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Natural Geographical Features Of Geographical Tourism In The Fergana Valley As A Part Of Uzbekistan

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Abstract: This article describes the natural geographical features of geographical tourism in the Fergana Valley as a part of Uzbekistan. In particular, the relief, climate, hydrography, soil, flora and fauna of the region, as well as specially protected areas were assessed by using modern geographical methods.
[Nigmatov A.N., Tobirov O.Q. **Natural geographical features of geographical tourism in the Fergana valley as a part of Uzbekistan.** *Researcher* 2022;14(3):36-47] ISSN 1553-9865 (print);ISSN 2163-8950 (online). http://www.sciencepub.net/researcher. 6. doi:10.7537/marsrsj140322.06.

Keywords: geographical tourism, comfort, subcomfort, discomfort, subdiscomfort, extreme discomfort, relief, climate, hydrography, soil, flora and fauna, specially protected areas

1. INTRODUCTION.

In geographic tourism, the natural geographical features of a place are crucial in choosing a particular area that tourists visit (Кумова, 2004; Рудникова, 2005).The availability and accessibility of natural resources have a significant impact on the scale, pace and manifestation of tourism development. The development of geographical tourism are illustrated by natural geographical factors: natural geographical location, relief, climate, hydrography, lithology, flora and fauna (Староверкина, 2007; Фоменко, 2007).

2. METHODS.

The assessment of the geographical tourist comfort of the region's natural resources is assessed based on the following criteria (Table 1). The geographical tourism assessment of the area was carried out using GAT innovative technologies using ArcGIS, QGIS and NEXTGIS programs.

Table 1. **Criteria for the assessment of the geographical tourism potential of the region**

No.	Score	Classification of comfort
1	90-100	***Comfort*** *is the availability of completely satisfactory conditions for one's travel in the area.*
2	70-90	***Subcomfort*** *is the availability of satisfactory conditions for one's travel in the area.*
3	40-70	***Discomfort*** *is the availability of conditions in the area that are partially satisfactory for one's travel.*
4	10-40	***Subdiscomfort*** *is the availability of unsatisfactory conditions for one's travel in the area.*
5	0-10	***Extreme discomfort*** *is the lack of conditions for one's travel in the area.*

3. RESULTS.

Tourist aspects of the natural geographical location of the Fergana Valley.

The Fergana Valley is located in the upper reaches of the Syrdarya River in eastern Uzbekistan, its natural boundaries run through the Mogultog Mountains in the west, the Kurama and the Karamazor Mountains in the northwest, the Chatkal Mountains in the north, the Fergana and Otoynak Mountains in the east, and the Alay and Turkestan Mountains in the south. It is connected to the Dalvarzin and Mirzachul plains by the narrow (8-10 km) west side through the Khojand Gate. The area is 78,000 square km. The length of the valley is 475 km from the west ($69^0$15') to the east ($74^0$55') and from 260 km from the north ($42^0$00') to the south ($39^0$24'). The total length of the border of the Fergana Valley is more than 2000 km.

The natural geographical location of the region plays an important role in the development of tourism (Романов & Саакянц, 2002). For instance, the proximity of the region to the sea, its richness in beautiful mountainous and forests, its location relative to major travel countries, important international transit routes and favorable climatic zones of the Earth.

The Fergana Valley is located in the center of the Eurasian continent, away from the free economic and political zone, at a distance of more than 1,500 km to the nearest Indian Ocean, and is surrounded by high mountains. However, the ancient "Great Silk Road" through the valley, Andijan-Osh-Ergashtom-Kashgar, can have a significant impact on the development of tourism. Due to the fact that the valley is located in the continental type of temperate climate zone, the tourist potential is also underestimated. The part of the region consisting of the Central Fergana Plain and cultural landscapes is located in the Republic of Uzbekistan (Тобиров & Мадаминжонова, 2021) (Figure 1).

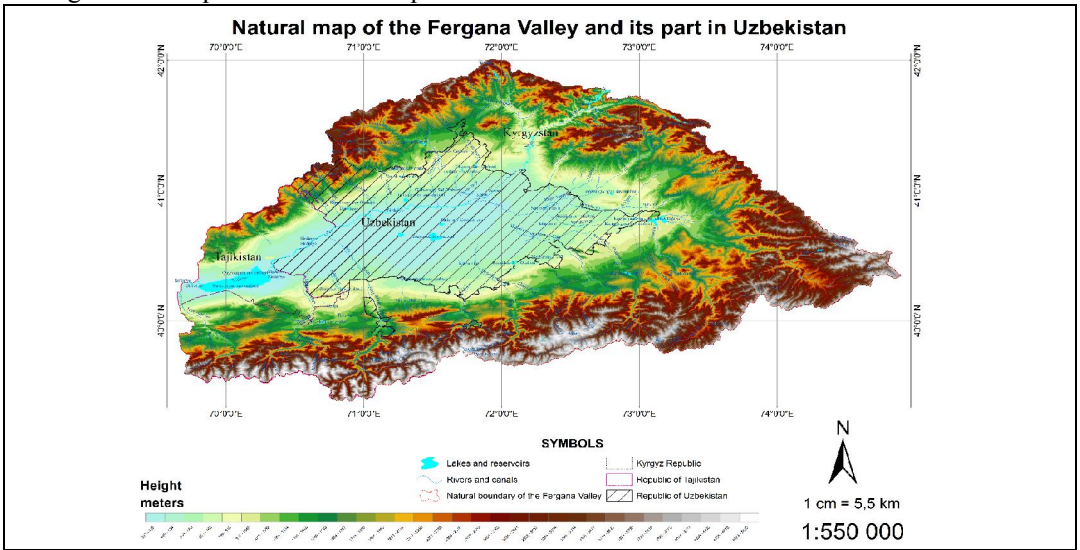

Figure 1. Natural geographical map of the Fergana Valley and its part in the Republic of Uzbekistan

The Fergana Valley is located on the territory of 3 states, covering 23 % of the territory of the Republic of Uzbekistan, 68 % of the territory of the Kyrgyz Republic and 9 % of the territory of the Republic of Tajikistan. The Fergana Valley is unevenly distributed across the republics in terms of natural geography. Since the Uzbek part of the total area of the valley is mainly flat, the components of nature are distributed accordingly (Table 2, Figure 2).

