

# PROTECTION OF THE "LAKE SKADAR" NATIONAL PARK IN THE FUNCTION OF SUSTAINABLE DEVELOPMENT OF TOURISM

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**Abstract:** Lake Skadar is the largest national park located on the territory of the Zeta-Skadar basin in the Republic of Montenegro. Known as a "hotspot of biodiversity", it faces many challenges. Therefore, the main objective of this paper is to indicate the system of protection of the park by the application of geographic information system (GIS) and to emphasise the importance of sustainable tourism development in connection with this. Conditionally, the paper will include four segments: the first, defining the area of the Lake Skadar, the second, the protection systems and regimes, the third, the existing and potential tourist activities on the lake, while the final section will sublimate all the findings accumulated during the study. The geo-ecological analysis of the area will help the organization of tourist activities and undertaking measures in the field of environmental protection.

**Key words:** Skadar Lake, protection, tourism, geographic information system

## 1. INTRODUCTION

The Lake Skadar National Park is situated in the area of Zeta-Skadar valley in the Republic of Montenegro. It is a country with a coastline on the Adriatic Sea. The total area of the country comprises 13,812 square kilometers, and according to the census of 2011 it had a population of 620,029 inhabitants. Lake Skadar as a cryptodepression (5.5 meters) represents one of the most important hydrographic facilities in the Balkans, as well as the border area between Montenegro and Albania. It is located in the sub-Mediterranean climate area. It extends for about 7 km away from the sea, in the southeast of Montenegro and northwest of Albania. The northern side of the lake offers a vast Zeta plain representing the most populated area which includes the two largest cities - Podgorica and Nikšić. The northeast side of the lake offers the slopes of the mountain Prokletije (Đeravica, 2,656 m), while the slopes of Taraboš (593m) and Rumija (1,593m) spread to the southeast side. The mountains Sutorman (Široka stranica, 1,185m) and Sozina (934m) cover the southern part, while the slopes of Lovćen (Štirovnik, 1,749m) cover the northwest part [1]. The 412 km<sup>2</sup> lake area represents the base of the park (254 km<sup>2</sup> /62 % in Montenegro and 158 km<sup>2</sup> /38 % in Albania). The volume of the lake amounts to 2 km<sup>3</sup>. It is 44 km long and as much as 14 km in diameter. It has an average depth of 5 m. On the other hand, the maximum depth measured in Raduško oko reaches 60 m [2]. The total length of the finely indented coastline is 207 km, of which 149.5 km belong to Montenegro, and 57.5 km to Albania. The lake is known for the peninsulas Petrova ponga and Obida, while the other side comprises of up to 50 smaller islands (Starčevo, Beški Moračnik, Gradac, Dužica, Skut, Grmožur, and many others). The largest lake tributaries are Morača (99.5 km), Plavnica, Zetica, Gostiljska rijeka, Rijeka Crnojevića (13 km), Mrka, Mala Morača, Šegrtnica, Seljašnica, and others which flow from the north and northwest, such as Orahovštica and Crmnica from the southwest. The rivers Proni, Tata, Riola, Vraka, Bunuši and Kiri flow from the Albanian side [3]. The lake is supplied with significant amounts of water via sublacustric (underwater) sources called "eyes", where the lake is deepest, and via precipitation. It is assumed that there are roughly 30 underwater sources. The only distributary of the lake is the river Bojana (45 km), but the lake loses a significant amount of water by evaporation as well (around 20%). The basin of the lake has an area of 5,490 km<sup>2</sup>, of which 4,460 km<sup>2</sup> belong to Montenegro and 1,030 km<sup>2</sup> to Albania. In the administrative sense, the area of the national park belongs to the following three municipalities: Podgorica (Lješanska nahija, Zeta and Malesija), Bar (Krajina and Crmnica) and Cetinje (Riječka nahija) [4].

