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Protected Areas in Azerbaijan: Landscape-Ecological Diversity and Sustainability

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Abstract: *Establishment of protected areas is one of the most important activities in the conservation of natural resources, biodiversity and gene pools, including, promoting a healthy lifestyle for people in the world. The concept of preserving landscape-ecological diversity and sustainable development promotes the improvement of socio-economic indicators and at the same time ensuring the protection of the environment and ecosystems. The aim of the paper is to examine the relationship between landscape-ecological diversity in protected areas in Azerbaijan and the factors that contribute to this relationship with sustainable development. The article identifies landscape-ecological differences, including the principles and development of protected areas such as National Parks, Nature Reserves and Habitat/Species Management Areas in Azerbaijan. For the first time, a landscape-ecological frame model was developed to ensure environmental balance. A medium-scale digital (1: 600,000) "ecological carcass" map of Azerbaijan has been developed and its structural elements explored. Currently, only 10% of the territory of Azerbaijan are protected areas. Given the anthropogenic pressure on landscapes in Azerbaijan, it has been established that the structure of the territorial organization of protected areas does not comply with existing environmental balance norms. To do this, proposals to increase the area of protected sites to 15% of the country's territory were justified. The current state of use of protected areas in the development of ecotourism has been considered and evaluated as an element of sustainability. Indicators of tourism activity in national parks were analyzed on the basis of statistical sources.*

Key words: *Protected areas, national park, nature reserve, landscape, sustainability, ecological carcass, ecotourism.*

1. Introduction

In recent decades, the rate of extinction of fauna and flora as a result of anthropogenic influences has surpassed the evolutionary process. The risk of species extinction has worsened by almost 10% over the last decades (United Nations, 2019). The creation of protected areas has become one of the most important steps in the conservation of natural resources and wildlife of the world. The effective management and location of such areas in biodiversity-critical areas play an important role in sustainable development. International Union for Conservation of Nature (IUCN) has approved Key Biodiversity Areas (KBAs) in the terrestrial, freshwater and mountain areas of the world to provide a global approach in identifying important areas for biodiversity (IUCN, 2016). Thus, the Important Bird Areas in which BirdLife International has operated since 1980 have been incorporated into other protected areas and formed the KBAs (Güven *et al*., 2016). The KBAs have international importance for the conservation of biodiversity on a global scale. KBAs are sites, in that they are relatively limited in extent, and could thus potentially be

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managed as protected areas or by other effective means to conserve biodiversity. (Dudley *et al.*, 2014). According to the UN report (United Nations, 2019), the share of protected areas in the KBAs has increased by 10% between 2000 and 2010, compared with 3% in 2010-2018. With the current trend, by 2030, about 50% of each KBAs will be covered globally by protected areas.

Protected areas in Azerbaijan covers 10.3% of the country's territory. The total KBAs areas are up to 15%. Based on the classification of protected areas by the 6 categories defined by the IUCN, the protected areas of Azerbaijan belong to 1st (Strict Nature Reserve), 2nd (National Parks) and 4th (Habitat/Species Management Area) categories. According to the number of protected areas, 24% of them are Strict Nature Reserves, 22% are National Parks and 54% are Habitat/Species Management Areas. Determining the landscape-ecological diversity of each protected area in order to ensure the sustainability of such areas is one of the important prerequisites.

Thus, the fact that protected areas in Azerbaijan are located in both highland and plains is the main reason for landscape diversity. More than 50 landscape ecological systems have been identified in the national park areas using the methods presented in the article. An ecological carcass model has been developed to ensure the sustainability of these systems in protected areas. The ecological carcass is a combination of ecosystem territorial management regimes that support environmental sustainability, prevent loss of biodiversity and landscape degradation (Tishkov, 1995; Elizarov, 1998). The functions of this concept are implemented by applying appropriate legal, economic and management mechanisms that relate to the level of existing economic infrastructure and environmental management technologies. The purpose of the ecological carcass is to ensure the environmental sustainability of the area in the most efficient manner while maintaining systematic management of nature. The ecological carcass is not a form of nature conservation, but a way of managing nature, which ensures long-term sustainable integration of human and natural resources.

Another factor that contributes to sustainability in protected areas, especially national parks, is the proper eco-tourism policy. The preservation of natural monuments and cultural heritage for future generations should be a priority goal when promoting eco-tourism in national parks (Tore *et al.*, 2012). Increase in visitors to national parks, especially in recent years, raises the importance of sustainability in terms of environmental protection. In this context, the eco-tourism indicators investigated in the article, some of the problems and solutions are intended to ensure sustainability in protected areas.

