THE UNIQUE LANDSCAPES OF THE MIDDLE ZARAFSHAN BASIN AS AN OBJECT OF ECOTOURISM

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Abstract: *The article evaluates the ecotourism potential of the unique grove and unique mountain and foothill landscapes of the Middle Zarafshan watershed. The possibilities of using standard routes in the organization of Zarafshan State Nature Reserve ecotourism have been revealed*

Keywords: *Zarafshan National Nature Park, Zarafshan State Reserve, unique grove landscapes, mountain and foothill landscapes, Chakilkalon-Karatepa Mountains, Kyrgtov Plateau, Pastushye Foothills, Gobdin Mountains.*

INTRODUCTION. In global practice, the development of ecotourism prioritizes the preservation of natural monuments, specially protected areas, geosystems, and the rational use of natural resources. Special attention is also paid to extending the seasonality of ecotourism, improving its regional structure, identifying opportunities for integration, and enhancing its effectiveness.

In our country, a number of measures are being implemented to develop various types of tourism services—including eco, agro, historical, religious, and extreme tourism—taking into account the potential of each region. According to the Presidential Decree No. PF–60 dated January 28, 2022, which approved the "Development Strategy of New Uzbekistan for 2022–2026", important tasks have been outlined such as "the rapid development of the tourism industry, increasing its role and share in the economy, expanding and improving the quality of tourism services, and developing tourism infrastructure," as well as "ensuring that people live in an ecologically safe environment." In this context, it is particularly important to study the ecotourism characteristics and potential of the landscapes of the Middle Zarafshan basin, which features diverse natural conditions and geosystems.

The implementation of the tasks outlined in several regulatory and legal documents—including the Presidential Decree No. PF–60 dated January 28, 2022, approving the "Development Strategy of New Uzbekistan for 2022–2026";

Presidential Decree No. PF-4861 dated December 2, 2016, "On measures to ensure the rapid development of the tourism sector in the Republic of Uzbekistan"; Presidential Decree No. PF-5326 dated February 3, 2018, "On additional organizational measures to create favorable conditions for the development of the tourism potential of the Republic of Uzbekistan"; and Resolution No. PQ-3514 dated February 7, 2018, "On measures to ensure the rapid development of domestic tourism"—is supported to a certain extent by this dissertation work.

LITERATURE REVIEW AND METHOD: Scientific and theoretical issues of ecotourism have been addressed in the research of geographers and economists in both Uzbekistan and foreign countries. Sources related to ecotourism were first studied in the late 20th and early 21st centuries in the works of foreign scholars such as R. Davidov, A.V. Drozdov, V.V. Khrabovchenko, T.V. Bochkaryova, L.I. Egorenkov, and A. Taksanov.

The various issues of tourism in Uzbekistan have been studied by O.X. Hamidov, N. Tukhliyev, T. Abdullaeva, A.S. Soliev, M.R. Usmonov, O'.B. Badalov, and others. The scientific and theoretical foundations of ecotourism have been researched by A.N. Nigmatov, N.T. Shamuratova, Sh. Yakubjanova, B. Kamolov, M. Khoshimov, S.N. Abduvohidov, Q.S. Yarashev, J.Yu. Khasanov, and others.

However, geotourism, as a distinct object of ecotourism, and their tourism potential have not been studied as a separate research subject. In particular, the development of ecotourism in the natural and anthropogenic geotourism of the Middle Zarafshan basin, identifying their potential, and conducting complex route planning have not been investigated.

DISCUSSION: Forest landscapes. A landscape complex is a part of the Earth's landscape sphere that has formed during the historical development of the Earth, under the influence of natural and anthropogenic factors, and differs from other areas due to its unique nature and distinctive characteristics. By landscape complex, geographical landscape, natural territorial complex, geocomplex, or geosystem, we refer to desert landscapes, sandy landscapes, basin landscapes, mountain landscapes, marsh landscapes, and others. Terms such as geocomplex, natural geographical complex, natural-territorial complex, and geosystem, which are widely used in geographical literature, are considered synonyms for the landscape [9].

Forest landscapes, despite the low natural moisture content in arid climatic conditions, are formed as a result of the full provision of riverbanks with both underground and surface waters throughout the year, as well as the interconnection with fertile alluvial soils, diverse plant species, and other components of the landscape. Their existence and development are closely related to the river's water regime and hydrodynamic activity [10].

The term "forest" refers to the local name for various plant formations growing in river valleys in desert and semi-desert zones. In some places, "forest" specifically refers to the forest, thicket, and vegetation growing in river valleys. This is also emphasized in many literature sources and encyclopedias. A forest landscape refers to a landscape complex that has formed historically as a result of the interaction and interconnection of various components in the ecological conditions that arise in riverbanks. Forest landscapes are characterized by stabilized, dynamic features of riverbanks, while the dynamic state of forest landscapes is particularly active in the lower riverbeds or parts of riverbanks [2].