## 2. SPECIES RICHNESS

Concerning the abundance of the species of flora and fauna and ecosystem diversity, Montenegro is among the leading countries in Europe. It comprises of two major biogeographical regions: the Mediterranean and Alpine with highly diverse types of ecosystems and habitats located on a very small area. This classifies Montenegro as one of the biological "hotspots" of the European and global biodiversity. The ecosystem of Lake Skadar is extremely complex and of the sub-Mediterranean type, consisted predominantly of freshwater and wetland biotopes, particularly along the northern coast, but also of brushwood, garrigues and rocky terrain on the southern karst slopes, indicating the diversity and richness in vegetation. Among the most important biotopes in the area of the Skadar basin are one aquatic and three terrestrial biotopes. These are the following habitats: the water biotope of Lake Skadar (930 of the microphytic and macrophytic representatives of algae, floating, submersed and emersed plants), biotope of brushwood (a type of degraded forest vegetation, mostly a community of belograbić), biotope of garrigues and rocky terrain (the ultimate

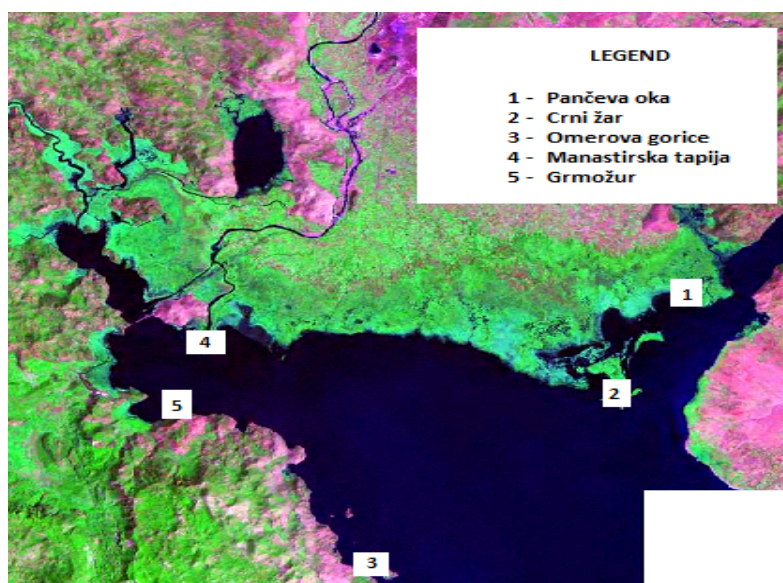
degree of degradation) and biotope of floodplain forests of willow and poplar. Among other prominent biotopes is the rural zone of the Zeta plain, which hangs on the floodplain zone, but also the semi-desert terrains of the same space [5].

For each area, the endemic species hold the highest value because of their narrow geographic area, as well as the unique combinations of genes. Many species are found on the Red List of the International Union for Conservation of Nature, and also the Annex I list of the Bern Convention, all of which enjoy national protection. Approximately 10 rare taxa were recorded in this area. Among them, the *Marsilea quadrifolia* (četvorolisna raznorotka), *Utricularis vulgaris* (mehurača) and *Najas flexillix* (podvodnica), which can be found on the lists of the Bern Convention, as well as the Habitats Directive [6].

**Table 1:** Endemic species in the area of Skadar basin

Specie	Scientific name	IUCN category
karonja	<i>Trapa longicarpa ssp. scutariensis</i>	-
skadarski dub	<i>Quercus robur spp. scutariensis</i>	VU
srpska ramonda	<i>Ramonda serbica</i>	LC

Lake Skadar lies within the confrontation zone of the large zoographic areas, in particular the spacious Palearctic area (Europe, much of Asia), the Mediterranean and North Africa, which is significant for the mobile fauna. The lake area belongs to the sub-Mediterranean fauna, and its nearest environment has significant continental fauna characteristics. The diversity of wildlife is reflected in the presence of 54 species of freshwater mollusks (*Mollusca*), 54 species of fish (*Pisces*), 16 species of amphibians (*Amphibia*), 28 species of reptiles (*Reptilia*), 282 bird species (*Aves*) and 57 species of mammals (*Mammalia*) [6]. A number of ornithological reserves was founded in the area of Lake Skadar, which represent the nesting sites for various bird species. Among them, the Pančeva oka (nesting place for cormorants, pelicans, herons, terns and gulls), Manastirska tapija (colonies of herons and cormorants), Crni žar (nesting sites of cormorants, herons, pelicans and terns), Grmožur (nesting site for terns, gulls and pelicans) and Omerova gorica (colony of gray herons) [7].