Table 2. Area of natural geographical components of the Fergana Valley and its part in the Republic of Uzbekistan

Natural geographical features of the earth's surface	*Area, %*		
	The Fergana Valley	***The part in the Republic of Uzbekistan***	***Regarding the valley***
Plain	14,2	50,8	82,2
Adir	47,7	46,4	22,4
Mountain	38,1	2,8	1,7
Water (river, lake, reservoir)*	1,23	2,07	38,92
Forests*	3,68	0,10	0,65
Grasslands*	3,97	0,15	0,88
Wetlands, floodplains such as rice fields*	0,04	0,07	35,66
Crops*	17,35	53,55	70,91
Scrubland*	55,54	19,31	8,04
Built areas such as urban/suburban, highways, railways, and paved areas*	7,74	21,63	64,20
Open rocky soils and bare areas with little or no vegetation*	8,71	3,12	8,24
Permanent snow and ice areas*	1,73	0	0
Protected areas	1,20	0,22	4,28

** 2020 Global Land Use Data / Caitlin Dempsey / June 24, 2021 | developed by the author based on GIS Data.*

There are certain inconveniences in organizing tourism in certain areas and defining the boundaries of the area. For instance, the incompatibility of political and administrative borders with natural borders, or the fact that several countries are located in a particular natural geographical area and their tourism policy is different. Therefore, almost all scientific research in the sphere of tourism in Uzbekistan has taken administrative units as the object of study. For instance, N.T.Shomuratova "Ecological tourism in Uzbekistan and its natural geographical aspects" (2012), M.T. Alimova "Development features and trends of the regional tourism market (in the example of Samarkand region)" (2017), Sh.T.Yakubjanova "Natural geographical aspects of agritourism (in the example of Uzbekistan)" (2018),

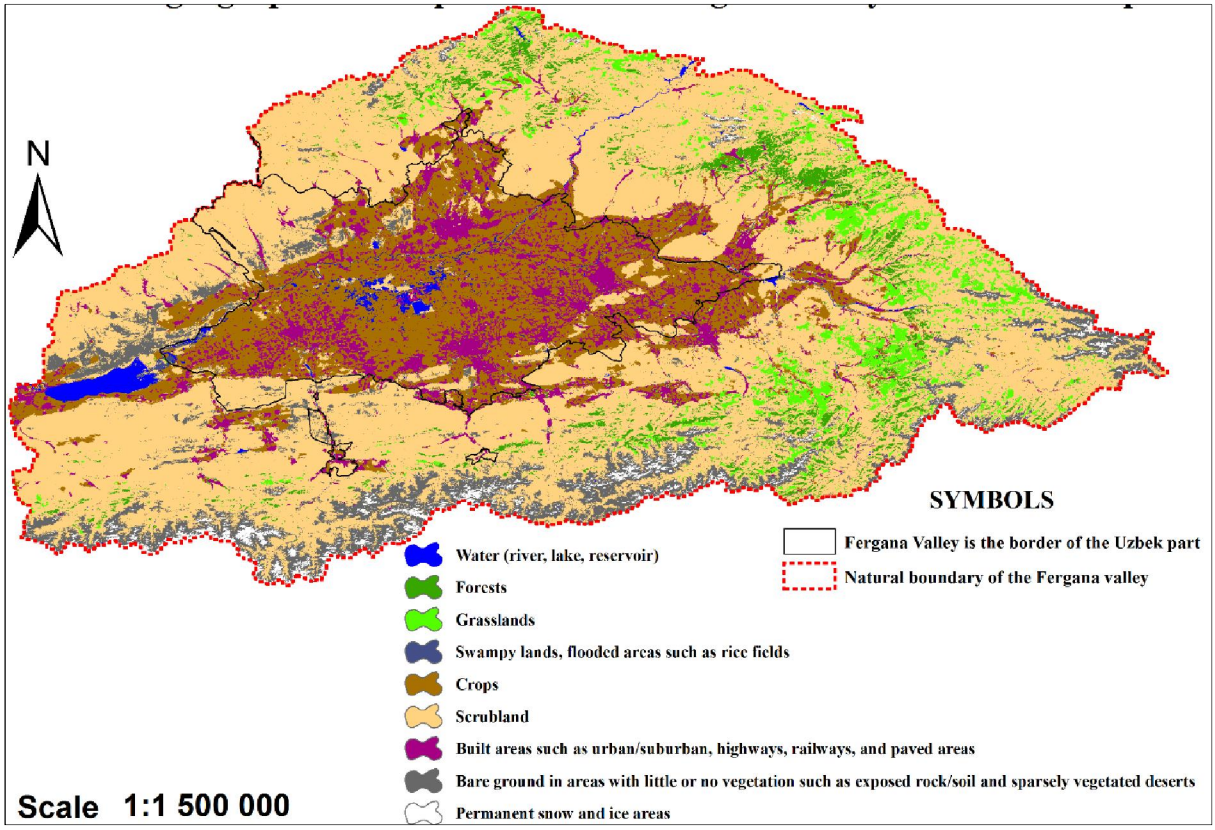

Figure 2. Natural geographical components of the Fergana Valley and the part in the Republic of Uzbekistan
2020 Global Land Use Data / Caitlin Dempsey / June 24, 2021 | developed by the author based on GIS Data.

