainly treatment-health tourism in mountain-forest landscapes, extreme (sports) and hiking (trekking) in nival-subnival and mountain-meadow landscapes, hunting in xerophyte and steppe landscapes of the front highlands, and hiking tourism in dry steppe and semi-desert landscapes.

3. For the first time, a diagnostic analysis of natural and recreational facilities in the area between the Mazym-Shin rivers was fulfilled and visual interpretation of satellite images was carried out

based on ArcMap 10.8 software (scale 1:200,000), as a result of which more attractive ecotourism, health-treatment, trekking, hiking, sports and cave (speletourism) tourism routes were classified on a scientific basis. Each tourist route assists in visually identifying the tourism and recreational potential of the area, as well as increasing rural tourism opportunities.

4. The natural-tourism potential of the area between the Mazym-Shin rivers was assessed based on 5-point criteria. These include weak (6.0% of the total area) -river valleys and mineral springs that are almost unused or impossible to use; medium (57.0%) - mainly steep rocks, highly fragmented relief forms, and alpine-subalpine meadows; river valleys with high potential, but poorly used (18.0%), mineral springs; attractive areas with high potential (17.0%) rich vegetation, rivers, waterfalls; rich forest coverwith high potential and use for realization, river valleys, waterfalls, mineral springs; and others.

5. By studying the natural-geographical conditions and tourism-recreational resources of the area between the Mazymchay and Shinchay rivers comprehensively, the zoning of the recreational potential was fulfilled by grouping two directions: recreation zones and exploitation opportunities for recreation. Based on the presented zoning, areas with specific future development prospects for such types of tourism as ecotourism, medical (health), sports, and hiking were determined.

Suggestions

Considering that the natural monuments located in the southern slope of the Greater Caucasus, which fall within the study area, are not fully exploited for tourism and recreation purposes, their development can have a positive impact on the socioeconomic development of the region. It is important to fully utilize the economic potential of the villages located in the mountainous areas and distinguished by their ecotourism potential, mainly in the Balakan, Zagatala, Gakh, and partly Shaki administrative districts, which fall within the study area.

The favorable climatic conditions of the studied area, especially the village of Ilisu in the Gakh district, as well as its richness in thermal and mineral springs and convenient highways, have potential opportunities for the creation of international mountain tourism and

health-treatment complexes in this village in the following years. The full and comprehensive exploitation of these opportunities can have a positive impact on solving the problem of unemployment of the local population.

By calculating the flow rate of thermal and mineral springs in the study region, an action plan should be prepared on ways to effectively use them, as well as the proper implementation of hydrotechnical works, which will contribute to regional health and medical tourism. The implementation of such a system of measures is likely to play a pivotal role in increasing the number of tourists and the socioeconomic development of the area.

The following scientific works were published under the topic of the dissertation:

1. Mammadova, G.G. State policy in the field of tourism // Proceedings of the International (Azerbaijan-Russia) scientific conference of social geographers on "Human Geography in Azerbaijan and Russia: Primary methods for its Development in the 21st Century", − Baku: − 2019, − pp. 68-72. (In Aze.)

2. Mammadova, G.G. Historical and architectural monument of the southern slope of the Greater Caucasus (between the Mazym and Shin rivers) // Republican Scientific Conference on "New Directions of Agricultural Development and Environmental Protection", − Baku: − 2021, − pp.781-784. (In Aze.)

3. Mammadova, G.G. Tourism and recreation potential of the southern slope of the Greater Caucasus (between the Mazym-Shin rivers) // Proceedings of the Republican Scientific Conference on"The Power of the Unity of the People, State and Army in Azerbaijan" dedicated to the 98th anniversary of the national leader Heydar Aliyev, − Lankaran: − 2021, − pp. 61-63. (In Aze.)

4. Mammadova, G.G. Opportunities and challenges in the ecotourism zone of the Southern slope of the Greater Caucasus // Multidisciplinary Republican scientific-practical conference on "The Legacy of Heydar Aliyev in the Development Strategy of Azerbaijan",

dedicated to the 98th anniversary of the national leader Heydar Alirza Aliyev, − Baku: − 2021, − pp. 56-60. (In Aze.)

5. Mammadova, G.G. Natural monuments of tourism and recreation importance of the southern slope of the Greater Caucasus (between the Mazym-Shin rivers) // Proceedings of the Republican Scientific Conference "Actual Problems of the Turkic World in the Modern Era", − Lankaran: − 2021, − pp. 83-84. (In Aze.)

6. Mammadova, G.G. The impact of ecotourism on social development of rural areas (the southern slope of the Greater Caucasus between the Mazymchay - Shinchay rivers) // International Scientific-Practical Conference on "Actual problems in land management and their solving techniques" at the Main Department of the Educational Institution "Belarusian State Agricultural Academy" dedicated to the 180th anniversary of the formation of the BSAA EI, – Nizhny Novgorod: − 2021, − pp. 41-46. (In Russ.)

7. Mammadova, G.G. Recreational and tourism resources of the administrative regions located on the southern slope of the Greater Caucasus and prospects for the efficient use of these resources (between the Mazym-Shin rivers) // News of Baku University, Series of Natural Sciences − Baku: − 2022. №1, − pp. 115-121. (In Aze.)

8. Mammadova, G.G. Ecotourism potential of the Gakh district // − Nakhchivan State University, Scientific News, Nakhchivan: − 2022. № 7 (120), − pp. 108-114. (In Aze.)

9. Mammadova, G.G. The role of thermal and mineral springs of the southern slope of the Greater Caucasus in the development of ecotourism (within the Azerbaijan Republics, the interfluve of Mazymchay and Shinchay) // International Scientific-Practical Conference on "Modern problems of geography: Integration of science and education", − Baku: 2022, − pp. 186-192. (In Russ.)

10. Mammadova, G.G. Recreational value of climatic resources of the southern slope of the Greater Caucasus (between the Mazymchay and Shinchay rivers) // "Silk Road" International Scientific Research Conference, − Lankaran: − 2022, − pp. 711-715. (In Russ.)

11. Mammadova, G.G. The role of health tourism in the sustainable development of the regions of the Southern slope of the

Greater Caucasus (between the Mazym-Shin rivers) // International Scientific Conference on "Towards the preservation of biological diversity and ecologically sustainable socioeconomic development", – Lankaran: – 2023, – pp. 59-61 (coauthor: Guliyeva, S.S.) (In Aze.)

12. Mammadova, G.G. Natural factors affecting the tourism and recreation potential of the southern slope of the Greater Caucasus (between the Mazymchay and Shinchay rivers) // Journal of Geography and Natural Resources, – Baku: – 2023. №2 (20), – pp. 78-83 (coauthor: Guliyeva, S.S.) (In Aze.)

13. Mammadova, G.G. The influence of morphometric indicators of relief on the recreational potential between Mazymchay and Shinchay // News of Tula State University "Earth Sciences and Related Environmental Sciences", – Tula: – 2023. №2, – pp. 17-26. (In Russ.)

14. Mammadova, G.G. Evaluation of ecotourism in the mountainous regions of the southern slope of the Greater Caucasus (between the Mazymchay and Shinchay rivers) // – Astrakhan Bulletin of Ecological Education. Lower Volga Ecocenter, Astrakhan: – 2024. №1 (79), – pp. 86-94. (In Russ.)

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