**Figure 1:** Location of ornithological reserves at Lake Skadar

### 3. TOURIST ACTIVITIES AT LAKE SKADAR

Tourism is recognized as a significant factor in the revitalization of rural areas, the encouragement of infrastructure development and the possibility of creating new jobs. Tourism also contributes to the reduction of migration flows (emigration) and protection of the cultural heritage. In this respect, the Lake Skadar National Park as a protected area has great potential for tourism due to the numerous benefits it offers. These primarily refer to the vast body of water, a large number of islands and adjacent mountains, as well as rich flora and fauna, climate characteristics, cultural heritage and authentic architecture [8]. All this is given a special charm by the proximity of the Adriatic Sea. Since it is a protected area, all types of tourist activities must be carried out in accordance with the principles of sustainability and carrying capacity limits of the destination. Thus, the main offer of Lake Skadar is based on an active vacation and organization of day trips and excursions. This is contributed by the existence of two visitor centers - in Vranjina and Virpazar. The visitor center in Vranjina represents natural and cultural values of the national parks of Montenegro through various programs (audio and video presentations and exhibits). On the other hand, the visitor center in Virpazar shows in an interactive way the tourism activities in the park with an emphasis on wine, walking and bike trails [9]. The

ecological center in Virpazar is highlighted as part of the educational content, which organizes nature schools, mostly during the summer.

The key aspects of the tourism offer in the area of Lake Skadar are:

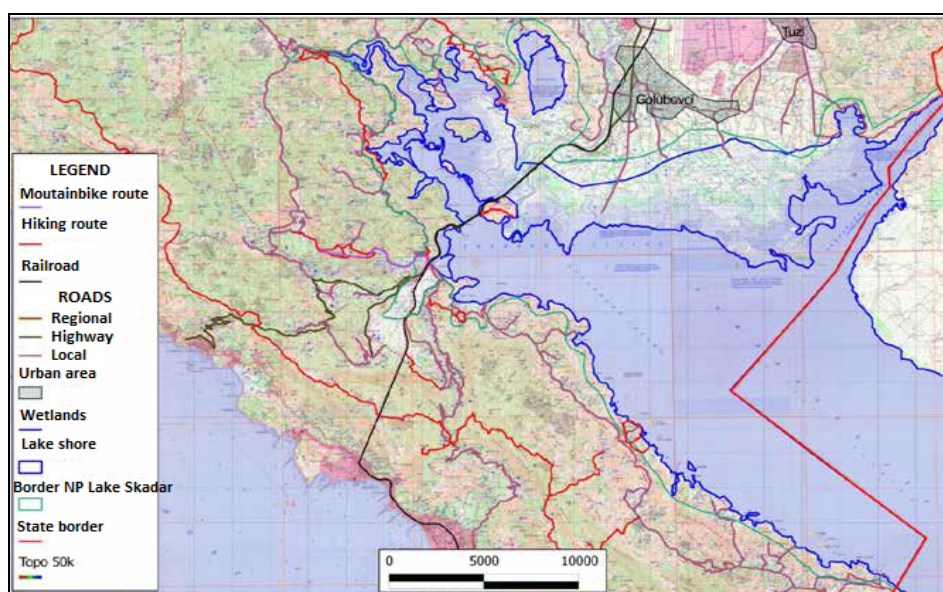
1. *Swimming and recreation* - there are numerous locations where these types of tourist activities take place. Among them are Donji Murići, Vranjina and the zone of Karuč-Dodoši-Žabljak, as well as the townships - Virpazar and Rijeka Crnojevića. A large number of sandy beaches are declared natural monuments. The key reason for the "limitedness" of this type of tourist offer is the lack of quality infrastructure equipment (transport, utility and catering facilities).
2. *Sports and recreational tourism* – this form of tourism is thought of as having a certain amount of "adventurous" spirit to it. There are as many as nine 30-km long footpaths on the park territory. All the footpaths are equipped with vertical and horizontal signalization and are medium-heavy. There are also five marked bike trails (140 km) and two mountain bike trails (20 km) with insufficient infrastructure. There are two educational trails which draw special attention - Lipovik (2.5 km) and Plavnica (1 km) [9].
3. *Birdwatching* - this type of tourism offer is organized on particularly attractive locations with adequate infrastructure. This specific tourist-photosafari activity is especially popular during the autumn and winter months when a considerable number of migratory birds are present. It takes place at purposely built observatories (Stanaj, Žabljačke livade, Plavnica and Raduš) elevated to 5 m above ground with the maximum capacity of 10 people [8].
4. *Wine tourism* – the Montenegrin winegrowing region of Lake Skadar is the largest viticultural, wine and grape production area, but also the space where there is a large number of family wineries included in the wine roads of Montenegro. The authentic wine route was launched by the "AD Plantations" company from Podgorica in 2007. It is an area situated approximately 30 km from the Adriatic Sea, where the 230-hectare surface holds one of the largest and most beautiful vineyards in Europe – the Čemovsko field with indigenous species of vines (krstač and cormorant) [10]. The offer includes a train tour of the vineyards along with a visit to the cellar "Šipčanik" and tasting of wine and national dishes (prosciutto, cheese, etc.).
5. *Sports and recreational fishing* – this form of tourism is still in the "initial" phase concerning its possibilities. But throughout the year (hunting season is closed from March 15<sup>th</sup> until June 1<sup>st</sup>) there are a large number of sports fishermen hunting mostly carp, bleak and eel. The number of fishermen is monitored on the basis of daily and annual issues of permits [9].