Forest landscapes in arid climatic conditions form a landscape complex that stretches in a belt-like shape along river valleys between arid geosystems, and they play a significant role in human life in the region. Forests are the main source of food and habitat for wildlife. They also serve as a habitat for tree formations such as reed, cane, poplar, tamarisk, bulrush, and others. People extensively use forests for various purposes to create favorable living conditions, such as for construction, firewood, and grazing livestock [1].

At first glance, forest landscapes may seem similar. However, the forest landscape complex demonstrates its distinct characteristics through the diversity of vegetation and soil cover, the morphological structure of riverbanks, and the mechanical composition of alluvial deposits, indicating the complex morphology of the forest type variant. Thus, forest landscapes consist of moisture-loving geocomplexes, and their spatial differentiation and variability are significantly influenced by the local changes in the environment, the morphological structure of the riverbanks, the mechanical composition of alluvial deposits, the proximity of groundwater to the surface, the degree of soil salinization and moisture, and the ecological conditions, which can vary even within small areas [1].

A. Abdulqosimov and Y. Abdurakhmonova conducted field research to study the morphological structure of forest landscapes and identified several types of habitats in the area. These include the following: habitats consisting of reed forests in alluvial soils, habitats with tamarisk-juniper forest formations in grassland soils, habitats with turangil-poplar forest formations in grassland-marsh soils, habitats with juniper-wild garlic forest formations in grassland-marsh soils, habitats with ajriq-jingil forest formations in grassland soils, habitats consisting of cane reed forests covering marsh soils, habitats with tall reed forests in periodically flooded lowlands, habitats consisting of gravel stone mounds, habitats with stony and sand-stony riverbeds, habitats with river lakes, habitats with elongated valley-like ancient riverbeds, and habitats with river islands that change shape due to erosion and are covered with sparse shrubs [2].

In recent years, forest landscapes are under the threat of disappearing. The main reason for this is the conversion of forest areas into agricultural land, and

secondly, the construction of numerous hydrotechnical structures in river valleys, such as reservoirs, hydroelectric power stations, dams, and canals, as well as the concretization of riverbeds. These factors disrupt the paragenetic and paradynamic interconnections of the naturally and historically formed components of the riverbanks and lead to the deterioration of ecological conditions. Specifically, the forest landscapes in our research area are experiencing significant degradation.

Due to people's lack of a deep understanding of the cause-effect and paragenetic interconnections, the area of forest landscapes is shrinking day by day, and they are now included among the rare natural objects. Large-scale efforts are being made to preserve forest landscapes in the Zarafshan river basin as a unique natural phenomenon and a model for studying nature. In this regard, the establishment of the Zarafshan National Park (which was named the "Zarafshan National Nature Reserve" based on the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 82 dated February 7, 2018, titled "On the Organization of Activities of the Zarafshan National Nature Park") and the ongoing work to preserve the forests there should be particularly emphasized [1].

The Zarafshan State Reserve serves as a model object in the organization of ecotourism. This reserve stretches along the right bank of the Zarafshan River in a ribbon-like shape. Initially, the reserve was established to protect and increase the population of the Zarafshan blue-winged wagtail, a species not found in any other region of the world, as well as to preserve the valuable medicinal plant, sea buckthorn (Hippophae rhamnoides), and maintain the unique forest landscapes in our region. The total area of the Zarafshan Reserve is 2,352 hectares, of which 868 hectares are covered by forested areas. The reserve extends 35 km along the riverbed, with its width ranging from 150 meters to 1,400 meters in some areas.

In describing the climate of the reserve, data from the Samarkand meteorological station can be used. The climate of the area where the reserve is located is characteristic of continental subtropical regions. During the summer, temperatures can reach +40°C, while in winter, they may drop as low as -15 to -20°C. The average annual precipitation is around 300-400 mm. The vegetation cover consists of trees, shrubs, and herbaceous plants such as poplar, tamarisk, juniper, and sea buckthorn. The reserve is home to 266 plant species, 172 bird species, and 8 fish species. The number of Zarafshan blue-winged wagtails, listed in the "Red Book of Uzbekistan," exceeds 4,000 and continues to increase every year. Since 1996, efforts have been underway to acclimatize Bukhara bustard (Chlamydotis undulata), brought from the Badai-Tuqay and Kyzylkum reserves, to the area [4].

Intensive efforts are underway in the Zarafshan Reserve to preserve, protect, and restore the unique forest landscapes, study the intensity of natural processes occurring in the area, establish scientific foundations for nature conservation, and

promote ecological knowledge among the population. Preserving biodiversity in the absence of anthropogenic influence yields great results. However, certain issues arising in the surrounding areas of the reserve may potentially affect the unique species being conserved in the future. The biodiversity within the reserve is closely linked to the hydrodynamic activity of the Zarafshan River.

