

**PHYSICAL-GEOGRAPHIC FEATURES OF SAZAN-KARABURUN AREA IN
FUNCTION OF SUSTAINABLE DEVELOPMENT**

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The Sazan Island and Karaburun Peninsula is bordered to the east by the Gulf of Vlora and to the west by Adriatic Sea and the Ionian Sea. In the morphogenetic framework, the coast is of high abrasive type and is associated with a variety of morphological, structural, coastal, karstic, and mass-wasting phenomena. The relief of the island and peninsula is generally hilly and is clearly distinguished by the marked morphological and morphogenetic contrasts. Climatic conditions and morphological features of the relief, as well as the isolated position in the west, north and east, have influenced to the intensity of external modeling processes, as well as to other physical-geographic elements, such as water, soil and hydrographic representatives. Most of the gullies and channels are characterized by very little bedding temporarily covered by surface water flows. Groundwater is scarce and is almost fully represented by karst springs of various types. Most of these resources appear in contact with the Ionian Sea that are perceived as coastal submarine springs. The territory is considered a protected area within the Sazan-Karaburun National Park. These lands are heavily exposed to the process of superficial erosion, as well as the construction of tunnels, transport and water supply channels of former Military Departments. In some fragments, carbonate soils, formed under wet conditions, along the limestone rocks, lead to the formation of weathering materials, which have been accumulated on rocky slopes.

As an important priority remains the conservation of coastal habitats as potential reproduction sites for marine birds and for predators, especially rocky slopes throughout the western sector, in the framework of conservation of biodiversity and the environment of the Maritime Protected Area (ZMD) Karaburun-Sazan. Across the southernmost edge of the peninsula, in Pashaliman, the territory has been subject to an intense human influence through the militarization of the naval base, which at the same time prevented the free movement of population within Karaburun during the period of the socialist system.

The changes regarding the morphological elements of the territory are closely related to the humane factors, which have defined the features of the settlement infrastructure. The greatest transformations in the context of Sazan settlement functions have been more visible after the Second World War. Several neighborhoods of residential character were constructed in the island, to accommodate the families of the staff of the Sazan Naval Base and the staff involved in supporting branches of subsidiary entities, etc.

Keywords: relief, climatic elements, karst, conservation, militarization

1.GEOGRAPHICAL POSITION

Karaburun Peninsula is bordered with the Gulf of Vlora to the east and Ionian Sea to the west, while in the north, Mezokanal Strait with a length of 4.8 kilometer-long divides it from Sazan peninsula. Karaburun Peninsula has a prevailing southeast-northwestern position. It has a total length of 16 km, a maximum width until 4.78 km and a minimum width until 3.34 km. The total surface is 62 km². The island of Sazan lies northwest of Vlora Bay and has a surface of 5.7 km², maximum length 4.25 km and a maximum width of 2.70 km. The overall length of the coastline of the island is 12 km. In the morphogenetic framework, the island and peninsula are characterized by a variety of structural, coastal, karstic and structural phenomena. Geomorphologic elements represent important scientific, didactic, economic, military and tourist values.



Map 1. The Physical Map of the Karaburun Peninsula (Inst.Military.Surveying 1983)

2. GEOLOGIC STRUCTURE

Cretaceous limestone deposits appear in about 99% of the peninsula surface and are mainly represented by carbonate rocks of neritic facies of Sazan tectonic area. The limestone rock layers, in a considerable part, fall towards the sea coasts of an angle 10-35°. Fragments of limestone gravels are displayed in the composition of limestone layers. (Collective authors, 2002, Geologic map). The molassic deposits of Aquitanian and Burdigalian appear in the form of two narrow fragments at the northwestern corner of the peninsula. Aquitanian molassic rocks are generally fragmented, accompanied by grain structure and appear between the Cape of Gjuhëza the west and close to Qafa e Lofates in the southeast (Collective authors, 1990, pp 246). The tectonic area of Sazan represents the most western part of our country and extends from Sazan Island in the north, continuing towards the south to the Karaburun Peninsula and then to Dhërmi. Sazan's tectonic area continues to Greece at Paksos island, called Paksos area, as well as to Italy, called Pre-Apulia area (Aliaj Sh., 2012, pp 38). In the semi-horst - monoclinical structure of Karaburun, limestone rocky layers have in average an eastern monoclinical fall of an angle of 15-30°. (Collective authors. 1990, Geology of Albania, pp 247).