B.H.Kamolov "Territorial, periodicity and complex features of ecotourism in Namangan region" (2018), A.K.Alimov "Main directions and prospects of ecological tourism development in the Republic of Karakalpakstan" (2018), M.M.Mahmudov's research on "Economic and geographical features of tourism development in Andijan region" (2020). However, our research is devoted to the natural geographical aspects of the Fergana Valley in Uzbekistan.

Natural components such as topography, climate, hydrography, flora and fauna, soil were taken as factors determining the natural geographical aspects of geographical tourism and various methods were used to evaluate them (Grdzelishvili & Kvaratskhelia, 2020; Priskin, 2001; Комарова, 2015; Mukayev, Ozgeldinova, Janaleyeva, Ramazanova, & Zhanguzhina, 2020).

4. DISCUSSION. ***The impact of valley relief on tourism.*** The topography of the area is of great importance in attracting tourists, as well as creating several inconveniences. For instance, in areas of medium and high mountainous terrain, it is difficult and expensive to build highways and other roads, however, such places compensate for the above inconveniences with beautiful scenic landscapes for tourists (Бредихин, 2010). Mountainous areas are characterized by great tourist opportunities due to the cool mountain air, the abundance of ultraviolet rays, the possibility of organizing skiing, etc. (Шамуратова, 2011; Якубжанова, 2018; Камолов, 2018). The relief of the Fergana Valley in Uzbekistan can be divided into the following types. These are high plains with absolute heights of 300-500 m, low adir (500-800 m), medium-high adir (800-1000 m), high adir (1000-2000 m), medium-high mountains (2000-3000 m) and high

mountains (3000-5000 m) (Маматкулов & Эгамов, 2019).

Based on an analysis of the tourism literature (Марков & Лебедев, 2005; Настинова & Староверкина, 2011), in tourism, two main indicators of relief, structure and slope, play a role. When assessing the relief of the Fergana Valley from the point of view of geographical tourism, the comfort of tourist opportunities increases as its absolute height increases. Conversely, the higher the relief slope, the lower the comfort index in tourism (Figure 3).

Climate and its role in tourism development.

Climate has both positive and negative effects on the organization of tourist and recreational activities. Tourists mainly tend to choose resorts with favorable climatic conditions (Gomez-Martin, 2005; Scott & Lemieux, 2010; Becken & Hay, 2012; Scott, Hall, & Gossling, Tourism and Climate Change: Impacts, Adaptation and Mitigation, 2012). The vagaries of nature, which are characteristic of unstable climates, sharply reduce the flow of tourists in areas with frequent natural disasters (Ван, 2018). The main tourist areas are located in the temperate and subtropical climate zones of both hemispheres, as well as on the islands in the tropics, which are affected by high temperatures and sea winds. The main features of the climate in terms of its effect on the human body are sunlight, which is distinguished by its light and ultraviolet regime (Кусков, 2008). The Fergana Valley is located between $41^0$54' and $39^0$87'. This region differs from other tourist areas by its very high level of