Firstly, changes in the river's hydrological regime have an impact, and secondly, socio-economic factors play a role. For example, private entrepreneurs and local populations are extracting large amounts of gravel from the river, often from areas of their choosing. This causes the banks to erode and deepen, accelerating the flow of groundwater towards the river and leading to a decrease in the groundwater table. As a result, this contributes to the degradation of vegetation and accelerates desertification processes. Additionally, the cultivation of nearby lands and the implementation of various agricultural activities are also causing harm to the environment.

The Zarafshan State Reserve is located only 7-8 km from the city of Samarkand, making it a promising area for the development of ecotourism. Samarkand attracts hundreds of thousands of local and foreign tourists annually, providing a great opportunity to engage them in ecotourism activities. To make their visit more meaningful and interesting, it is advisable to include ecotourism routes within the Zarafshan Reserve in their travel itinerary. Several factors contribute to the establishment of these routes:

1. The object is located near cultural centers.
2. There is an opportunity to introduce tourists to the natural landscapes and biodiversity of the area through excursions along the ecological trails (paths) established within the reserve.
3. Tourists can observe unique plants and animals, as well as enjoy the aesthetic experience they provide.
4. There is an opportunity to closely observe the Zarafshan River, its banks, and the natural processes occurring there.
5. Tourists can observe the Bukhara bustard, as well as take photos and videos, and more.

The idea of establishing ecological trails in the reserve was developed by N.V. Marmazinskaya. According to S.A. Abduvohidov and J. Hasanov, the travel experience along the ecological trails can consist of three routes:

1. The first route is dedicated to observing the Zarafshan tillarang quail, with a distance of up to 1 km.
2. The second route allows for the observation of the Bukhara bustard, with a distance of up to 3 km.

3. The third route offers the opportunity to observe wild animals, jiydazor and chakandazor landscapes, and various plant species, with a distance of up to 5 km.

Additionally, a waterway running from east to west along the riverbed has been established, providing opportunities to organize travel routes along it. The list of objects to be presented and described to tourists includes the observation of the Bukhora bustard (xongul) in its natural habitat, with opportunities for photo and video shooting. Visitors can take a walking tour along the to'qayzors, where they can observe unique flora and fauna, as well as the landscapes of the Turkestan and Zarafshan mountains. Tourists can continue their walking tour along the to'qayzors until reaching designated resting spots for eco-tourists.

To create greater convenience for ecotourists, the following measures should be implemented in the areas where ecological trails have been established in the Zarafshon National Nature Park:

- Include ecological trail routes on the national park map and place images of objects that can be viewed and enjoyed along the trails.
- Beautify the entrance alley to the Zarafshon National Nature Park.
- Beautify the surroundings of the administrative building of the Zarafshon National Nature Park and create rest areas for tourists.
- Decorate the lobby of the administration with natural flowers, install photos of the National Nature Park on the walls, and display various scientific-popular information, including models of animals.
- Enrich the Zarafshon National Park museum with electronic displays, turn it into a modern information resource center, update the museum with new exhibits, and connect it to the internet to strengthen communication with similar museums.
- Show the scientific-popular film "Pod pologom tugaynogo lesa," which was made about the Zarafshon Reserve, to tourists before they enter the museum.
- Set up a souvenir gift shop in the museum, selling Bukhara bustard feathers, bird feathers, souvenirs made from them, and herbariums.
- Involve local villagers, including representatives from the national handicraft sector, in making various souvenirs and herbariums, thereby providing them with a source of income.
- Establish services that meet sanitary and hygienic requirements in the Zarafshon National Nature Park area.
- Install screens near the existing aviary to showcase the fauna and flora of the National Park, allowing tourists to observe the Bukhara

bustard, Zarafshon warbler, squirrel, fox, badger, and learn about the birds living in the area.

- Create comfort for tourists by setting up chairs, tables, picnic areas, cooking utensils, grills, food, beverages, and refrigerators to store various fruits.
- Ensure that ecological trails do not harm the growth of protected animals and plants along the routes.
- Install windows in aviaries to allow for photo and video shooting, as well as distribute books and brochures.
- Build protective barriers at the entrance to the aviaries.
- Set up advertising banners around ecological trails, especially in places with rare plants, displaying their names and other information.
- Create rest pavilions along the riverbanks, etc.

During the trip, the following responsible staff should be appointed to provide services to ecotourists in the national nature park: ecotourism guides, animal and bird caretakers in the aviary, and gastronomic service staff. In conclusion, it should be emphasized that the negative impacts of this ecological trail and ecotourism route on nature should be analyzed by expert groups consisting of representatives from the responsible authorities and experienced scientists, and future activities should be planned based on their conclusions.