2. Materials and Methods

In the study we used a landscape map of Azerbaijan (2017), multispectral images based on Earth Explorer USGS (Landsat 8), as well as materials obtained from literature and field studies. Satellite images have been analyzed, in particular, in the definition of landscape-ecological systems for each national park. The analysis is based on images of the last 2 years. Azerbaijan's 1: 600,000 scale modern landscape map (2017) was also used during system identification. Thus, using ArcGIS software, the landscape map and protected areas were brought to the same coordinate system and the landscape systems that fell into the area were identified. The results of the observations we have made during our field studies have also been helpful.

In the analysis of the research, the methods utilized in mapping, statistical, comparative, system-structural and literature sources were used. Cartographic techniques have been used in the mapping process and the comparative research method used in the determination of landscape systems. The system-structural method was taken into account in the development of the environmental framework throughout the country. Statistical data is available from official websites of the State Statistics Committee of the Republic of Azerbaijan and the Ministry of Ecology and Natural Resources.

3. Analysis and Discussion

The Eldar Pine Botanical Reserve, declared in 1910 in Azerbaijan, is the first reserve in the Caucasus. The Goygol Nature Reserve, established in 1925, the Zagatala and the Kyzylagaj reserve in 1929, the Hirkan reserve, established in 1936, are the first protected areas in Azerbaijan. Nature reserves with had been created in later decades, such as Turyanchay, Pirgulu, Gobustan, Basitchay, Shirvan, Ismayilli, and others were had contributed to the further expansion of the environmental network across the country and the coverage of various geocomplexes.

Although there is little experience in organizing and managing national parks in Azerbaijan, some progress has been made in this area. The creation of the first national parks dates back to 2003. In the same year, the Ministry of Ecology and Natural Resources established the Ordubad, Shirvan and Aghgol national parks. As a continuation of this work, the national parks of Hirkan and Altiagach in 2004, Absheron National Park in 2005, Shahdagh National Park in 2006, Goygol National Park in 2008, Samur-Yalama National Park in 2012 and, finally, Kyzylagaj National Park in 2018 was created (Table 1). Most of the national parks were created based on the expansion of previously existing reserves.

In 2008, the area of Hirkan National Park was almost doubled and increased from 21,435 hectares to 40,358 hectares. On November 25, 2009, the Ordubad National Park was expanded by the Decree of the President of the Republic of Azerbaijan at the expense of the Shahbuz State Nature Reserve, Shahbuz, Julfa and Ordubad districts' area to the 42797.4 hectares (the previous area was 12,131 hectares). By the same order, the national park was renamed and called Zangazur National Park named after academician Hasan Aliyev. By the Decree of the Cabinet of Ministers of the Republic of Azerbaijan dated July 8, 2010, the territory of Shahdag National Park was expanded to 14,613.1 hectares and was increased to 130,508.1 hectares (the previous area was 115,895 ha). Currently, national parks make up 4.9% of the country's territory.

The total area of protected areas in the country is 892 547.39 hectares. There are 10 national parks, 10 state nature reserves and 24 Habitat/Species Management Area (Zakaznik) in the country. The share of protected areas throughout the country is 10.3% (tables 1 and 2). For comparison with European countries, it is possible to note that this figure is 53.6% in Slovenia, 40.9% in Luxembourg, 39.7% in Poland, 39.3% in Croatia, 37.8% in Germany and 37.6% in Slovakia. The lowest countries in Europe are Turkey with 0.2%, Bosnia and Herzegovina 1.4%, Ukraine 4%, Moldova 4.2%, Montenegro 6.4%, etc. (UNEP-WCMC and IUCN, 2019).

Table 1. Share indicators of protected areas in Azerbaijan.

Protected area	**Area, ha**	**in percents**	**By country, %**
National Parks	421 366.4	47.2	4.9
Nature Reserves	120 723.04	13.5	1.4
Zakazniks	350 457.95	39.3	4
Total	892 547.39	100	10.3

The management of protected areas in the republic is regulated by the "Law on Specially Protected Natural Areas and Objects" (2000). According to the law, state nature reserves has the status of nature protection agencies and research institutions territory, created to preserve the natural state of typical and rare natural complexes and objects of study of natural processes and phenomena. The main objectives in the creation of the reserves are to preserve the natural and genetic fund, biological diversity, ecological systems, and natural complexes and objects, to conduct scientific researches and monitoring.

National Parks - with the status of nature protection agencies and research institutions territory where natural complexes are located have special ecological, historical, aesthetic and other value used for nature conservation, educational, scientific, cultural and other purposes. The main objectives of national parks are to create conditions for tourism and recreation; development and application of scientific methods of nature protection and ecological education; environmental awareness and environmental monitoring of the population.