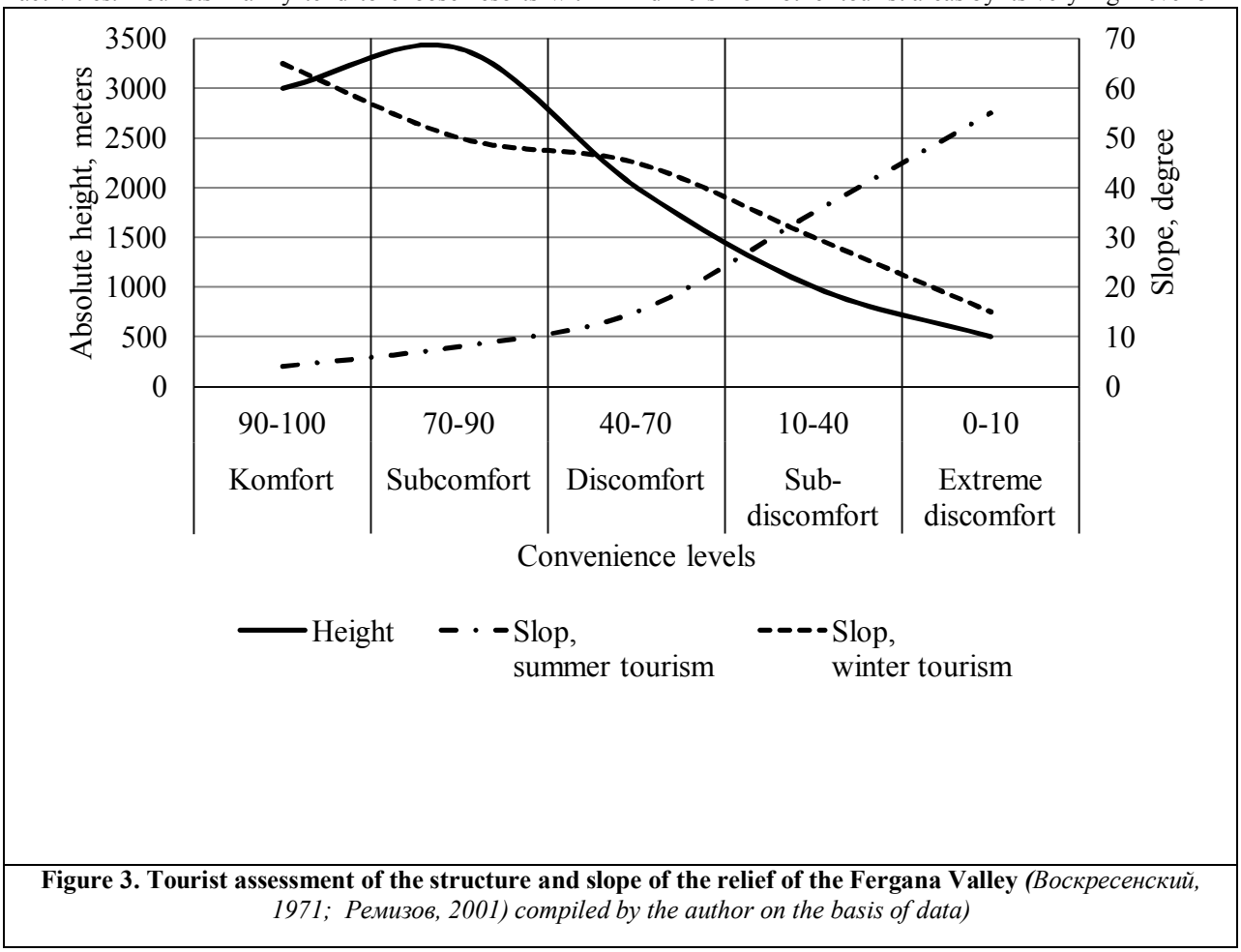

Figure 3. Tourist assessment of the structure and slope of the relief of the Fergana Valley *(Воскресенский, 1971; Ремизов, 2001) compiled by the author on the basis of data)*

ultraviolet rays[1]. The Fergana Valley region is most exposed to ultraviolet light, mainly in April and September (Table 3).The most important meteorological characteristics that affect the human body are air temperature and humidity, atmospheric pressure, wind direction and speed, rainfall (Шамуратова, 2011). There are specific units of measurement of these elements, which have a significant impact on the duration of tourist-recreational periods in the region (Table 4).

[1] http://hikersbay.com/climate/uzbekistan?lang=ru#uvtable

Table 3. Evaluation of medical and climatic indicators of ultraviolet (UV) regime in the territory of the Fergana Valley in Uzbekistan

(Developed by the author based on data on http://hikersbay.com/climate/uzbekistan/)

UV-index	Level of convenience for the tourist	UV level by months in the Fergana Valley											
		1	2	3	4	5	6	7	8	9	10	11	12
0-2	Comfort	+											
3-5	Subcomfort		+									+	+
6-7	Discomfort			+							+		
8-10	Subdiscomfortт				+	+	+	+	+	+			
11+	Extreme discomfort												

Table 4. **Geographical tourist assessment of the comfort of climatic indicators of the Fergana Valley, Uzbekistan**

(Developed by the author based on the classification indicators of (Mieczkowski, 1985)

Air temperature (^0C)	Monthly rainfall *(mm)*	Wind speed (km / h)	Assess the geographical tourist convenience of the area	
20-26	0.0-14.9	< 2.88	Comfort	90-100
19/27	15.0-29.9	2.88-5.75	Subcomfort	70-90
18/28	30.0-44.9	5.76-9.03		
17/29	45.0-59.9	9.04-12.23		
16/30	60.0-74.9	12.24-19.79	Discomfort	40-70
10-15/31	75.0-89.9	19.80-24.29		
5-9/32	90.0-104.9	24.30-28.79		
0-4/33	105.0-119.9	28.80-38.52	Subdiscomfortт	10-40
-5 – -1/34	120.0-134.9	38.52 <		
35	135.0-149.9	-		
-10 – -6/36	150.0 <	-	Extreme discomfort	0-10

While the average annual air temperature in the valley area is 13-14 ^{0}C in the plain of Central Fergana, this figure reaches -7 ^{0}C lower in the mountains. In summer, the air temperature rises to 26-27 ^{0}C in the center of the valley, 9 ^{0}C in the mountains, and 3-4 ^{0}C in some places in July. Kokand wind, specific for the valley, blows at speed on average 25 m / sec from neighboring Mirzachul to the valley in spring and autumn and Bekabad wind blows at speed on average 15-20 m / sec from the valley to Mirzachul during the winter months (Ҳасанов, Гуломов, & Қаюмов, 2010). The average wind speed in the valley is 5 m/s[2]. According to data from local meteorological stations, the average annual rainfall is 80-90 mm and is the lowest annual rainfall in Uzbekistan. The number of rainfall increases as you head towards any part of the valley. The relative humidity in the Fergana Valley averages 50-80%, which is assessed by the level of comfort in tourism.

Mieczkowski's formula (1985) is applied to assess the suitability of climate indicators in tourism (Formula 1).

TCI = 2[(4CID) + CIA + (2P) + (2S) + W] (1)

Here:

TCI – tourism climate index

CID – monthly maximum temperature (^{0}C), CIA – monthly lowest temperature (^{0}C), P – monthly rainfall (mm), S – length of day (hours), W – wind speed (km/h).

While this formula was developed to calculate climate indicators at the global level, the following formula was used to calculate indicators at the subregional level (Formula 2).

TCI = (4CID) + (2CIA) + (2P) + (2W) (2)

Here:

TIK – tourism climate indicator

CID – monthly maximum temperature (^{0}C), CIA – monthly lowest temperature (^{0}C), P – monthly rainfall (mm), W – wind speed (km/h).

TCI = (4*10)+(2*10)+(2*10)+(2*10) = 100

[2] https://globalwindatlas.info/area/Uzbekistan

Using the formula for assessing the climate of tourism, the annual results of the climatic indicators of the Fergana Valley, both individually and aggregated by month, allowed us to determine the level of comfort for tourism in the region (Figure 5).

