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LANDSCAPE AND RECREATIONAL POTENTIAL OF THE MOUNTAINOUS TERRITORIES OF THE TURKESTAN REGION OF THE REPUBLIC OF KAZAKHSTAN

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Abstract: This article presents the criteria for a component integral assessment of the landscape and recreational attractiveness of the mountainous territories of the Turkestan region. The method is based on a component assessment of landscapes, which consists of the main indicators that make up the landscape: relief, climate, water bodies, vegetation cover, and specially protected natural areas. As a result of the study, the mountain landscapes of the Turkestan region were zoned according to the degree of landscape and recreational potential. The study allows you to get an idea of the availability of natural and recreational resources and determine the priority areas of recreational activities in the study region.

Key words: tourism, recreation, landscape, recreational potential, mountain territories

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INTRODUCTION

As our daily lives become faster and more hectic, increasing numbers of people are discovering mountains as places for recreation and spiritual connection. As urbanization and population growth continue apace, mountains – which are often quite remote – are increasingly perceived as among the surviving «untouched natural treasures», offering attractive landscapes and a wide variety of plant and animal species. From mountaineering to skiing, trekking to climbing, mountain-biking to canyoning, wildlife observation to recreational activities at medicinal mineral water sources and spas, the spectrum of opportunities for mountain tourism is particularly broad (Debarbieux et al., 2014).

Tourists frequently seek transcendent locations and landscape. The same can be said of wellness tourists. Mountains with their spectacular scenery, majestic beauty, and unique amenity values, are one of the most popular destinations for tourists. It is no coincidence that many international tourist resorts are located on mountain tops (Smith and Puczky, 2008; Nepal and Chipeniuk, 2005). However, the steepness, fragility, marginality, and high cost interms of economic resources are limitations for the development of tourism in the mountains. Yet, for a long time, recreational tourism was the dominant type of tourism in mountain areas, with activities such as fishing, hiking, skiing, snowmobiling, and snowboarding (Heberlein et al., 2002). With the emergence of alpine wellness (Weiermair et al., 2007), studies on mountain tourism gradually moved to focus on its positive effects on health and other specialized, differentiated products. Wellness tourism in mountain areas is becoming a hot topic in tourism research (Ramazanova et al., 2020; Berdenov et al., 2021).

Tourism and recreation have a clear focus on the use of natural resources, while recreational activities include not individual components of nature, but the entire natural complex (landscape) as a whole. This article analyzes the state of the landscapes of the mountainous territory of the Turkestan region and a ranked landscape and recreational assessment of the components (Dirin and Madry, 2019), (Gurova, 2018). The studied mountain territories (Karatau, Boraldai, Talas-Alatau, Maidantal, Ugam, Karzhantau ranges) are located in the center of the Turkestan region, from northwest to southeast. These mountain ranges are the western spurs of the Western Tien Shan mountain system. The total area of the

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mountainous territories of the Turkestan region is 21988 km^2 (18.7%), the Karatau and Boraldai Karatau ranges are located within Kazakhstan, the rest (Ugam, Talas-Alatau, Maidantal) are located in the border regions of Uzbekistan and Kyrgyzstan.The landscapes of the mountainous territories of the Turkestan region are the object of assessment of recreational attractiveness. The basis for drawing up a landscape map of the studied region was made up of field research materials involving component maps and literary sources (Isachenko, 1991; Solntsev, 2001; Medeu, 2010; Gvozdetsky, 1978; Tretiak and Marchenkova, 2020). In the mountainous territory of the region, we have identified 13 geosystems at the level of the landscape type. The purpose of this study is to assess the landscape and recreational potential of mountainous areas for further use of the results obtained in determining the priority areas of recreational activity of the studied region.

MATERIALS AND METHODS

This paper based on a secondary and primary sources, that aims to provide theoretically based case studies analysis of the essential characteristics and key resources of the south mountain regions in the Republic of Kazakhstan as a potential tourist destinations. The methodology that was applied is widely used in geographical and tourism studies.