Unique mountain landscapes. The mountain landscapes of the Middle Zarafshon are divided into two groups based on their height: I) Medium-altitude mountains: Chaqilqalon, Qoratepa, G‘o‘bdintov, Oqtov ridges. II) Low mountains: Zirabuloq, Ziyovuddin mountains, Qaroqchitov, Qoratov ridges, Cho‘ponota residual mountain (hill). These mountains were formed during the Hercynian orogeny, and although their heights differ, they are geologically similar to each other. The Hercynian orogeny is very strong in the region, with lava rising from tectonic faults. All of the intrusive rocks in the mountains are related to the Hercynian mountain-building process. During the middle of the Mesozoic era, the Hercynian structures were eroded, and forms resembling peneplanation took over their place. [5]

According to geologists, the Central Asian region was covered by the sea from the early Paleozoic era to the middle of the Paleogene period, but the boundaries of the sea changed due to tectonic movements. According to Sh.D. Davlyatov, the most recent sea transgression occurred during the Eocene, and this situation changed at the end of the Eocene and the beginning of the Oligocene, when tectonic uplift forced the sea to recede. At the end of the Neogene period and the beginning of the Quaternary, tectonic activity sharply increased, and the mountains surrounding the Zarafshon basin assumed their present form. During this time, a subtropical climate dominated the Zarafshon basin, with precipitation

reaching 1500 mm. In this warm, humid climate, plant life was diverse and abundant. According to M.M. Pakhomov, Himalayan-type plants were widespread in the mountains.

The crystalline foundation of the mountains consists of Paleozoic rocks, including limestone, slates, and sandstones. Mesozoic deposits are much less widespread, and they are found on the southern slopes of the G‘o‘bdintog‘, and the northern slopes of the Zirabuloq and Ziyovuddin mountains, composed of conglomerates, sandstones, and clayey slates.

The Paleogene rocks are exposed on the northern foothill plains of the Chaqilqalon, Qoratepa, Zirabuloq, and Ziyovuddin mountains, as well as around the Cho‘ponota hill and the southern foothill plains of the G‘o‘bdintog‘, Qorachatog‘, Oqtog‘, and Qoratog‘ ridges. Neogene deposits are exposed on the foothill plains and the slopes of the valleys, especially on the foot of the Zirabuloq and Ziyovuddin mountains. These rocks are primarily composed of conglomerates, sandstones, and gravels, and they appear in reddish-brown, brown, and yellowish-brown colors. Deluvial, alluvial, and proluvial deposits are widespread in the mountains.

The slopes of the mountain ridges in the basin have an asymmetric appearance. The northern slopes of the mountains are steep and short, while the southern slopes are long and gentle. The main reason for this is that a tectonic fault passes through the northern foothill areas, while a flexure fold forms on the southern slopes. This type of tectonic structure influences the length of the valleys, the characteristics of groundwater springs emerging at the base of the mountains, the deposition of proluvial rocks in the foothill plains, and their granulometric composition. On the northern slopes, conical fan-shaped deposits of varying sizes, consisting of stones, sands, and soils, have formed in the proluvial deposits of the foothill plains.

The situation is completely different on the long, sloping southern slopes. In large valleys, with a length of over 10 km, there are river bends and terraces where people have lived for centuries. In thousands of small streams, water flows temporarily in the spring and winter. The steep slopes are covered with soft deluvial materials. In the large valleys, the local population practices horticulture and viticulture, while on the slopes, irrigated farming is developed.

At the foothills of medium-altitude mountains, typical and dark brown soils are widespread, which are replaced by light, typical, and dark brown soils as the altitude increases. The distribution of plants on the mountains is also dependent on the altitude. The foothills are mostly covered with steppe plants, which are replaced by desert plants starting at altitudes of 1100-1300 meters. In areas with minimal human impact, dense mountain forests are formed by juniper, maple,

rhododendron, mountain ash, hawthorn, almond, wild almond, and others. However, near villages, these trees have been cut down.

In the division of mountain landscapes into morphological units, the exposure of slopes, altitude, different types of mountain rocks, and relief forms play a key role. The differences in temperature and humidity of slope exposure are highlighted in the works of I.N. Stepanov and E.M. Murzaev. A.R. Rakhmatullayev, using the example of the Oqtog‘ range, demonstrated through some measurements that there are microclimatic differences on the western and eastern slopes of rivers. In an arid climate, weathering in various mountain rocks occurs at different rates, leading to the formation of diverse relief forms. Taking into account these characteristics of mountain rocks, "landscape types," which are morphological units of the Western Zarafshon ranges, are distinguished and described. Due to the exposure of mountain rocks in an arid climate, selective denudation occurs at varying rates under the influence of external forces, resulting in the formation of different relief forms, with varying thickness and mechanical composition of the weathering products [3].

Even the weathering crust formed on rocks differs in mineralogical and chemical composition. On granite rocks, the amount of carbonates is relatively low, while in areas composed of limestone, the weathering crust and the soils within it have a high calcium content. As a result, on limestone slopes, plants that require a lot of calcium, such as calcifuge species, Acantholimon, and other types of plants, are widespread. To highlight the ecotouristic significance of mountain landscapes, we will attempt to examine the average altitude mountain landscapes of Chaqilkalon, G‘o‘bdintog‘, and Cho‘ponota residual mountains. The main reason for selecting these mountains is that one of them connects to the high mountain knot in the east of the basin, while the other connects to large desert massifs in the north of the basin. The geographical location and natural geographical characteristics of these mountains allow us to consider them as a methodological basis for researching other mountain landscapes within the basin from an ecotouristic perspective.