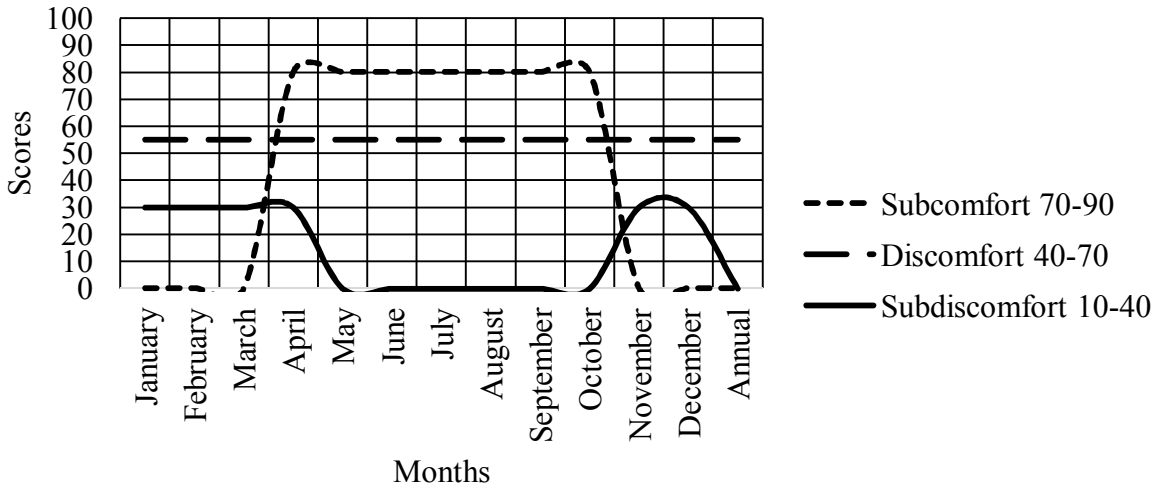

Figure 5. Tourist assessment of monthly and annual indicators of the climate of the Fergana Valley
(*https://worldclim.org/ compiled by the author on the basis of data)*

The results of the geographical tourist assessment of the Fergana Valley on climatic indicators were analyzed, and their distribution by region was calculated as a percentage (Table 5). In the Fergana Valley, areas with subcomfort for geographical tourism by months of climate indicators are mainly in April, May and September, October, and areas with discomfort occupy a large area in January, February, March, June, July, August, November and December. In contrast, subdiscomfort zones do not makeup even 4% of the area in the Fergana Valley, while comfort and extreme discomfort zones do not exist at all. Annual climate indicators were assessed at subcomfort levels.

Table 5. **Tourist assessment of the level of climate comfort in the Fergana Valley by month**

Tourist assessment of climate indicators, in percent	***Months of the year***											
	January	*February*	*March*	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*December*
Subdiscomfort	3	3	1								0,5	2
Discomfort	97	97	99	7	3	92	95	92	2	5	99,5	98
Subcomfort				93	97	8	5	8	98	95		

Impact of hydrographic networks on tourism. Rivers and lakes are an important wealth of tourism and recreation. They enrich the appearance of the landscape, create a favorable microclimate, allow tourists to go fishing and water sports, and most importantly, provide fresh water to resorts and tourist centers.

The main river of the valley is the Syrdarya, which is formed by the confluence of the Naryn and Kara Darya rivers. Almost all rivers in the valley are transboundary. Their sources of saturation are located in the territory of Kyrgyzstan and Tajikistan (Тобиров, Разумное пользование трансграничными водными ресурсами и потоками, 2017). In the valley, there are the rivers Podshootasay, Kosonsoy, Govasay, Chodaksay, which flow from north to south, and the rivers Isfayramsay, Shohimardon, Sokh, Isfara, Khojabakirgan, Aksu, which flow from south to north. A total of 3,817 rivers flow through the mountains surrounding the Fergana Valley, with a total length of

20,621 km (Солиев, 2008). There are Karkidon, Shursuv, Yazyavan, Kurgantepa, Andijan, Chartak, Eskier, Karasuv, Ertikan, Varzik, Koksarek, Jiydasay, Otchopar, Turakurgan, Almasay, Kenkolsay, Govasay, Fergana, South, Kyzylorda, Goyan and Andijan canals in the territory of the Fergana Valley in the territory of. Rivers, reservoirs and canals now serve as a source that determines the basis for the development of tourism in the valley. The denser the rivers, the higher the rate of tourism (Figure 6). The rivers in the Fergana Valley are concentrated mainly in the upper northern and lower southern parts, while the rivers are mostly sparse in most of the region. With this indicator, the region is underestimated in tourism.