Based on the methods proposed by V.I. Popov, M.V. Gudkovsky (Popov and Gulyaeva, 2003), (Gudkovskikh, 2017), we have proposed criteria for a component-by-component integral assessment of the recreational potential of mountain landscapes. Methods for assessing landscape and recreational potential are based on the definition of individual indicators, which are eventually integrated into the overall assessment. The choice of indicators depends on the components of the nature of the selected region, in our case, a mountainous area is selected.

This methodology is based on a component-by-component assessment of landscapes, which consists of the main components of the landscape (relief, climate, water bodies, vegetation cover and specially protected natural areas). The structural scheme of the study of the landscape and recreational potential of mountain territories is presented in Figure 1. The main evaluation criterion is the degree of favorability of landscape components and its functional suitability.

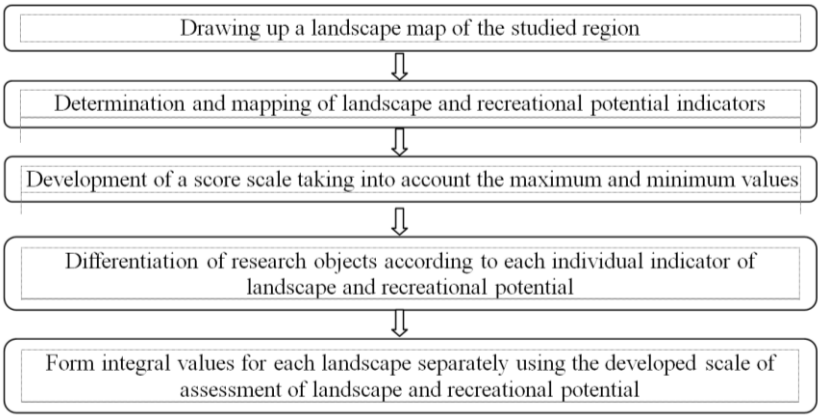

Figure 1. Block diagram of the study landscape and recreational potential of mountain territories

Table 1. Scale of assessment of landscape and recreational potential of mountain territories (Popov and Gulyaeva, 2003; Gudkovskikh, 2017)

Terrain assessment component						
№	Indicators	Score scale				
		1 s.	2 s.	3 s.	4 s.	5 s.
1	Absolute height, m	<1000	1000-2000	2000-3000	3000-4000	>4000
2	Slope angle, degree	<80		84		> 88
Climate assessment component						
3	Duration of sunlight h / year	<1500	1500-2000	2000-2500	2500-3000	>3000
4	Average annual precipitation, mm per year	<300	300-500	500-700	700-900	>900
5	Average annual wind speed, m/s	<1	1-2	2-3	3-4	>4
6	The duration of a comfortable summer period is t.15°C, the sun.	<150	150-160	160-170	170-180	>180
7	Average long-term number of days with favorable weather in summer	<50	50-60	60-70	70-80	>80
8	Average long-term number of days with favorable weather in winter	<50	50-60	60-70	70-80	>80
9	Average snow cover Height, cm	<20	20-30	30-40	40-50	>50
10	Has a stable snow cover average duration of days	<150	150-200	200-250	250-300	>300
Water resources assessment component						
11	River network density km / km^2	<0,10	-	0,15	-	>0,20
12	Average July water temperature, °C	<2	2-3	3-4	4-5	>5
13	Availability of mineral springs, number of wells	<1	-	2	-	>3
14	Availability of therapeutic mud sites, units	<1	-	2	-	>3
Vegetation cover assessment component						
15	Woodiness %	<5	10	15	20	>25
16	NDVI	<0,10	0,10-0,15	0,15-0,20	0,20-0,25	>0,25
Component of the assessment of specially protected natural areas (protected areas)						
17	Protected area, %	<20	20-30	30-40	40-50	>50

Most scientists believe that the morpho lithogenic basis is the leading component of the landscape. The relief, along with other natural components (the same type of geological structure, climate, and a specific combination of soils, flora, and fauna), determines the possibilities of tourist and recreational development of the region, increases or limits the variety of possible tourist and recreational activities, affects the aesthetics of the landscape. Scientists such as Nefedova V.B., Smirnova E.D. (Nefedova et al., 1973), and Bredikhina A.V. (Bredikhin, 2004) have assessed the favorability of the relief for recreation (Table 1). Bredikhin A.V. considers the relief (in the aspect of recreational geomorphology) as a recreational resource that provides recreation, i.e. a means of maintaining and restoring people's ability to work, health, and satisfaction of their cultural and aesthetic needs. The action of endogenous and exogenous forces of varying intensity in time and space is manifested like relief. At the same time, the relief itself largely determines the nature of its further development, since it is the most important property of the geographical environment and depends on the natural conditions of climate formation, the distribution of surface and groundwater, the structure of soils, and vegetation cover (Bronguleyev, 1961). The absolute height of the mountainous territories of the Turkestan region was determined using the SRTM digital Earth model.