3. MORPHOGRAPHIC FEATURES OF THE RELIEF

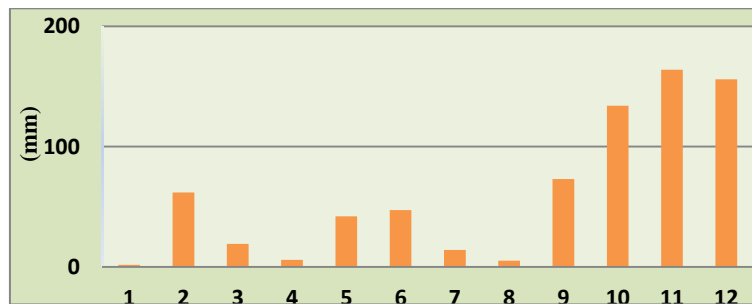
The relief of the peninsula and island is generally hilly and it is clearly distinguished by the prominent morphological and morphogenetic contrasts. Several factors have influenced to the process of relief formation such as abrasive marine activity, fault and fold tectonics, accompanied by marine transgressions and regressions, in particular the neo-tectonic differential movements during Plio-Quaternary, lithological content, carstic and masswasting phenomena, as well the temporal ravines streams. The almost longitudinal direction northwest-southeast of the above geological structure is a direct reflection of the very active tectonic displacement, where the prominent asymmetry of the restrictive slopes is a direct consequence of the highly evident structure of asymmetry.

4. CLIMATIC ELEMENTS

The peninsula and island, for its geographic position and direct contact with sea and low values of absolute heights, is distinguished for particular microclimatic characteristics. They distinguished for a typical Mediterranean climate, (Collective authors, 1981, Map of the climatic zones of Albania) with warm and dry summer and soft and humid winter. The temperature of January as the coldest month is 10.3°C and July as the hottest month is 24.8°C. (Collective authors, 1960-1990, Meteorological data - station of Vlora) During the cold season the precipitations occupy $\frac{3}{4}$ of the total rainfalls amount. Precipitations in the 24-hour intervals have reached at 120.8mm, causing local flooding near Pashaliman's lagoon (Collective authors Climate of Albania, 1981, pp 239).

5. HYDROGRAPHIC NETWORK

The hydrographic network of temporary character is distinguished for a high erosive capacity and a solid flow conveyor. The slopes in the eastern coast of the Karaburun ridge have been interrupted by temporary flows, resulting in narrow and deep cobble stones. The limestone cliffs, which represent the base of the geological structure, are massive, in white and gray color and have good aquifer capacity. Most of these karst springs appear in contact with the Ionian Sea and are considered as submarine springs.



Graphic 1. Height of annual rainfall. Station Orikum. (Collective authors, 1984, Meteorological Bulletin.)

6. PEDOGENIC COVER

The specific conditions of the island and peninsula's relief are closely related to the physico-chemical and biological processes of the soil formation, as well as to the degree of weathering along the slopes. In the coastal hilly fragments, gray-brown soils have been developed on proluvial and deluvial deposits, formed by limestone alteration, along with the differentiated profiles at different degrees. This generation belongs to the carbonate-humus soils, because of the prevailing limestone composition on which they are placed, having a very small content of humus, nitrogen and phosphorus. (Spaho.Sh, 1990, pp 278).

7. PLANT COMPOSITION AND ELEMENTS OF THE ANIMAL WORLD

The plant cover includes almost $\frac{2}{3}$ of the peninsula's surface, which belongs to the Mediterranean vegetation shrubs. The eastern side of Karaburuni has more deforested areas by fires in a landscape of maquis with a few pines and cypresses shaped by the wind. Small dry troughs fall into the sea almost vertically, especially broadleaved evergreen forests (Assoc. Orno-Quercetum ilicis); plant communities dominated by *Quercus cocciferae* (Assoc. Orno-Quercetum cocciferae); plant communities dominated by *Euphorbia dendroides* and *Pistacia lentiscus* (Assoc. Pistacio-Euphorbietum dendroides); as well as the forests dominated by *Quercus ithaburensis* subsp. *Macrolepis* (INCA, 2015, pp 22-23).

The diverse physico-chemical environment with mediterranean pine and oak trees, herbaceous coverings and limestone slopes bare by vegetation, are an important base for sheltering singing birds, reptiles, rodents, etc. The densely crowded population of rabbits and the widespread presence of rats at the most extreme corners of the peninsula carries a considerable number of predatory birds.

8. MORPHOGENETIC FEATURES

Structural reliefs landforms are, monoclinical ridges, tectonic and lithological scarps, structural benches, structural surfaces, cuestas, subsequent troughs, and so on. Along the western segment, continuous sequences appear, fault line scarps due to the diagonal tectonic, (Derrau. M, 1966, pp 333) that limits the western part of the semi-horst structure and the grading of the southeastern layers. The fold tectonics, resulting in Karaburun's monoclinical structure and the tectonic movements have had a significant influence on the features of karst morphology, proving a very active karst process (Collective authors, 2002, Tectonic map of Albania). The new tectonic and

recent movements, as well as the eustatic sea level movements, have influenced to the development of the coastal karst, accompanied by caves, burrows, corridors and karst hollows.



Photo 1. Coastal cliff on eastern part of peninsula (Hoxha.A)

Beaches with the proper morphological features are found in Zhapovel, Raguze and Shen-Vasil, due to the larger size of small bays, especially in Shen-Jan. The block character of fault tectonics, which has been developed intensively during the Quaternary period up to the present day, has defined the highly expressed morphological features of the cliffs and the tectonic scarps, the type of fault scarps and the fault line scarps (Panizza M., 1990, pp 261-262). After the Holocene era and until the historical era, mass wastings phenomena of the type of gravel gullies were developed, due to the activity of surface flows of temporary character. In the northwestern segment, drainage phenomena are appeared due to the flysch and molassic composition, accompanied by creeps, falls and slides, near the coast, close to the Cape of the Gjuheza.