**Figure 2:** Panoramic view of Lake Skadar

6. *Nautical tourism* – represented in the form of sailing with the purpose of the area tour, but it has not been sufficiently exploited so far. The reason for this situation is the unregulated flow of the river Bojana (the lake's distributary) and lack of access of ships to the lake from the sea. Yet, there is a long tradition of tourist sailing on the lake. The first passenger steamboat has worked since 1914 as part of the company "Jadransko-skadarska plovidba AD". Later, the development was intensified within the company called "Galeb" which stopped working in the 80s of the 20<sup>th</sup> century. Today, the excursions take place under the organization of several local carriers from the ports in Vranjina, Virpazar and Plavnici [11].
7. *Transit tourism* - this represents a promising type of tourist offer on the main road traffic direction Podgorica - Petrovac with the Virpazar and Rijeka Crnojevića checkpoints. Along with this, the Podgorica-Bar section of the railway (Belgrade-Bar) built in 1959 plays an important role. It passes partly through Crmnička nahija (known for its wine) and the Lake Skadar basin. There is a possibility of combining this type of tourist offer with the excursion tourism. Precisely due to the proximity of the largest emissive centres (centres of demand) and the Montenegrin coast as a contractive zone (zone of attraction), there is a plan to build the "Historical Museum of Montenegro Railways" in Virpazar as a former railway junction [12].

8. *Event tourism* – a large number of events and festivals are held in the national park area, many of which have a long tradition. Among them are particularly the Wine and Bleak Festival (December), the Lake Skadar Trophy (July 13<sup>th</sup>), Nature and Culture Festival (September), Koštanijada (October-November), Days of Ecology, Tourism, Culture and Sports (summer months). The aforementioned festivities attract a significant number of visitors [13].
9. *Rural tourism* – it has potential as a form of business, but little has been done in terms of its development. This area is characterized by healthy food, hunting and fishing, as well as agricultural (agro-tourism) activities which the urban man misses. Almost all settlements of the compact type and with authentic architecture possess the basis for the development of this type of tourism. This will activate the so-called "weekend" tourism along with the rural, where the existing housing stock in the era of cottage building is insufficiently used [4].



**Figure 3:** Main itineraries in the area of Lake Skadar

By observing the data on the visit to the national park, we can conclude that the number of visitors increases every year. This area is characterized by the fact that it is mostly visited by foreign tourists (over 75%). These are usually the guests who visit the Montenegrin coast during the summer season and visit Lake Skadar on daily trips. Gathering of information on the number of visitors is performed at the checkpoints in Virpazar, Vranjina, Rijeka Crnojevića, Plavnica, Murići and Žabljak where the entry points or visitor centers are situated.

Although the material basis of the national park represents the foundation of the tourism business, it is modest. Most of the objects are placed within the four villages on the banks of the lake: Donji Murići (28 beds), Godinje (6 beds), Virpazar (170 beds), Rijeka Crnojevića (17 beds), Prevlaka-Karuč (15 beds), Vranjina (6 beds) and Plavnica (8 beds). Most of the units are privately owned, and are categorized as rooms and suites, while the hotel facilities are typical of Virpazar (the hotels 13. Jul, Pelikan and Vir) [14]. Special attention is paid to the eco-resort Plavnica, a highly ranked environmental center on the lake shore.