Based on the indicator of the absolute height of the mountainous territory of the Turkestan region, we can determine what types of recreational mountain tourism we can organize in this territory. How high is the absolute altitude we are engaged in mountaineering, hiking in the mountains, or rafting. The slope angle - that is, the slope, among the orographic recreational resources, mountain resources occupy a special place. The variety of natural conditions of the mountains, the presence of extreme, and even favorable conditions for recreation and sports create all the prerequisites for the development of various types of recreational activities. Mountain walks have various opportunities both for the entertainment of different categories and for sports-this is due to overcoming passes, rocks, snow, ice. Mountain hikes cover all high-altitude zones-from low-lying to high-altitude, but the most interesting in terms of sports is the nival-ice zone. The category of mountain tourist routes is influenced by technical complexity, their length, absolute height, snow cover and icing, the number of overnight stays on the route, climatic conditions, and severity of weather conditions (Buvalkin, 1978). The slope indicators of the mountainous territories of the Turkestan region are determined using the tools of the «Spatial Analysis» module for ArcGIS.

The analysis of the annual temperature and the course of precipitation is a mandatory component of tourist characteristics. The average monthly values of temperature and precipitation are presented in the form of a table, the analysis of which makes it possible to determine the presence and duration of the summer and winter tourist seasons, the degree of their favorability for tourism, and the possibility of using the directions and types of tourism. When describing the temperature, it is necessary to know the distribution of air temperature by season and annual temperatures. The temperature of the coldest (winter) and warmest (summer) seasons are determined by climate maps. Based on the data of the isotherm and the analysis of the annual course of temperatures, the presence, and duration of the tourist seasons are determined: winter and summer. One of the components of the assessment of the recreational potential of the mountainous territory as a whole is the climate. The greatest influence of climate is the human reaction to heat, namely lighting, the length of the day, the total intake of solar and ultraviolet radiation, air transparency, temperature and humidity, wind speed, cloud cover, etc. climatic conditions of the region, of course, can have a great impact on the development of tourism. The implementation of many recreational activities, such as swimming, sunbathing, many types of climate therapy, is possible only in certain climatic conditions.The duration of sunlight has a positive effect on the organization of this recreation.

The average long-term number of days with favorable weather in summer and winter, the duration of a comfortable summer period is 15°C / day, when describing precipitation, it is important to indicate their total amount, the change in their amount over the study area, the annual course (the mode of precipitation by month) and the form of precipitation. The total amount of precipitation and its geography is determined by the climatic maps of the research region and the data of the Republican State Enterprise «Kazhydromet». The analysis of snow cover assumes an indication of its presence, stability, and duration of lying, the higher the values of these indicators, the more favorable conditions for the development of winter types of recreational and sports tourism. On tours in this climatic zone, it is necessary to note the main winds. Only the so-called main winds. But in some cases, it is necessary to name the most important local winds (bora, barguzin, samum, etc.), which significantly affect the possibility of tourism development in this area during a certain tourist season (Valeev, 1986).

The water components of the natural complex make up a significant part of the natural recreational resources of the mountainous territory. In tourist and recreational activities, they provide great opportunities: rafting on mountain rivers, boating, fishing, many are interested in magnificent waterfalls or aesthetically relaxing by the water. When determining the recreational favorability of water bodies in the study area, the following characteristics were taken into account: the density of the river network, the average water temperature in July, the presence of mineral springs, the number of wells, the presence of therapeutic mud deposits. The importance of vegetation cover as a recreational resource is very great for all other types of natural tourism, as it is associated with the health-improving effect of the landscape, the presence of attractive plants and animal species due to ionization, and phytoncide properties of plants.