The next specially protected area is the Zakazniks (Habitat/Species Management Areas). Zakazniks - areas of particular importance to the protection or restoration of natural complexes or their components, as well as maintain the ecological balance. These reservoirs may be complex, biological, paleontological, hydrological and geological profile. Any activity that may cause damage to natural complexes and their components is prohibited in the Zakazniks. In addition, the activities of protected areas guided by the Constitution and laws of the Azerbaijan Republic, international treaties supported by Azerbaijan, decrees and orders of the President of the Azerbaijan Republic, decrees and orders of the Cabinet of Ministers, the regulatory legal acts of the Ministry of Ecology, regulations of parks and reserves.

Table 2. Biodiversity in the National Parks of Azerbaijan.

N:	National Park	Administrative and territorial units	Protected species	Area (ha)	Date of creation
1	Zangazur NP named after acad. H.Aliyev	Ordubad, Shahbuz, Julfa d.	**Fauna:** Leopard, muffin, wild boar, wild cat, Pallas's cat, brown bear, wolf, jackal, badger, etc.; **Flora:** Tussilago farfara, Berberis vulgaris, Dorema glabrum, Cephalaria, İris grosshemii	42 797.4	June 16, 2003
2	Shirvan NP	Baku c. Garadagh d., Salyan and Neftchala d.	**Fauna:** gazelles, flamingo, Mute swan, badger, wolf, fox, wild boar, jackal, beaver etc. **Flora:** dark-salt, salty-saline, wormwood-ephemeral plant formations, etc.	54 373.4	July 5, 2003
3	Aghgol NP	Aghjabadi and Beylagan d.	**Fauna:** Badger, fox, boar, beetle, Eurasian otter, reed cat, Mallard, Western swamphen, Whooper swan and others. **Flora:** Artemisia vulgaris, Halocnemum strobilaceum, Kalidium caspicum, Phragmites australis, etc	17 924	July 5, 2003
4	Hirkan NP	Lankaran and Astara d.	**Fauna:** black stork, bear, spotted deer, wildcat, squirrel, badger, raccoon, leopard, Lynx, Francolinus, etc. **Flora:** Albizia julibrissin, Parrotia persica, Buxus hyrcana, Gleditsia caspica, Quercus castaneifolia, Diospyros lotus, Rubus etc.	40 358	February 9, 2004
5	Altiaghaj NP	Khizi and Siyazan d.	**Fauna:** deer, brown bear, wild boar, lynx, raccoon, rabbit, fox, wolf, woodpecker, etc. **Flora:** Fagus orientalis, Mespilous, Paliurus spina-christi, Rosa cinnamomea, Crataegus	11 035	August 31, 2004
6	Absheron NP	Baku c. Khazar d.	**Fauna:** Caspian seals, Macrovipera, Caspian turtles, water birds (seagulls, coot, mallard, etc.) **Flora:** Canvolvulus Persica, Crepis Parviflora B., Daucus Carota L., Juncus Acutus L., Phragmites Communis, Tamarix Ramosissima	783	February 8, 2005

7	Shahdagh NP	Guba, Gusar, Ismayilli, Gabala, Oghuz and Shamakhı d.	**Fauna:** roe deer, boar, brown bear, wolf, jackal, raccoon, lynx, lizard, eagle, steinadler etc **Flora:** Taxus baccata L., Pinus kochiana Klotzch ex C. Koch., Juniperus foetidissima Willd, Castanea sativa Mill., Atropa caucasica Kreyer, etc.	130 508.1	December 8, 2006
8	Goygol NP	Goygol, Dashkasan, Goranboy d.	**Fauna:** Caucasian deer, roe deer, wild boar, brown bear, European wildcat, wolf, jackal, etc. **Flora:** Euonymus europaeus, Fraxinus excelsior, Viola, Mespilus, Pinus eldarica Nedw.	12 755	April 1, 2008
9	Samur-Yalama NP	Khachmaz d.	**Fauna:** Reed cat, lynx, Caucasian deer, Caucasian chamois, European wildcat, wild boar, etc. **Flora:** Oak, peanuts, fraxinus, Alnus incana, Crataegus, Ribes, Prunus avium, Mespilus	11 772.45	November 5, 2012
10	Gizilaghaj NP	Lankaran, Masalli and Neftchala d.	**Fauna:** wolves, foxes, jackals, wild boars, Eurasian beaver, pelicans, black storks, marbled duck, etc. **Flora:** Ceratophyllum demersum, Algae, Phragmites.	99 060.0	September 26, 2018
	Total:			**421 366.4**	

Landscape-ecological diversity of protected areas. Here we consider landscape-ecological diversity as a combination of landscape and biodiversity of any territory. A change in the amplitude of the relief from -27 m above sea level to 4466 m in Azerbaijan led to landscape-ecological diversity. From this point of view, the sharp differences in relief in protected areas make the landscape-ecological diversity even more colorful. Depending on the location in protected areas, different landscape types can be seen, ranging from the semi-desert landscape to the nival landscape. Azerbaijan's protected areas can be divided into two groups due to their mountainous and flat landscapes. 62% of the total protected areas are located in the highlands and 38% in the plains.