**Table 2:** The number of visitors in national park

2004.	2005.	2011.	2012.	2013.
7.000	15.500	45.362	59.885	74.649

Among the sources of income of the national park, various tourist taxes and fishing licences play a particularly crucial role. The greatest share among the taxes comes from tickets (visitor and cruise centers), and also restaurants taxes, taxes for rent and use of boats and speedboats, as well as film recording and camping. On the other hand, fishing licences (daily and annual) account for about 30% of total Park revenue. It is evident that every year the revenues rise on all grounds, with slight variations. It should be mentioned that this, as well as other national parks, is largely financed by own-source revenues, while state funds hold a significantly smaller share [15].

**Table 3:** Main sources of income in national park

Sources of income	2010.	2011.	2012.	2013.	2014.
tickets	138.072	157.807	236.524	291.974	290.000
fishing licenses	64.336	62.410	57.855	68.070	60.000

#### 4. PROTECTION SYSTEM OF LAKE SKADAR NATIONAL PARK

The protection of the wider area of Lake Skadar began in the second half of the 20<sup>th</sup> century. Lake Skadar as the largest lake on the Balkan Peninsula is of particular importance for the countries that share it, as a resource and a protected area. The Montenegrin part of Lake Skadar with an area of 40,000 hectares was declared National Park (IUCN category II) in 1983, while in Albania it is protected under the category of "managed nature reserve" (IUCN Category IV) from 2005 on. According to the Nature Protection Act, national parks are areas of extraordinary and multiple natural values which enable scientific, educational, cultural, economic and recreational function. The Lake Skadar National Park respects the criteria of the International Union for Conservation of Nature (IUCN) for protected areas of category II [1].

Due to the richness in the bird fauna, this territory was declared Important Bird and Biodiversity Area (IBA) in 1989. This was preceded by the establishment of ornithological reserves Pančeva oka (312.5 ha) and Manastirska tapija (53.1 ha) in 1968. Following the actions of protection, the lake was listed in the "Ramsar List" of Wetlands of International Importance in 1996 (20,000 ha and 49,562 ha of the Montenegrin and Albanian sides respectively), along with the river Bojana [16]. On the other hand, river Bojana became nationally protected as "water landscape" (IUCN Category V) in Albania in 2005. Apart from this, Lake Skadar is listed as one of the internationally important plant areas (IPAs). Based on the criteria of the Berne Convention, 17 representative Emerald habitats were found in the lake area.

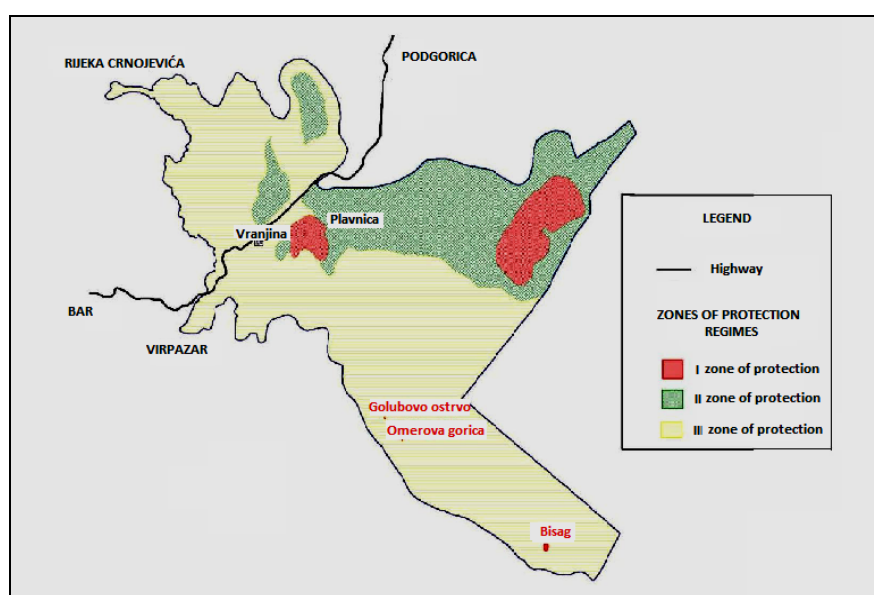


Figure 4: Zones of protection regimes

Zoning was carried out within the Lake Skadar National Park, which is based on the principles of protection and preservation of natural and cultural values. In this way, they isolated areas that are under strict protection (level I) and surfaces on which certain activities were allowed, such as fishing, specific forms of agriculture, construction of buildings and other economic activities including tourism (levels II and III) [1]. Zoning is carried out in accordance with the Spatial plan of special purpose for the Lake Skadar National Park, UNESCO's recommendations for the programme "Man and Biosphere" and the principles of the "Pan-European Ecological Network" (Pan-European Biological and Landscape Diversity Strategy).