The recreational attractiveness of the vegetation cover of the mountainous territory of the Turkestan region was carried out (determined) by the following indicators: forest cover and NDVI (Normalized Difference Vegetation Index). Forest cover - the degree of forest cover of any territory, expressed as a percentage, determined by the ratio of forested land to its total area (Kazakh Soviet Encyclopedia, 1975). NDVI, the vegetation index is an indicator calculated as a result of operations with various spectral ranges of remote sensing data and related to plant parameters in a given pixel. The effectiveness of vegetation indices is determined by the reflection features. The calculation of most of the vegetation indices is based on the two most stable regions of the spectral reflection curve of plants. We determined the indicator of the normal vegetation index using the ArcGIS 10.4 program using the 4th and 5th channels from the multispectral wood of the Landsat-8 satellite, an artificial Earth satellite.

The development of ecotourism, i.e. nature-oriented, not causing significant harm to the natural environment, aimed at environmental education, taking care of the preservation of the local socio-cultural environment, ensuring the sustainable development of the areas in which it is carried out, should be planned in specially protected natural areas (protected areas).

The development of ecological tourism in the modern world is inextricably linked with protected natural areas, national parks, nature reserves. It is impossible to develop mass tourism in our reserves, which no one has ever planned, and it is technically impossible. Unlike nature reserves, the development of tourism for national parks is one of the main and officially announced areas of activity. However, the creation of an effective infrastructure for the development of tourism is required in national parks. In the Turkestan region, the protected area covers most of the mountainous territory. We have determined the volume of protected areas using the National Atlas and standard applications of the ArcGIS 10.4 program.

The relief, climate, water resources, and indicators of vegetation cover and protected areas of the mountainous territories of the Turkestan region were obtained for each mountain range. The integral evaluation of a component is the sum of the scores of those indicators that were used to evaluate it. According to this amount, a ranking was carried out, and the final evaluation of the component was revealed. The integral assessment of recreational attractiveness is the total value of the above parameters and was calculated using the formula (1):

$$LRP = \frac{Si * 100}{Smax} \quad (1)$$

where LRP is landscape and recreational potential, Si - score of indicators, Smax-the maximum possible score. The present formula has been adapted according to Orlova's formula (Orlova, 2006).

In our studies, the maximum possible score is 85, since we have 17 indicators, where the highest score is 5. Then the values of the value of recreational attractiveness for each landscape were found. Based on the data obtained, a corresponding map was compiled. According to the results of the assessment of the value, four types of territories with different degrees of recreational attractiveness were identified.