Chaqilkalon is a mountain landscape of average elevation. It occupies the eastern part of the basin region and borders the Mo‘minobodsoy river in the east. This area also marks the boundary of the limestone distribution. In the geological structure of the mountains, slates dominate, which makes them significantly different from the Qoratepa mountains. The southern boundary is marked by the upper section of the Qashqadaryo river, while in the west, it is separated from the Qoratepa mountain ranges by the Oqsuv river valley and the Omanqo‘tonsoy river, which is dominated by intrusive rocks. In the north, the mountain range drops steeply into the foothill plain and merges with the river valley. The total area of the mountain massif is 628.16 km².

Orografically, Chaqilkalon is a second-order, highly elevated and tectonically disturbed anticlinal structure, primarily composed of limestones, with some Silurian and Devonian slates. The characteristic features of the landscape are its elevation and fragmented relief. The absolute elevation of the mountain reaches up to 2,350 meters, and sometimes up to 2,590 meters, with the western part of the massif having a water divide line that descends to 1,700 meters. In the upper reaches of the rivers (Mo‘minobodsoy, Kamangaronsoy, and Shoxoqsoy), steep slopes form terraces. The existing river valleys and slopes are made of limestone, which are steep, facing south, with a flat surface but still quite inclined.

In the landscape cross-section, the slopes of the Chaqilkalon mountains have a distinctly asymmetrical character. The northern slopes are short and steep, intersected by deep transverse valleys, formed by both permanent and temporary water flows. The limestone areas create a canyon-like appearance. The southern slope is more gradual, with traces of ancient denudation processes clearly visible, deeply fragmented by valleys. Traces of these ancient denudation processes can also be observed in the upper part of the Kamangaronsoy. The slopes are composed of limestone, where karst processes are intense due to moisture and temperature.

In the Chaqilkalon region, the period when the average daily temperature exceeds +5°C starts on March 7 and lasts until November 26, totaling 263 days. During this period, the cumulative positive temperatures amount to 4260°C. The number of days with average daily temperatures exceeding +100°C spans from April 6 to October 22, with a total of 198 days. The cumulative positive temperatures during this period reach 3780°C. The Chaqilkalon mountains are well-supplied with atmospheric precipitation. The average annual amount of precipitation in the area varies, ranging from 450 mm in the lowland landscapes to 1,000 mm in the mountainous zone. Along the northern slopes of Chaqilkalon, the main water arteries—Omonqo‘tonsoy, Kamangaronsoy, Urgutsoy, G‘ijduvonsoy, and Mo‘minobodsoy—are formed, creating cone-shaped alluvial fans in the foothill plain.

Under relatively rich and favorable moisture conditions, the slopes of the Chaqilkalon mountains are dominated by dry-steppe and semi-desert landscape complexes. In the region, L.A. Alibekov identifies three altitudinal zones (levels), and he also outlines complex patterns that illustrate the system of their components and the key characteristics of their structure.

The altitude of the mountain mass above sea level creates cooler and more humid climate conditions compared to other areas of the basin. Winds blow throughout the year. Winters are longer in the mountain mass, while summers are relatively short, and transitional seasons are less pronounced. The annual precipitation reaches up to 1000 mm in many areas, and even more in the east.

The plant cover is characterized by formations such as acantholimon, esparcet, and takasagiz, with the eastern high part dominated by arid zone vegetation, growing along the slopes and in cracks on the rocks. In the western part of the region, wheatgrass is widespread. Inadequate humidity conditions lead to the formation of weakly humus-bearing, rocky-skeletal open brown soils over the leached limestone and slates of the drainage area. Based on the lithological structure and relief features of the drainage area, the following landscape types can be distinguished: coarse-layered limestone and heavily fragmented drainage areas.

The slopes of the mountains, especially in areas with steep gradients ranging from 40 to 45 degrees, are characterized by jagged, terraced peaks. The southern slopes, in particular, are often steep and rocky, formed by monoclinal limestone structures. Most of these slopes are shaped by intense physical weathering processes. The sparse vegetation cover leads to the degradation of existing pastures.

The mountain landscape is suitable for ecological tourism as it offers favorable living conditions for people. The region has a high density of settlements, particularly in the foothill plains. The frost-free period lasts from April 7 to October 25, covering a span of 200 days. In January, the average temperature is -0.2°C, while in July it rises to 24.6°C. During the spring period, when temperatures range from +5°C to +15°C, 143 mm of rainfall occurs, while in the summer, 74 mm of rainfall is observed. The dry period begins on June 4.