Due to the geographical features of the national parks of Azerbaijan, there is a unique landscape and ecological diversity. The diversity that is associated with relief is given in Table 3. The table of the landscape-ecological diversity is based on a comparison of the landscape map of the Azerbaijan Republic (Landscape map, 2017) with a map of protected areas, satellite images and field surveys (Figure 1). The analysis shows that with the change of altitude in the national parks in the mountainous areas, ecosystems changing and acquiring new qualities. Located here, the Shahdag National Park, the largest national park in the South Caucasus, is located in the middle and highlands of the Greater Caucasus, combining various forest ecosystems, mountain meadows, and rock-glacial complexes. The other national parks located in the mountainous areas are Zangezur, Hirkan, Altiagac, and Goygol.

Although 40% of the areas of the national parks are located in the plains, the landscape and environmental diversity here is quite high. Despite the low amplitude of the relief, relatively low-lying fields in the area, Oxbow lake sediments, underground water distribution at different depths create smooth, flat seaside relief, and colorful ecosystems. As a result, this increases landscape-environmental diversity. These are Shirvan, Aghgol, Absheron, Samur-Yalama and the newly created Gizilaghaj National Park. Most of the national parks in the plains are below the ocean level. Information on biodiversity of National Parks is given in Table 2.

Landscape-ecological carcass- is a system of measures aimed at preserving the landscape and biodiversity in a given territory. There is a need for the creation and modeling of landscape-ecological carcass based on geographical location data for the preservation of the ecological balance of each country, region or the world as a whole. In modern conditions, the dramatic increase in anthropogenic impacts has resulted in an increase in the value of natural resources and ecosystems as well. The rapid progress of this situation in the modern world requires a well-regulated nature management procedure. At present, environmental management in Azerbaijan is at the local level. From this point of view, the study of the elements of nature as a whole system is very important in ensuring sustainability.

Table 3. Landscape-ecological diversity in national parks.

N:	National Park	Amplitude of the relief height (m)	Landscape-ecological systems
1	Zangazur NP named after acad. H.Aliyev	2000 - 3904	Mediterranean steps, xerophyte bush's, alpine meadows, sub nival and nival rocks, and perennial snow and glaciers
2	Shirvan NP	-27 - 47	Semideserts of eol and marine plains, hydromorphic and saline depressions, seaside terraces and sand ridges
3	Aghgol NP	-10 - 0	Semideserts of alluvial plains, aqual-lake complexes, coastal swamp, swampy meadow and salinity
4	Hirkan NP	50 - 1000	Relict Hirkan Forest Ecosystems of Plains, Low and Medium Mountains
5	Altiaghaj NP	700-1500	Mountain forests, mountain meadows, mountain steppe ecosystems
6	Absheron NP	-27 – (-26)	Seaside swamps, wetlands, eol sands and aqual-marine complexes
7	Shahdagh NP	600 - 4466	Oak-hornbeam, beech-hornbeam, beech-oak forests ecosystems of low, medium and highlands; subalpine and alpine meadows, subnival and nival
8	Goygol NP	1200 - 3066	Oak-hornbeam, beech-hornbeam forests of medium and lowlands, mountain meadows, aqual-lake complexes
9	Samur-Yalama NP	-27 - 60	Intrazonal plain forests, meadow-forests, seaside rocks and sandy semi-desert, tourism and recreation complexes
10	Gizilaghaj NP	-27 – (-26)	Aqual-marine complexes, coastal reeds, swamps, wetlands, and seaside sands ridges

Different structural and administrative elements of the environmental carcass can vary depending on regional geographical features. Due to its role in maintaining environmental stability in Azerbaijan and to ensure its sustainability, specific regimes for the use of certain areas have been identified. We consider it expedient to divide the structural-managerial elements of the landscape-ecological carcass in Azerbaijan into four levels. These are the national, regional, local and individual farmers' levels. Separate structural elements are given depending on the scale of each level (Figure 2). The management of protected areas is organized at the national level. The main goal of the activity is to limit and regulate the anthropogenic impact in such areas. At the regional level, it is expected to regulate anthropogenic impacts on natural complexes and forest ecosystems which are not belonging to protected areas. At the local level, the management of the ecological frame is organized to regulate anthropogenic loads. These include the use of natural ecosystems based on landscape planning, the protection, and conservation of natural monuments and small forest areas. The last part of the management structure is at the level of individual farmers. This level includes regulation of grazing norms in the context of improved land use, erosion control measures, and strengthening of slopes.