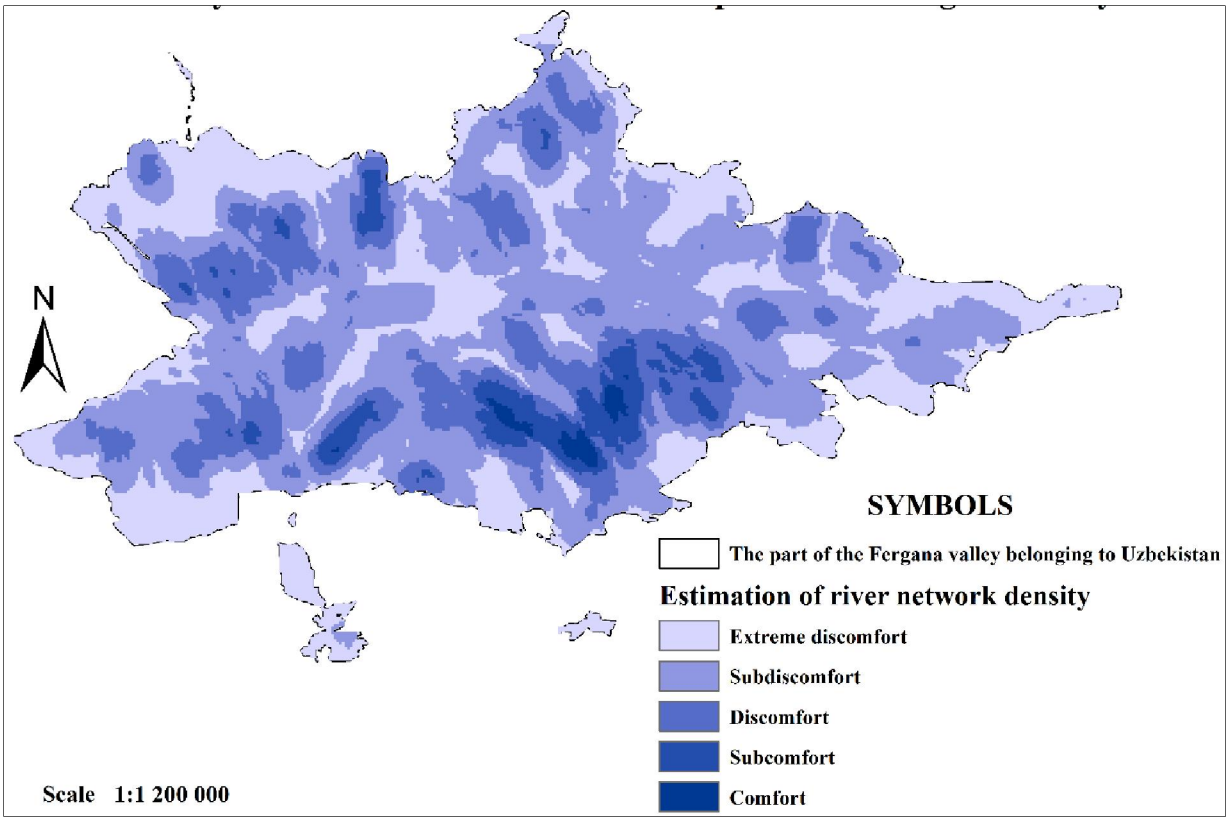

Figure 6. Tourist assessment of the hydrographic density of the Fergana Valley (Developed by the author on the basis on *https://www.hydrosheds.org*)

The valley area is also famous for its healing, crystal clear springs. There are more than 130 springs, such as Sari Suv, Kol, Uchbulak, Tuzlak Buvi, as well as Karaboshbulak, Olimbulak, Kirkbulak, Qambar ota, Imam ota, Kengulsoy, Chust, Abdullabur, Aydinbulak, Kaynarbulak, Tashbulak, Chimyon, Satkak, Norbulak. There is a resort near them, where visitors can relax and enjoy the water of springs. Probably because of the purity of their water, tourists are not cut off from the places where they are located (Алихонов, Абдуллаев, & Орипов, 2011).

The soil of the Fergana Valley is different. On the banks of the Syrdarya and up to an altitude of 400 m, mainly meadow, meadow-swamp, saline sandy soils of various degrees are distributed (Isaqov, Yusupova, & Tobirov, 2017). At altitudes of 400 m to 800 m, gray and brown soils are prevalent, and at altitudes of 800-1200 m, light, dark and typical gray soils are prevalent (Акрамов, 1960). These soils not only affect the flora of the area but also affect many other areas.

The impact of soils on the tourism sector can be clearly seen in the following types of tourism. For instance, while all types of soils serve as objects for scientific tourism, how much humus is rich in soil serves as a key indicator that determines agrotourism. In addition, the sands scattered in the central part allow for use in medical tourism, recreational tourism (Низомов, Аманбаева, & Сафарова, 2014; Никанорова, 2015).

Flora and fauna of the valley. There are more than 4,000 plants in the valley, including 301 species of alkaloids, 138 essential oils, 115 vitamins, 106 saponins, 156 tannins, 31 resins, 132 colorants, 35 fibers, 198 oils and more than 500 nectars (Ҳамидов, 1990; Хожиматов, 1993; Газыбаев, 1994). On the banks of the river there are mainly willow, wild jida, turangyl, reeds, sedges, in the sands of the central part

there are cherkez, kandym, rabbit, saxaul, jida, izen on hills, wormwood, ephemeral and ephemerides. The diversity of plant species in the Fergana Valley and its part in Uzbekistan was assessed based on GLOBIO4 data in a 100-point system.

As a result of the assessment, 92% of the territory of the Fergana Valley was assessed as subdiscomfort and 8% as subcomfort. This figure is as follows in the Uzbek part of the valley. 99.9 percent of the area was assessed as subdiscomfort, while 0.1 percent of the area was assessed as subcomfort (Figure 7).