9. HISTORICAL EVOLUTION OF SAZAN - KARABURUN AREA

All historical evolution and the human infrastructure development of Karaburun Peninsula and Sazan Island are closely related to the existence of Orikum harbor and the geostrategic importance at Otranto Channel. (Shpuza S. Descoedres.JP Bereti.V, pp. 345-352) The very appropriate geographic position has converted this space to an objective of neighboring countries, which have used all the means to conquer them, in order to have Adriatic Sea under their control. In these conditions for the existence and protection of the territory, the seamanship sector has been developed. The Conference of London in 1913 decided that the island would be included within the sovereignty of Albania. (Gallori. Paolo. Albania: rotta su Saseno, l'isola che non c'era - Espresso- 12 August 2015) On October 30th 1914, Sazani was conquered by the Kingdom of Italy, while due to Austro-Hungarian army's offensive, it has been withdrawn temporarily until May 1916, when it re-established the control in this area. During the First World War, the island became an important military base. On September 18th 1920, according to the Italo-Albanian agreement, Sazan island was unjustly placed under jurisdiction of Italy, (Istituto di Studi Giuridici Internazionali. Protocollo di Tirana del 2 agosto 1920 è allegato a Sforza a Giolitti e Bonomi) until October 1943. (Olinto.M. Popolazioni dell'Istria, Fiume, Zara e Dalmazia 1850-2002. ediz. A.D.E.S) In November 1943, Sazan was occupied by Nazi Germany armed forces, which kept it under control until October 22 1944. The substantial transformations regarding the functions of the harbor and Sazan settlement emerged after the Second World War.

Over a period of 45 years, the island and the peninsula were converted into very important military bases on the shores of the Adriatic Sea. During the transition period, due to the change of the political system and the huge lack of economic and social conditions, the local population began to emigrate towards Italy and Vlora, while during 1997 the island was definitely abandoned. Due to the worsening of the political situation in Albania in 1998, Italian forces "Guardia di Finanza" were established at the island of Sazan, and stayed there until 2009 when the Ministry of Defense of the Republic of Albania re-established the full control in this area. The use of territory for military purposes and the abandonment of residential houses and other facilities led to the creation of massive stocks of metals weighing tens of tons of toxic asbestos elements. where, as consequence, in 2013, after the military training at Sazan island, the soldiers were affected by mustard gas, since the symptoms were similar to the effect that this gas emits into the skin. (Braho.L. Gazeta Shekulli – 30 March 2014) This incident occurred due to the existence of chemical and biological weapons remained in the island, from former Soviet troops, until 1961.

10. PLANNING AND TERRITORY REGULATION

The entire surface of the island and Karaburun Peninsula, together with the construction facilities, are state property, while currently they are managed by the Ministry of Defense. For a more qualitative management of the island and the peninsula, the zoning process should be realized, ensuring an efficient use of the territory, rehabilitation of the socio-economic infrastructure facilities and put them partly in the function of harbor and touristic activities. Within the current legal status, a part of the Adriatic Sea's water space near the shores of Sazani Island along with the Karaburun Peninsula was proclaimed "Karaburun-Sazan Maritime National Park", according to the decision of the Council of Ministers, no.289, dated 28.04.2010. (Ministry of Environment - Management Plan for National Marine Park Karaburun-Sazan 2014, pp 10) The island is not included in the space of the protected area, but in the prospective, it must provide the status of protection, acquiring the management experience of Karaburun-Sazan Maritime Park. The National Tourism Agency should ensure the promotion of touristic values and organize the development of tours to respective itineraries, accompanied by legal protection, through the prevention of fires and discharge of agricultural waste (INCA, 2015, pp 16).

RECOMMENDATIONS

- For the near future, it is important a morphological study of the marine shallow of the eastern sector of the island and peninsula related to the dynamics of morphotectonic evolution and the deposition balance.
- To prevent fishing in the limited seaside sectors and to apply best practices to reduce casual catches of marine birds
- To carry out researches in the north of the Shen-Jan Gulf and the Cape of Gjuheza, as it results that those have oil reserves
- Determining the forecast of the coastal line dynamics in the medium to long term period requires the assessment of the coastal fragments that are involved in the abrasion and the deposition process
- The existing area of harbor, through the restoration, can be used as a yachts harbor, where the warships of the Cold War period can be anchored to be visited by foreign tourists.
- Technical measures must be foreseen for the recovery of damages to the environment and the creation of touristic infrastructure, in function of the sustainable development of the island and the peninsula.
- To assess the impacts of military constructions in the former Pashaliman Base and temporary locations in a close relationship with the environment and the ecological elements of the peninsula.

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