Depending on the time and place, the elements of the environmental carcass may also change. Each of these elements has a role in the efficient functionality of the ecological framework. Failure of one element

can affect other parts of the system as well. To maintain interconnection between systems, river systems, natural monuments that play the role of ecological corridors, such as large forest strips, should be considered in the organization of the ecological frame. Taking into account the necessity of links between the elements of the structure, it is important to integrate such natural objects into the composition of the ecological carcass. Such structural elements were used during the preparation of the map of the Azerbaijan Landscape-ecological carcass (Figure 3). All protected areas are regarded as the landscape-ecological core of the carcass. Ecological corridors have been identified along the river beds flowing through the territory of Azerbaijan. Other elements included in the map are wetlands, unprotected natural forest ecosystems, and various natural monuments (caves, mud volcanoes, rocks, sea and river terraces, etc.).

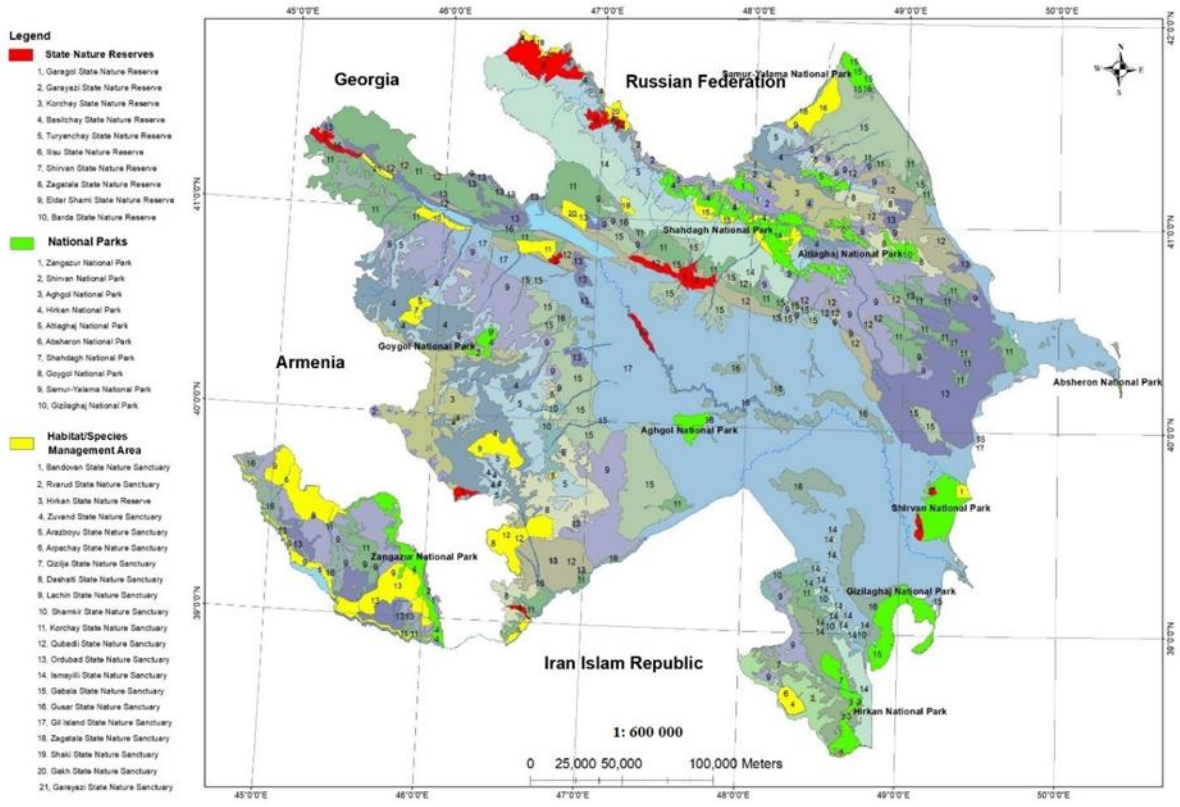

Figure 1. Azerbaijan Landscapes and Protected Areas.