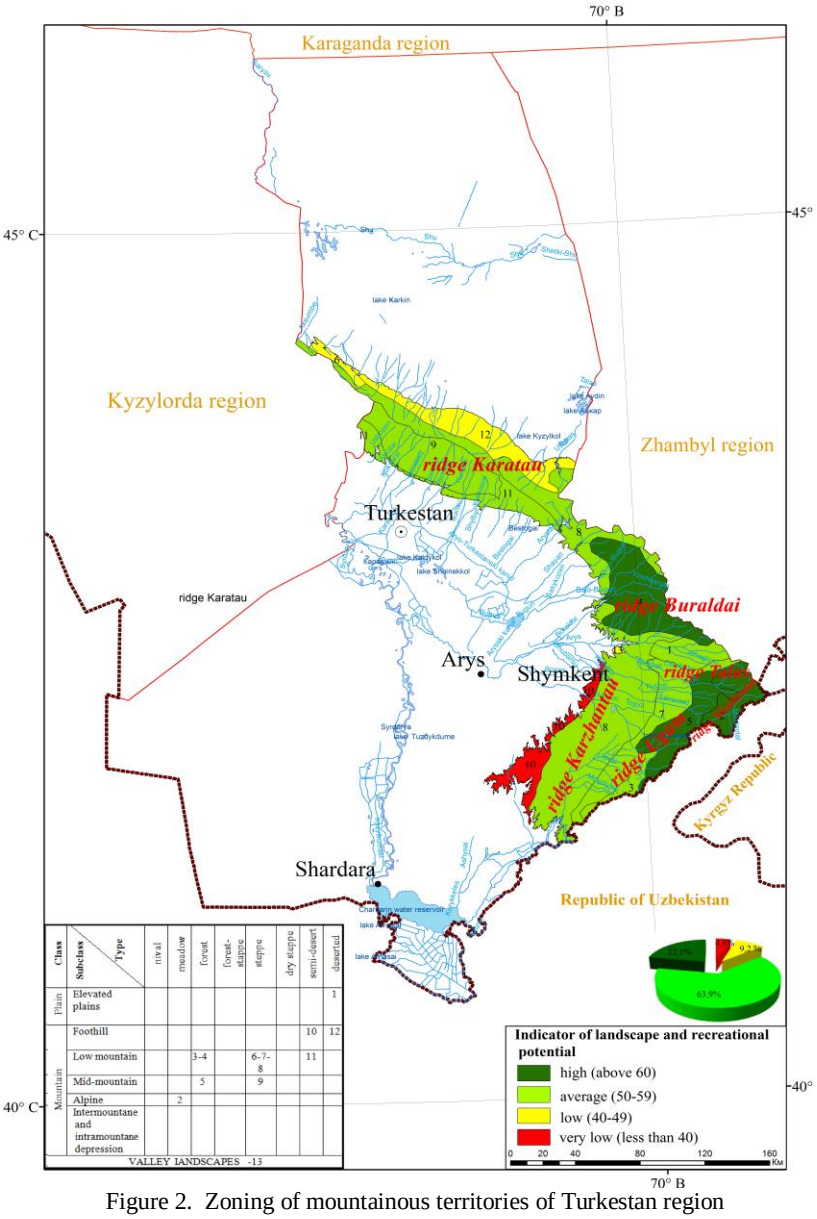

Figure 2. Zoning of mountainous territories of Turkestan region according to the degree of landscape and recreational potential

RESULTS DISCUSSIONS

To assess the landscape and recreational potential of the mountainous territories of the Turkestan region, we studied stock materials, weather service data, and cartographic material. Based on the collected materials, we have compiled a map of the zoning of the mountainous territories of the Turkestan region according to the degree of landscape and recreational potential.

The analysis of the map showed that as a result of the assessment of the landscape and recreational potential of the mountainous territories of the Turkestan region, landscape No. 10 belongs to the areas with a **very low** degree of potential. This landscape is located at the foot of the mountains, consisting of clay, sand, gray soil in the usual conditions of the south of the territories of Kazakhstan, consisting of mint and ephemeral vegetation. The impact of the foothills and the desert natural zone is characterized by low rainfall and sparse density of the river network with the number of days with constant snow cover. A territory with low landscape and recreational potential, the share of specially protected natural areas is only 0.1%.

Of the natural unique objects, the Spring "Koshkar ata" can be noted. The landscape under consideration includes the foothills of the Karzhantau and Ugam Mountain systems and covers 4.8% of the mountainous territory of the entire Turkestan region. According to the integral scale, this landscape area is estimated at 38.8 points (Figure 2). Therefore, it belongs to an area with a very low degree of attractiveness for recreational activities. Landscapes 6, 12-13 are characterized with **low** landscape and recreational potential, which are mainly represented by foothill

alluvial-proluvial poorly divided plains,composed of loess-like loams, boulder-pebbles, with ephemeral-boyalych-seropolynny vegetation on gray-brown normal soils and occupy 9.2% of the territory of the entire studied object. The terrain ranges from 896 to 1757 meters, the slope averages 78.9 degrees. Low-potential landscape territories are characterized by the absence of mineral springs, wells, and areas of therapeutic mud. The average annual wind speed is 2.1 m/s. The duration of sunshine is 2962 hours per year. The share of specially protected natural territories in the region, characterized by low landscape and recreational potential, is 15%. Among the unique natural objects: Lake Karaguz, the Bessaz massif, the Zhylagan ata spring, the Turlan and Balaturlan plateaus, Lake Kyzyl. Forests cover 3.3% of the area. These landscape zones include the northern foothills of the Karatau ridge and the lowlands of the Talas Ridge system. According to the integrated scale, these landscape areas are estimated at an average of 48.2 points.