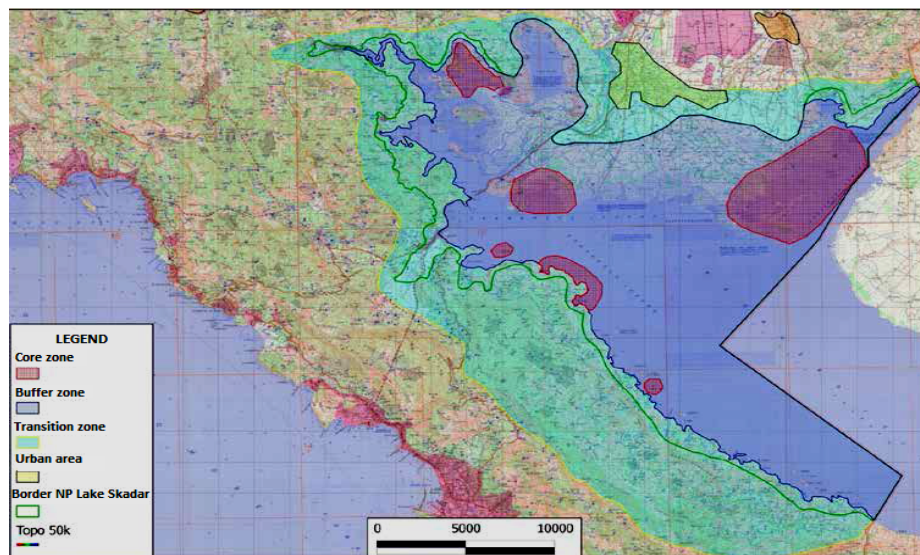
Based on the complex evaluation of conditions and application of geographic information system (GIS, Geomedia programme) with previously executed digitization of topographic and thematic maps using MicroStation, the following protection zones were isolated in the field [1, 4]:

1. *Central Zone (Zone I)* – these are the authentic natural habitats and wilderness areas with high value at the local, as well as regional and global levels, with the strict protection regime which prohibits the use of and access to them. The special nature reserves "Pančeva oka" and "Manastirska tapija", along with the birds' nesting site "Crni žar" belong to this zone.
2. *Protection Zone (Zone II)* - these are the natural habitats and wilderness areas under protection, where certain activities and the use which is compatible with the ecological principles (traditional fishing), grazing and selective forms of tourism are allowed. This zone includes the north and northwest marsh side of the lake with a

narrow belt of open water to the river Karatuna, Gornje Malo blato and some islands on the southeast side of the lake (Bisag, Omerova gorica, Golubova ostrva, etc.).

3. *Buffer zone* (Zone III) - these are preserved semi-natural habitats, cultural heritage, villages around the lake, as well as recreational sites. It is the zone of active protection. It includes the land area of the park, mostly along the southcoast (Krajina, Crmnička Riječka and Lješanska oblast), with populated or deserted settlements, as well as areas of open water with many islands. There are cultural monuments placed there as well.

4. *Transit zone* (zone IV) - these are the urban areas and landscapes of intensive use surrounding the protected area. It is a closely leaning area outside the park boundary, making the natural whole of the Lake Skadar region. The possible activities in this zone are extensive agriculture, exploitation of mineral resources and industries which affect to a high degree the quality of the environment.



**Figure 5:** Protection zones of Lake Skadar National Park

Due to its importance, the lake was proposed for the nomination as a transboundary UNESCO reserve "Man and Biosphere" Biosphere Reserve (MAB). The main reason for the establishment of this programme is the fact that the ecosystem of Lake Skadar extends over two state borders and is subject to the common, though different, potentially conflicting practices, unsustainable development, land management and use. During 2012 a project called "Dinaric Arc Parks" was launched, which includes a platform of protected areas that connects all nature and national parks of Albania, Bosnia and Herzegovina, Montenegro, Croatia, Kosovo, Macedonia, Slovenia and Serbia [17]. This is a three-year period project, funded by the Norwegian Ministry of Foreign Affairs and the MAVA Foundation. In the future, the plan is to expand the boundaries of the Lake Skadar National Park to the Rumija Regional Park (in the state of establishment) and /or the area of Lake Šas /estuary of the river Bojana.