The Chaqilkalon mountain range holds immense potential for the development of ecological tourism. The region offers ample opportunities to organize and develop various forms of ecological tourism throughout the seasons. The mountains are considered a moderately stable ecological zone, with clear, refreshing air, crystal-clear water, and an abundant variety of plants and wildlife. This makes it an ideal destination for diverse recreational activities in different seasons:

- **Spring:** Visitors can enjoy activities like tulip picking, nature walks, and relaxation amidst the serene landscape.
- **Summer:** The area is perfect for short trips, mountaineering, hunting, horseback riding, and hiking.
- **Autumn:** This season offers great opportunities for short excursions, hunting, and both horseback and walking tours.
- **Winter:** The region becomes ideal for winter sports such as skiing and sledding, along with opportunities for hiking and horseback riding.

With its pristine environment and diverse natural offerings, Chaqilkalon is an excellent spot for sustainable and nature-based tourism.The Qirqtog‘ Plateau, located in the Devonian period's karst-prone limestone, is characterized by a gentle, sloping, and uneven surface. It consists of monoclinal sedimentary layers

made up of gray and light gray Devonian rocks. The absolute elevation of the Qirqtog‘ Plateau is around 2200-2300 meters.Karst processes are widespread in this area, and they occur intensively under the influence of moisture and temperature on the limestone. Asymmetric, circular karst sinkholes are commonly found here, with diameters reaching several tens of meters and depths extending to 15-20 meters.

In our republic, a unique and exceptional underground water reservoir created by nature is located on the high mountains of the Qirqtog‘ Plateau. There is no place in our country that compares to the Qirqtog‘ Plateau; this area is an unparalleled landscape, covering an area of 25 km². On this flat plain, numerous karst formations, sinkholes, basins, lakes, wells, and shafts are found. The region is dominated by limestone, where many cracks are present. At the intersections of these cracks, snow and rainwater collected from above accumulate, causing the limestone to dissolve and resulting in the formation of vertical flow channels. Over long geological periods, these steep flow channels have expanded to the point that natural wells and shafts have formed, large enough for people to walk through. In some places, their width reaches 30-40 meters. Karst researchers have mapped the western part of the Qirqtog‘ Plateau, and on this map-scheme, 310 karst sinkholes and 56 karst shafts are marked. Additionally, the Sariqtol karst lake, with depths ranging from 15 meters to 200 meters, is also depicted on the map.

Considering that karst processes do not only create underground voids but can also lead to the collapse and closure of certain parts, it is possible to turn each small well, including its sealed sections, into an important object for ecotourism by inspecting and evaluating them. This approach could add significant value to the area, making it an interesting destination for visitors interested in karst landscapes and underground formations.

In the Qirqtog‘ Plateau, karst shafts are widespread, and the largest and deepest of these is the KILSI (Kiev) shaft cave. When descending into the Kiev shaft for the first time, one encounters a blockage at a depth of 420 meters, followed by another obstruction 100 meters further down. Speleologists have discovered a lake formed at a depth of 955 meters, where the natural shaft is sealed with red clay.

Karst sinkholes and shafts are underground water reservoirs created by nature, where rain and snowmelt water accumulate, leading to the formation of underground rivers, lakes, and springs. However, in recent years, the extensive use of natural resources in the Qirqtog‘ Plateau region has resulted in changes to the area's ecological balance. To prevent further deterioration, it is essential to designate this area as a protected zone, preserving it as a region where underground water reserves are formed. Additionally, the number of livestock in

the area should be limited, which will help in the restoration of pastures. Overgrazing in these pastures can lead to significant negative consequences.

The Qirqtog‘ Plateau stands out from surrounding areas due to the intense karst processes that occur there. The surface features of the plateau include various sizes and shapes of stones, cuesta-like ridges, exposed cliffs, and vibrant green pastures. The first researcher to study this plateau, N.A. Gvozdeskiy, compared it to the Crimean steppe: “... this region, in terms of the intensity of karst formation and numerous morphological features, is very similar to the Crimean steppe,” he emphasized.

In this region, plants such as arenaria, sarsazan, lactuca, and others grow in karst sinkholes, along with species like sassiq, taran, feruza, saffron, mountain irises, and wild oats. The Qirqtov Plateau is divided into the following zones: surfaces covered by diverse herbaceous plant formations in the karst sinkholes and hills populated by karst-shaped xerophytes.

Cho‘ponota Lowland (Residual) Mountain Landscape. The area covers 5.1 km². The Cho‘ponota residual mountain landscape is located to the northeast of Samarkand city and is named after the Cho‘ponota hill. The residual mountains represent a portion of the Paleozoic foundation that has emerged to the surface, consisting of clay and crystalline shales, as well as red sandstones that have undergone metamorphism. Additionally, the region features Mesozoic marls and limestones, along with Tertiary clays and conglomerates. The Cho‘ponota residual mountain is strongly fragmented by dry riverbeds and their valleys.