The group of landscapes with an **average** degree of landscape and recreational potential includes landscapes № 1, 3, 7, 8, 9, 11 and occupy 63.9% of the entire study area. The landscapes of this group extend from the elevated plains to the middle mountains and include the Karatau, Boraldai, Talas, Ugam, Karzhantau ranges at an altitude of up to 1700-3000 meters. The slope of the slope angle is characterized by an average of 80 degrees. The average annual precipitation is 950 mm. The duration of sunlight is 2535 hours per year. The average annual wind speed is 2 meters / sec. The density of the river network is on average 0.13 km / km^2 . Unique natural objects: Mashat Gorge, Kyryk Shilten Valley, Akkum Canyon, Ulkentura and Kishitura plateaus, Oguztau tulips, Shert well, upper Biresek River, Ushayryksay tulip basin, Aksheshek creek, Bolshoy Aktas. Specially protected natural areas occupy 15.5% of the landscape area of the total average potential (Korytny, 2001).

Low-mountain landscapes (2, 4, 5) composed of limestones, sandstones, conglomerates, jaspers, with deciduous xerophilic woodlands and shrubs on mountain chestnut soils have a **high** landscape and recreational potential. These landscapes cover 22.1% of the mountainous territory of the Turkestan region. It covers the high peaks of the Karatau, Boraldai, Talas, Maidantal, Ugam and Karzhantau ranges. These landscapes have high indicators of relief, climate, water resources, and vegetation cover. According to the absolute height of the relief, it is possible to distinguish the peak of Sairam at the height of the Ugam ridge 4238 meters. The slope angle, on average 86.1 degrees. The average amount of precipitation shows 900 mm. The average height of the snow cover is 35-40 cm. The average duration of days with stable snow cover is 281 days, nival zones are found on high peaks. The area occupied by protected areas is on average equal to 72% of the territory. Of the unique natural objects in landscapes with high indicators: Leontievsky collapse, Akmeshit cave, Aragonite hill, etc. According to the integral score indicator, these landscape zones are estimated at 63.5 points.

The improved and adapted methodology is generalizing. Main advantage is an attempt to take into account all the components of nature that affect to the whole recreational potential. The results of landscape and recreational assessment allow us to obtain information about the availability of natural and recreational resources and determine priority areas of recreational activity in the studied region.

CONCLUSION

Having studied the landscape formation of the mountainous territories of the Turkestan region, as a result of their typological grouping, and then structural and genetic classification, 13 landscapes of hierarchical taxonomy were identified. A landscape map of the mountainous territory of the Turkestan region has been compiled. These landscapes subject and subheadings in the legend define the following classification categories: classes (flat, mountain, and valley landscapes), classes (upland plains, foothill, low-mountain, mid-mountain, high-mountain) species (meadow, forest, steppe semi-desert, and desert). The methodology for assessing the landscape and recreational potential of mountain areas has been improved and adapted, taking into account the local characteristics of the study area. To assess the landscape and recreational potential (relief, climate, water resources, vegetation cover, and specially protected natural areas), 17 indicators of natural components were determined using literature, agro-climatic definitions, and aerospace surveys.

The assessment of the landscape and recreational potential of the mountainous territory of the Turkestan region consisted of two stages. Component assessment each natural component is separately taken and an appropriate assessment is given. The evaluation of these components was carried out on a point scale. At the second stage, the results obtained were integrated into an integral assessment. Maps have been compiled for each indicator of a single evaluation component, as well as for an integrated assessment of the landscape and recreational potential of the studied region.

A landscape 10 with a low potential for evaluation results has been identified. This landscape has a foothill landscape and all component indicators to a lesser extent. The slopes of the Karzhantau ridge. 2,4,5-landscapes have high potential. Identified in high-altitude areas of the Boraldai, Ugam, Talassky Alatau, Maidantal ridges and have high indicators of estimated components. The method allows you to get an idea of the availability of natural and recreational resources and determine the priority areas of recreational activity in the mountainous territories of the Turkestan region. The article focuses on the description of the successive stages of evaluation by the balance method, the definition of the selected evaluation criteria. The issue of the points ranking system is considered in detail.

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