## 5. GEOECOLOGICAL EVALUATION OF LAKE SKADAR NATIONAL PARK

Bearing in mind that the area of Lake Skadar has a very good basis for the development of various forms of tourism, the index method of recreational potential and bonitation stands out as one of the most suitable evaluation methods. This method was prescribed by the Food and Agriculture Organization of the United Nations in 1976 as part of the project called Framework for Land Evaluation. What is characteristic of this method is the fact that each bonited landscape holds 100 points as a starting value, while adding or subtracting the so-called correction qualities of the landscape, converted into points, results in its actual value, which falls under a certain category [18].

**Table 3:** Ratings and categories of valued landscapes

Assesment of landscape	Category of landscape	Points
10	Most valuable part of the landscape	91–100
9	Very valuable part of the landscape	81–90
8	Prevalently valuable part of the landscape	71–80
7	Relatively valuable part of the landscape	61–70
6	Prevalently less valuable part of the landscape	51–60
5	Relatively unfavourable part of the landscape	41–50

4	Prevalently unfavourable part of the landscape	31–40
3	Unfavourable part of the landscape	21–30
2	Very unfavourable part of the landscape	11–20
1	Extremely unfavourable part of the landscape	1–10

It is noted that, due to the frequent fluctuations in water levels and the natural morphology, the coastal structure as a value category suffered some changes due to the presence of muddy and sandy shores. A similar situation affects the quality of water, bearing in mind that the water is generally of category II-III, while in some localities it even belongs to category IV or is outside of category (Vranjina). The two distinctive sources of water pollution are the point sources (the wastewater of Niksić, Danilovgrad and Podgorica, the waste from the Aluminum Combine, Niksić Steel Mill depots, but also from numerous illegal depots) and the dispersed sources (mainly the agricultural areas in the Zeta plain with the excessive use of artificial fertilizers and pesticides) [19]. The network station for testing the quality of surface waters included the lake ecosystem in 2012. The testing of surface water quality was controlled in four series of sampling in the period of June-October. The Lake Skadar water is of the calcium-bikarbonate type and belongs to the A2CK2 class. It is a class II type of water which can be used for food industry and drinking after adequate conditioning (coagulation, filtration and disinfection) - (A2). The water can be used for swimming as well - (K2), but also for farming shellfish and more common fish species (cyprinids) - (C) [20]. However, the lack of commercial facilities arises as a problem, which greatly affects the achievement of additional revenue. Based on the above and certain "minor" problems notwithstanding, Lake Skadar is one of the most valuable parts of the landscape in terms of the development of swimming and recreation and nautical tourism.

**Table 4:** Geocological evaluation of Lake Skadar National Park area for the purpose of swimming-recreation and nautical tourism

Corretive values		Corretive Points	Saldo	Assesment
Riverbed	occurrence of shallow	– 10	115	10
	occurence of islands and peninsulas	+ 10		
	occurrence of bays	+ 15		
Depth of the riverbed	< 5 m	– 15	95	10
	5–20 m	0		
	> 50 m	+ 10		
Structure of the coast	sandy	+ 10	90	9
	muddy	– 10		
	rocky	– 10		
	mixed	0		
Shore vegetation coverage	forest vegetation	– 10	100	10
	mixed vegetation	0		
	no vegetation	+ 10		
Water clarity	I-II	+ 10	90	9
	II-III	+ 5		
	III-IV	– 5		
	> IV	– 10		
Availability of shopping facilities	close	0	90	9
	a 30 minute walk	– 5		
	more than 30 minutes walk	– 10		
<b>Total</b>				<b>10</b>

## 6. CONCLUSION

Based on all of the above, it can be concluded that the area of the Lake Skadar National Park represents an exceptional site of the highest tourist value. Its rich natural resources and history require continued protection in the future. We should work on preserving the existing and establishing new protection regimes. In this regard, tourism activities should also be planned in accordance with the carrying capacities of the destination and the principles of sustainable development. Only sustainable forms of tourism can contribute to the further development of this area and achieve the highest score in terms of tourist valorization.

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