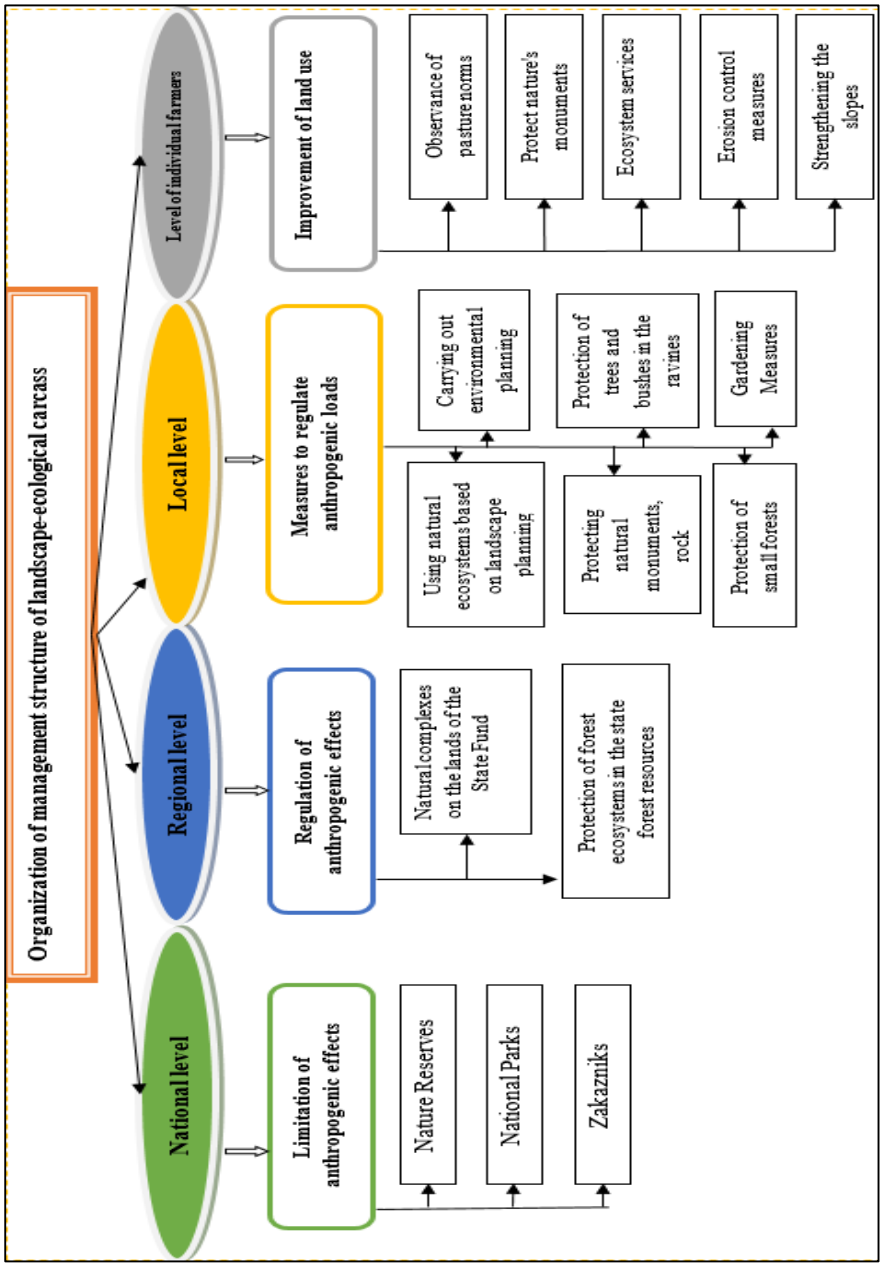

Figure 2. Structural-management model of landscape-ecological carcass.