The relief of the Cho‘ponota residual mountain is sloped, with its elevation varying between 860 m and 700 m. In terms of ecological tourism, it is essential to establish recreational areas for the urban population, including parks, vacation homes, and short-term leisure areas around Cho‘ponota hill, creating an ecotourism zone. It is recommended to preserve the natural landscape and monuments in their original state. Ecotourism routes should be developed to provide opportunities for visiting the picturesque natural sites, engaging in sports activities, and exploring unique historical and architectural landmarks. Enhancing tourist flow to locations such as the Maydon Garden, Chilustun Palace, and Ulugh Beg Observatory, increasing and improving service quality, advertising, and attracting interest will significantly boost the number of visitors to the Cho‘ponota residual mountain. Additionally, the Konigil area also holds great potential for attracting tourists. The Konigil hills are historically significant, as it is known from sources that the area was once a site for royal picnics and gatherings for the people and rulers of Samarkand, dating back to ancient times.

Ghobdin Mountain Landscape. Ghobdin Mountain is a medium-altitude mountain, considered part of the Nurata mountain system, which in turn is a western branch of the Turkestan mountain range—an extension of the western

Pamir-Alay mountains. The mountain massif stretches 41 km from east to west and up to 18 km from north to south, with its highest point located in the central part (1672.8 m), gradually descending toward both the west and the east. Ghobdin Mountain is regarded as one of the structural elements of the Ural–Tian Shan geosynclinal zone [7].

The geological development history of the Ghobdin mountain massif has been studied by geologists such as A.A. Yurev, N.A. Smirnov, A.A. Chistyakov, and others. The Ghobdin mountain is composed of rocks from the Paleozoic, Mesozoic, and Cenozoic eras. The geological foundation of the mountain consists of Paleozoic deposits, including metamorphosed slates, sandstones, and limestones belonging to the Silurian and Devonian periods of the Paleozoic era. Additionally, deposits from the Triassic, Jurassic, and Cretaceous periods are exposed on the southern slopes of the massif, particularly along the slopes of certain streams.

The northern slopes of the Ghobdin Mountains are steep, while the southern slopes are more inclined. This condition is explained by the diversity of tectonic movements that have occurred in the mountain massif, which has also led to the varied deposition of sediments. For example, slates, limestones, and sandstones are deposited in horizontal layers, whereas metamorphic rocks are found in fragmented, block-like forms. The steep and highly inclined arrangement of the deposits creates favorable conditions for the infiltration of precipitation into the ground.Tectonic movements during the Quaternary period also led to the uplift of the area between the Chumqortov and Ghobdintov ranges, causing the Sangzor River to alter its course and begin flowing northward. The ongoing deep erosional processes in the streams, ravines, and valleys, the increasing formation of gullies, and the occasional occurrence of earthquakes in the area all indicate that neotectonic activity in the Ghobdin mountain massif is still continuing.

In B.A. Alisov’s climatic classification scheme of the former Soviet Union, the Ghobdintov region and its surrounding areas fall under the continental subtropical climate type. This climate is characterized by high levels of sunlight and warmth, large diurnal temperature fluctuations, and low precipitation levels.

The average annual air temperature is recorded as 11.6°C in Lalmikor, 12.9°C in G‘allaorol, and 12.5°C in Bulung‘ur. In the vicinity of the Ghobdin Mountains, the average temperature in July ranges from 26°C to 27°C. During the coldest period, absolute maximum temperatures at nearby meteorological stations have reached up to +23°C in January and +30°C in February. In contrast, the absolute maximum temperature during the hottest months has been recorded at +46°C in Lalmikor and Payariq. The absolute minimum air temperatures in the region drop to between –26°C and –35°C in January, and in April, a decline to –8°C to –10°C has been observed.

Due to the relatively low elevation of the Ghobdin Mountains and their east-west orientation, they do not pose a significant barrier to the westerly air flows, resulting in relatively low precipitation. The mountain foothill plains receive an average of 300–350 mm of annual precipitation, with a maximum of about 550 mm recorded in G‘allaorol. The snow cover typically lasts for 10–15 days, although in some years it may persist for more than a month.

In the Ghobdin Mountains, groundwater infiltrates through fractures and fissures in crystalline rock formations and emerges at the surface in the form of springs. The abundance of water in these springs is associated with the geological structure and the composition of the mountain rocks. Streams are scarce in the area, and those that do exist are dry streambeds that carry water only periodically.The streams on the northern slopes are short (not exceeding 5–7 km in length) and have small catchment areas, whereas the streams on the southern slopes are relatively longer (up to 15 km) and have larger basins—such as Ingichkasoy, Qadamjasoy, Kattasoy, and others. During peak flow periods, the discharge in the middle reaches of large streams reaches 25–35 liters per second. During periods of heavy rainfall, this discharge can increase up to 100–120 liters per second [6].