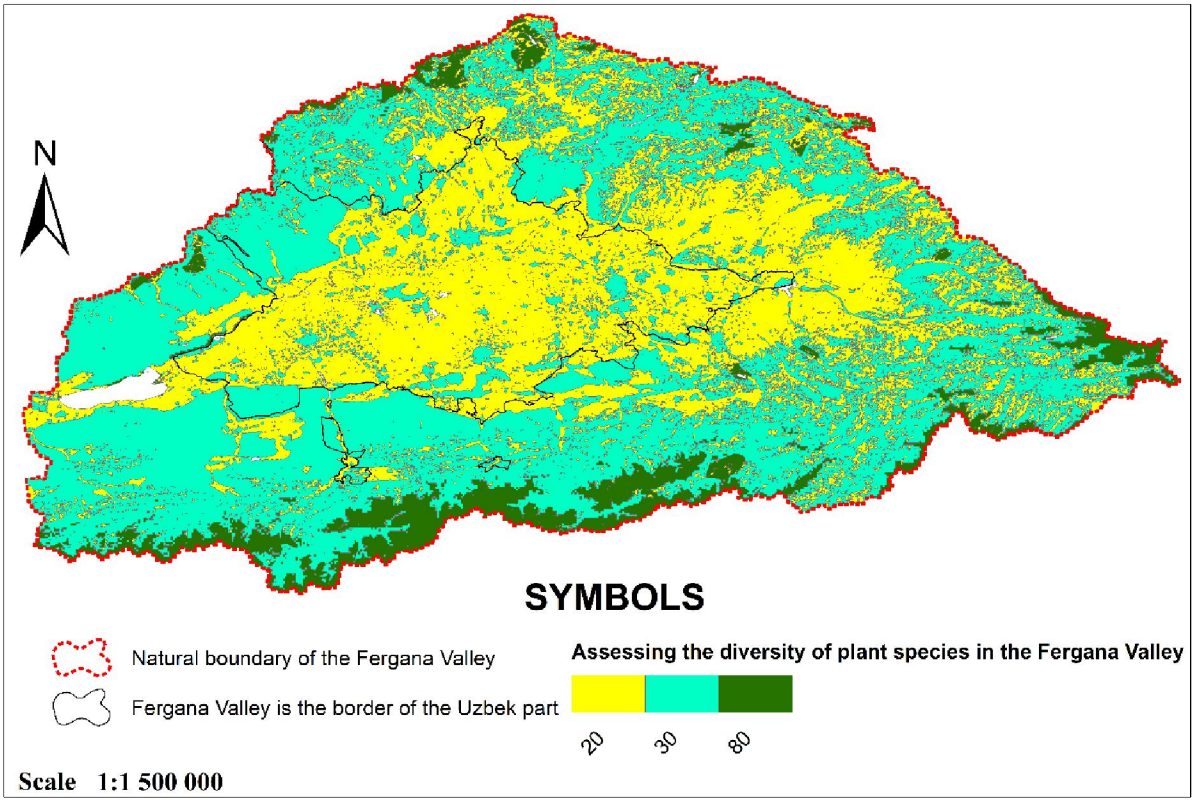

Figure 7. Tourist assessment of phytobiological diversity in the Fergana Valley and its part in Uzbekistan

Wild animals include tigers, wolves, foxes, rabbits, birds such as pheasants, ducks, sparrows, squirrels, squirrels, rodents, and various venomous snakes. Reservoirs, artificial lakes and rivers are rich in fish species. In recent times, muskrats have been propagated in collector ditches on irrigated lands (Никанорова, 2015). The diversity of bird and mammal species in the Fergana Valley, Uzbekistan was also assessed based on GLOBIO4 data in a 100-point system (Table 6, Figure 8).

Table 6. **Assessment of the regional distribution of diversity of bird and mammal species in the Fergana Valley and its part in Uzbekistan**

Territory	In a 100-point system		
	Subdiscomfort	Discomfort	Subcomfort
The Fergana Valley	25,6	66,4	8
its part in Uzbekistan	26,5	73,4	0,1

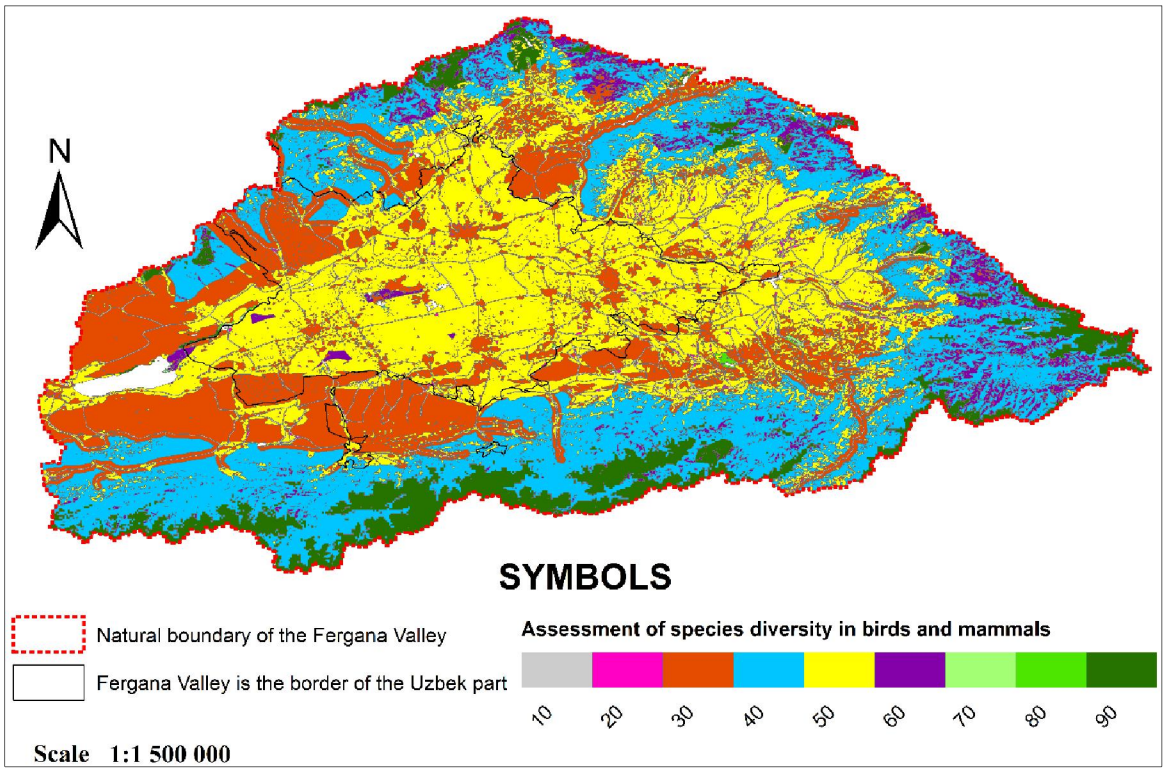

Figure 8. Tourist assessment of the Fergana Valley and its part in Uzbekistan on zoobiological diversity