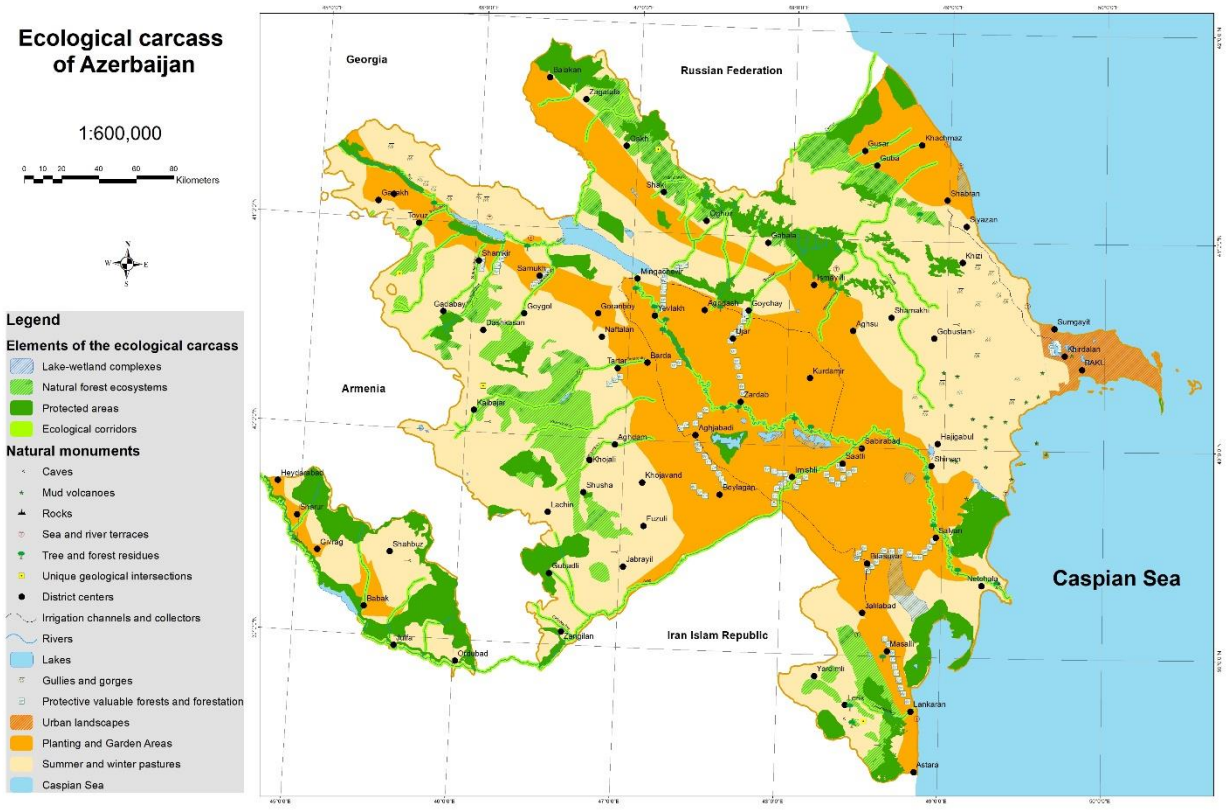

Figure 3. Landscape -ecological carcass map of Azerbaijan.

Problems and difficulties. There are also challenges and difficulties depending on the area where the protected areas are organized and managed. In order to maintain sustainability and protection of the natural gene pool in such areas, it is necessary to study and identify the causes. At present, national parks of the country have such problems as management of a territorial organization, the territorial ratio of park-interior structures, in the design of natural functional units, ongoing lack of financial resources, the selection of ecotourism routes, the establishment of relationships between protected areas and economic activities, and the lack of qualified personnel (some of them are given in the pic. 3). In mountainous areas, it is difficult to prevent natural disasters, especially forest fires, in difficult relief conditions. An example of the complexities of the territorial structure and the difficulties of managing from a single center is the Shahdag National Park. There are separate subdivisions of this national park, covering the territory of 6 regions.

An example of protected areas located on the plain is Samur-Yalama National Park. Here, some parts of the unique plain forests are occupied by population and tourism facilities, some rare trees in the forest have dried up, the fruit trees and shrubs in the lower reaches of the forest and animal feed have been destroyed, and the tall fences inside the park have disrupted wildlife migration, caused animals to attack villages frequently. In this park, for the proper management, there is a need for an organization of environmental education with the local communities, the removal of stone fences, and etc.

Unsystematic grazing of animals is observed both in the mountains and in the plains. In winter season plains and during the summer months mountains are severely eroded. This leads to the degradation of biodiversity, especially soil and vegetation, and desertification. Although the law provides for grazing 4-

8 sheep per 1 ha in a pasture, this figure is higher. It is possible to observe 25-30 and sometimes 50 heads of sheep per hectare. This means that the norm is repeatedly violated.

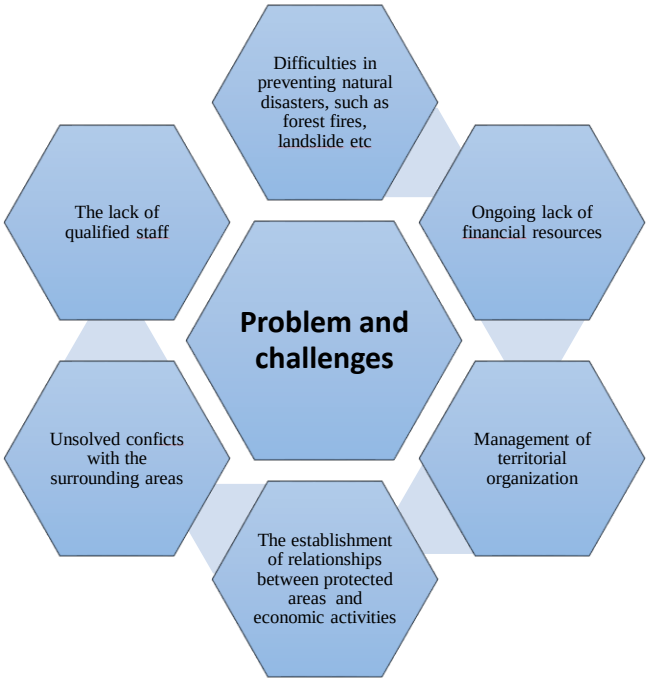

Figure 4. Some difficulties in protected areas of Azerbaijan.