The soils of the Ghobdin Mountains are distinguished by their diversity. In the foothill plains, typical gray soils with varying mechanical compositions are widespread, gradually transitioning into dark gray soils at higher elevations. The soils on the northern and southern slopes of the mountain differ from each other. On the northern slope, typical dark gray soils are common, while light brown soils are found at the mountain summit. On the southern slope, gray soils dominate, with dark gray soils appearing at the summit.In the foothill plains, a variety of soil types can be found, including typical gray, dark gray, and light brown soils, as well as irrigated gray soils. Meadow soils are distributed across the stream basins. These soils differ in their mechanical composition, thickness, and humus content.

P.Q. Zakirov reports that 679 plant species are found in this region, while R.V. Kamelin emphasizes that the number exceeds 850 species. The majority of the vegetation consists of wheatgrass along with various ephemerals and ephemeroids, perennial saltworts, mallows, ziziphora, scabiosa, Aegilops, knapweeds, desert feather grass, globe thistle, chickling vetch, liquorice, milkwort, and several species of xerophytes.Among the trees and tree-like species growing in the area are willow, poplar, hawthorn, Semenov’s maple, black almond, wild almond, wild cherry, cotoneaster, and wild pistachio.Common rodents in the region include the Turkestan rat, jerboa, forest mouse, jird, mole-rat, small jerboa, great sand gerbil, blind mole rat, and hare. Among predators, wolf, fox, and wildcat are frequently encountered. Reptiles such as tortoise, yellow snake, blunt-nosed viper (Gyurza), and small boa snake inhabit the area. Birds such as the

raven, lark, songbirds, quail, house sparrow, magpie, and myna are widely distributed.

In the Ghobdin Mountains, tectonic structures play a key role in the differentiation of landscapes. Based on the genetic principle, A.R. Rakhmatullaev and others consider the Ghobdin Mountains as a distinct regional complex and identify the following landscape types: 1)Mountain landscape composed of crystalline rocks; 2)Foothill plain landscape formed by ancient and recent proluvial deposits [8].

Results. The ecotouristic characteristics of geosystems in the Middle Zarafshan Basin have been analyzed, and proposals have been developed to preserve their current state and to promote the development of ecotourism in the region.

For the purpose of developing ecotourism, ecotouristic routes have been designed.

In accordance with the provision outlined in the Decree of the President of the Republic of Uzbekistan No. PF–60 dated January 28, 2022, approving the *Development Strategy of New Uzbekistan for 2022–2026*—specifically the point concerning "the creation of new types of tourist routes, the development of modern forms of tourism, and the enhancement of their attractiveness"—a map of the ecotouristic regions and routes of the basin has been developed.

The ecotourism potential of the Middle Zarafshan Basin (including natural monuments and unique landscapes) has been utilized in the practical activities of the Ministry of Tourism and Sports of the Republic of Uzbekistan for the development of future plans to establish new ecotourism bases. As a result, it enabled an increase in the number of planned tourist bases.

To promote the future development of ecotourism, the map titled *"Ecotouristic Regions and Routes of the Middle Zarafshan"* has been integrated into the practical activities of the Ministry of Tourism and Sports of the Republic of Uzbekistan for the design of new tourist routes. As a result, it created opportunities to introduce both domestic and international tourists to numerous new sites within the basin

Data supporting the justification for utilizing stream basins (Zarafshan, Kattakurgan, Omonqoton, Urgutsoy, and Tosinsoy) as ecotouristic sites, along with proposals and recommendations aimed at the effective use of the basin's ecotourism potential—such as the establishment of natural nurseries and the construction of guest houses in mountain and foothill areas—have been integrated into the practical activities of the Ministry of Tourism and Sports of the Republic of Uzbekistan. As a result, this has enabled the effective utilization of the ecotourism potential of the basin.

The proposals and recommendations regarding the development of ecotourism in the landscapes of the Middle Zarafshan Basin have been incorporated into the practical activities of the Ministry of Tourism and Sports of the Republic of Uzbekistan to identify promising types and directions of ecotourism. As a result, this has facilitated the development of scientific and practical foundations for establishing modern tourism routes in the basin and identifying new ecotouristic paths.

Conclusion.

It should be emphasized that there is significant potential for organizing and developing various types of ecological tourism throughout the seasons in the mountain massif. The area is characterized by clean and pleasant air, crystal-clear and environmentally stable water sources, a rich diversity of plant species, and colorful natural landscapes.Due to these favorable conditions, the G‘o‘bdin Mountains offer excellent opportunities for seasonal ecotourism:In spring, activities such as tulip and greenery festivals, horseback and hiking tours, mountain sports, and nature-based recreation can be widely promoted.In summer, the area is ideal for short-term tours, hunting, horseback and hiking excursions.In autumn, it is suitable for short recreational stays, hunting, walking and riding tours, as well as mountain sports.In winter, the region offers great potential for mountain sports, including skiing and sledding, as well as horseback and hiking tours.

Foydlanilgan adabiyotlar

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