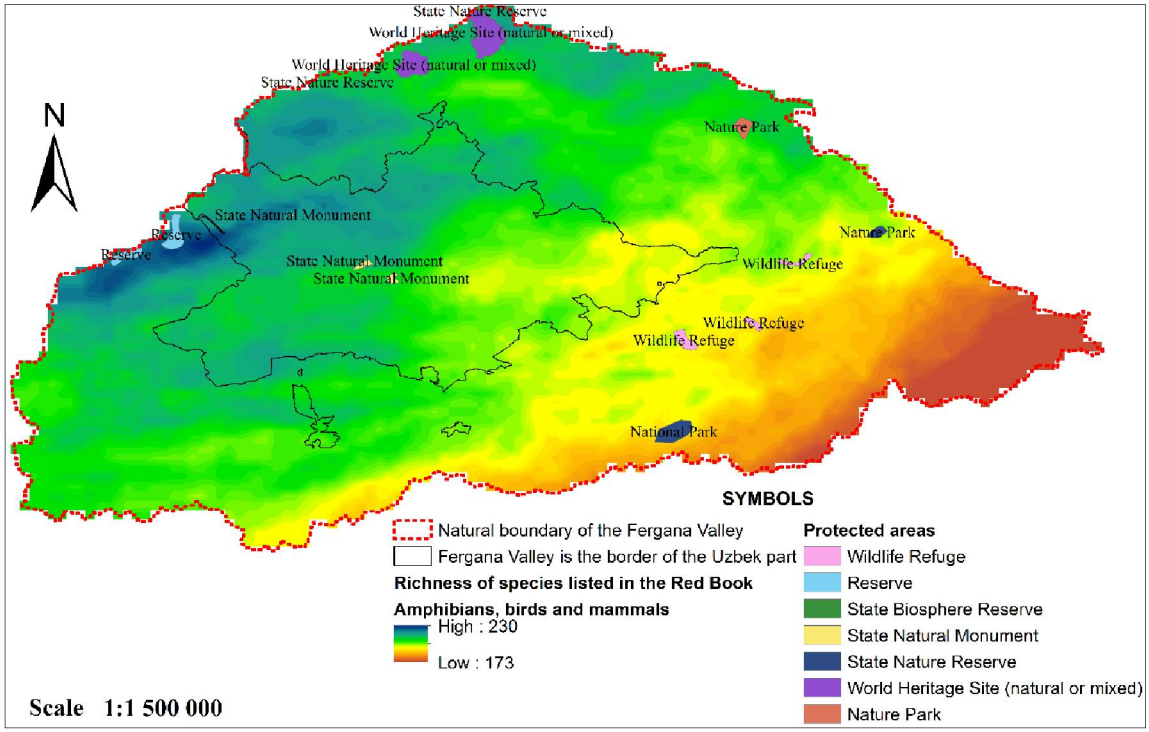

Figure 9. Tourist assessment of protected areas in the Fergana Valley and its part in Uzbekistan and biological species listed in the Red Book

Such diversity of flora and fauna of the region makes a great contribution to the development of ecotourism and agrotourism from the types of tourism. Such flora and fauna can attract not only local tourists but also international tourists.

Particular attention is also paid to the preservation of the original state of the environment through the establishment of protected areas in the valley (Figure 9). In particular, in 1991, the Mingbulak natural monument was established to preserve the desert ecosystem and the remnants of the Akkum desert sands. Founded in 1994, the Chust Natural Monument is aimed at preserving natural complexes in the desertand reptiles such as 5 species of trees, 24 species of shrubs, 10 species of semi-shrubs, 98 species of perennials, 160 species of other plants in this natural area. Here you can meet white and black saxaul, sugarcane, cherries, desert grapes, astragalus and other plants.

The Yazyovon natural monument was established in 1994 on an area of more than 1,800 hectares in order to preserve the original biodiversity of the desert. In this protected area 5 species of trees, 24 species of shrubs, 10 species of semi-shrubs, about 100 species of perennials, 160 species of other species are preserved. They are distinguished by black and white saxaul, candy, desert grapes, astragalus.

The Central Fergana natural monument was established in 1994 and is aimed at preserving the natural state of deserts and tugai forests ((Алихонов, Абдуллаев, & Орипов, 2011).

More than 50 species of plants unique to the flora of the valley are included in the Red Book of the Republic of Uzbekistan. In particular, Fergana tulips and kachimsimon etmak, Angren tanga grass, Stone neuralgia, Sharipov tulips, Odilov onions, purple astragalus, small fruit dorema, tulip, Drobov shora are unique plants for this region.

More than 90 species of fauna are included in the Red Book of the Republic of Uzbekistan. These include the Turkestan mustache, the shield gecko, Fergana sand lizard, small white, blackbird, Aral animal, Turkestan fish, Turkestan devil, Said Aliyev bald circle leader, Rustamov gecko, bitter carmine-giving worm, galateya, Fergana Keskir, mountain lestiforus, Island thorns, gray lizard ((Алихонов, Абдуллаев, & Орипов, 2011).

5. CONCLUSIONS. To sum up, the available natural resources for the development of geographical tourism in the Fergana Valley, Uzbekistan are unevenly distributed throughout the region. In particular, in areas with a high relief structure, on the contrary, its comfort increases on the sloping plains. Changes in climate indicators, mainly by months, are the opposite in the region, mainly in the months between May and August, when comfort period remains high. In hydrography, as in the above, the comfort towards the mountains increases. In terms of flora and fauna diversity, mountainous areas are also more comfortable than plains. It can be seen that since most of the valley area is flat, the areas that are comfortable for geographical tourism are mostly mountainous areas.

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3/22/2022