The loss of valuable grazing areas in the coming years will be inevitable if such negative consequences are not prevented soon enough. For this reason, there is a need to develop additional activities and ecosystem services, especially in residential zones close to protected areas. One of the key aspects of successful management of protected areas is the support of local stakeholders (Wells and McShane, 2004). Promoting ecosystem services for sustainability (Schirpke, 2017; Guerbois and Fritz, 2017) and implementation of programs can be an important solution in this regard. Thus, the development of other alternative farms can lead to a decline in the number of sheep and livestock. Fruit and its processing, expanding beekeeping, collecting medicinal herbs, selling local crafts, handicrafts, and stimulating activities for local businessmen will lead to improved living standards and at the same time protecting biodiversity.

Ecotourism in national parks. Ecotourism is seen as a tool for conservation and sustainable development (Ceballos-Lascurain, 1998, p. 8). So, how to maintain sustainable development for an ecotourism site has become a critical issue (Tsaur *et al.*, 2006). Ecotourism plays a highly important role as an effective tool for the concept of sustainable development. Ecotourism, as alternative tourism, involves visiting natural areas to learn, to study, or to carry out activities environmentally friendly, that is, tourism based on the nature experience, which enables the economic and social development of local communities (Kiper, 2013). The development of ecotourism, in particular, contributes to the development of the regions and the improvement of living standards. There are great opportunities for the development of this type of activity in national parks of Azerbaijan. Landscape diversity, biodiversity, fascinating natural monuments, and rich resources of national parks located in plain and mountainous areas give it a reason. Although some efforts have been made to improve the infrastructure in national parks in recent years, there are still shortcomings. It is important to improve and mark all ecotrails necessary for tourists' movement in national parks, as well as to increase security measures. There is a need for the restoration of several historical

monuments located in the high mountains. The total number of ecotrails is currently about 100 (Table 4). Depending on the type of trail, it is possible to move by foot, horse or car.

It is positive that the number of visitors to national parks has increased 10 times, especially in the last 5 years. Thus, in 2013 the number of visitors to the national parks was 1,634, while in 2017, the number was 184,504. The number of foreign citizens increased from 484 to 5798 in those years. Visitors of Absheron, Shirvan, Altiagac, and Shahdag national parks are higher than others because of the location close to the capital.

Table 4. Tourism activities in national parks (The State Statistical Committee of the Republic of Azerbaijan, https://www.stat.gov.az, Accessed: 01 Sep. 2019).

Activities / Years	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Number of ecotrails and routes - total, units	19	82	58	58	74	43	90	101
From them:								
water	1	1	1	-	-	-	-	-
with a horse	2	5	5	6	7	5	26	26
on foot	14	50	43	42	59	28	42	49
Number of visitors, people	2062	5248	1781	1634	1432	74771	198583	184504
citizens of foreign countries	108	445	336	484	183	733	2801	5798

Thus, protected areas play a very important role in preserving the country's biodiversity and promoting sustainable development. Measures for the protection and expansion of these natural pearls should be carried out continuously, and public awareness activities should be taken into account. There is a need for the creation of protected areas in the KBAs, with approved by the IUCN. From this point of view, it is advisable to create zakazniks along the Mil plain, on the delta of the Kura River, around Hajigabul, Sarisu, Mehman and Agzibir lakes. It is possible to expand the areas of the Altynagac, Hirkan, and Goygol national parks. The Sultanbud forest, which is widely spread on the Karabakh plain, should be declared a reserve. It is expedient to create a zakaznik about 50 meters of both coasts along the Gusarche River basin. Thus, the creation of protected areas along the river basin is critical to improving the relationship between marine and terrestrial ecosystems.

4. Conclusions

Although the total area of Protected Areas in Azerbaijan has increased by 1.8% over the last 10 years, it cannot be considered in accordance with existing environmental standards. To achieve this, it is advisable to increase the total protected areas up to 15% by creating new national parks and expanding the existing protected areas in the country over the next 10 years.

An analysis of a table drawn up by comparing modern landscape map and satellite images with the locations of national parks reveals that the landscape and ecological diversity of national parks in mountainous areas is higher than that of plain national parks. This also shows that mountainous areas have higher ecotourism potential. Based on the statistical data analyzed, the increase in the number of visitors to national parks shows that tourists' interest in the landscape and environmental diversity of Azerbaijan has increased recently.

For the first time, the structure-management model of the landscape-ecological frame and the map of the medium-sized landscape-ecological frame of Azerbaijan (1: 600,000) have been developed. The structure-management model includes four levels (republican, regional, local and farmer), and the

environmental map shows nuclear, ecological corridors, wetlands, unprotected natural forest ecosystems, and various natural monuments. It is advisable to use these elements in the organization and management of sustainable environmental development in Azerbaijan.

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