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NATURAL STRUCTURE ANALYSIS AND AGRICULTURAL AREAS: A CASE STUDY OF KARABURUN PENINSULA, TURKEY

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ABSTRACT

The Aegean Region of Turkey covers 85.000 km² in total with a coastline of 2805 km, which comprises nearly 35 percent of the total Turkish coastline. The Aegean coastal zone in Turkey is facing problems mainly of coastal urbanization and mass tourism, which have been experienced in last two decades. Such long term and affective human activities have partly damaged the ecosystem along the Aegean coasts.

Large fertile agricultural areas have slowly and steadily been overwhelmed by urban, tourism and industrial developments. And also vegetation formations as halophytes, psammophytes, macchias and phrygana dominating the coast have been steadily vanishing.

In this study the Karaburun Peninsula where we see the longest undisturbed coastlines of the Aegean Region of Turkey was selected with the aim to analyze the natural structure of agricultural areas. The Karaburun Peninsula (436 kmq) is on the northern part of the Urla Peninsula (1246 km²), which is the biggest in the region. Currently the population of Karaburun is about 15.000.

The coastline of the Karaburun Peninsula has high cliffs penetrating into the sea, shores in various dimensions, islets and islands. The inland part is used for agriculture but there are also valleys and series of hills among which the highest one is Akdag reaching up to 1218 m. The peninsula is in typical Mediterranean thermic regime with the climate. Besides having the Mediterranean rich flora and fauna the area is also a breeding area for particular birds and sea mammals internationally protected.

The peninsula had been one of the most important areas of the Aegean Region in production of grapes, olives, honey and some other local agricultural products till 1980s. Today the peninsula is under the threat of current ongoing and potential future human activities that will cause natural and cultural structural change.

1. INTRODUCTION

Karaburun is a coastal town of the Izmir Province (Fig. 1). The Karaburun Peninsula is in the north of Urla Peninsula being the very western land part of the Aegean Region, which penetrates into the Aegean Sea. It is bordered by Balikliova Village in the southeast and by Gerence Bay in the southwest. Total area is 436 km². The peninsula has 30 km. of length and width differing between 15-km. max. to 10-km. min. Karaburun town is 100 km from Izmir city center.

Figure 1. Location of the Karaburun Peninsula

The town was founded by the Hittites in 3000 BC and known to be the most developed cultural center of that time. The peninsula was declared a town in 1910 and its name was changed from “Ahirli” to “Karaburun”. Karaburun name meaning “Black Cape” is supposed to be given to the region due to the black color of soil dominant in the region. The second probable reason for this name is the peninsula's location on the very edge of Anatolia and being connected to the main land by a rather narrow land-strip.

2. NATURAL STRUCTURE ANALYSIS

The latest formation of the Karaburun Peninsula has appeared to pass through the following states; tectonic movements which became very active and effective during the Miocene Age, volcanic movements which were caused by tectonism and karstic movements such as erosion, transportation and deposition leading to fluvial erosion and melting. As a result of these stages it was transformed into what it is today during the Kuaterner Age. Its principal morphological units are the Karaburun-Bozdag mass, and the Pre-Neogen calcareous fields and plateaus (Soykan . *et al.*, 1993).

Akdag Hill rises over carbonate structured Karaburun Boz Mountain. As a distinctive morphological feature, the hill forms the highest point of the peninsula with an altitude reaching 1218 m. Pre-Neogene calcareous, sandstone magmatic rocks reach down to the coastline from the shoulders of the Karaburun Bozdag massive. Surrounding the neogene lake and the volcanic rocks, Karaburun plain lands are spread around on rather wide areas. The step, by the coastline, changes in height from 60-70 cm. up to 150-300 cm, where we see shores of medium or large sized pebbles or grained sands (Figure 2).

The peninsula is in the Mediterranean macroclimate area and is classified as semi-humid marine climate. The peninsula in the Aegean Region coastline has a good climate for summer and sea tourism activities. Average value of temperature is stable over 20° C in summer season along all the Aegean coast and in near regions.

In Karaburun there are types of soils with different lithological characteristics and ages. On the eastern part of the peninsula are red Mediterranean soils and reddish brown Mediterranean soils, on the west, non carbonated brown soils and on the coastal line and Mordogan coasts there are volcanic regresol, alluvial, kolluvial-alluvial soils scattered.

Fig. 2. A view from Karaburun Coastline Major Profile (Orig., 2001)

3. LAND USE AND POPULATION

There are 13 villages and two municipalities named Karaburun and Mordogan on the peninsula. High hills ending with cliffs by the coastline affect population, locations of settlements and use of land as a major factor. Villages like Manastir, Cullu, Bozköy established on the north part of the peninsula are located on the hills. Villages like Saip, Kosedere, Eglenhoca, Mordogan are located in the southeast of Karaburun where they are based rather low in altitude near or by the coastline.

Agricultural areas are spread in various locations. Due to the complex geomorphologic structure of the region distinctive plains like Yukari Ovacik and Asagi Ovacik and Kücükbahce regions are the most important areas for agricultural activities. Plain areas by the coastline are also the most convenient areas for agriculture. Thus agricultural areas are seen in two main characteristics, inland and coastal.

Coastlines convenient for agricultural activities and shores of sandy or pepple beaches inbetween capes are attractive for local inhabitants and city people for summer season activities as secondary housing. Since the 1970s, an increase in building areas and an enlargement of locations along the coastline has occurred.

A moment of structural change along the coastline is observed as rapidly increases second house constructions. Change in agriculture is observed as plantation of vegetables (artichoke) and irrigated agriculture applications (citrus plantations) in areas where once production of olive and grape were dominant. Locations like Denizgiren and Kücükbahce begun to be inhabited for the complete term of year for agricultural activities.

Current ongoing studies on rehabilitation and modernization of the main road starteted in 1967, passing by the coastlines of the peninsula, is one of the main reasons why inhabitants of inner villages have abandoned their homes and established new villages by the road and the coastline. Balikliova is a perfect example of this change.

Another reason for the increase in number of locations along the coastline is the fatal earthquakes experienced. Earthquakes in the last decades have greatly damaged villages, Mordogan (previous), Kosedere, Inecik and Eglenhoca. Thus inhabitants of these villages have decided to move their living sites to the areas by the coastline.

Second house construction on the east part of the peninsula is observed to be intense in dispersal compared to the west side. Constructions on the east side are intense by the borders of Mordogan and Karaburun Municipality by constructions in form of cooperatives or private possessions.

2000 second houses constructed in the western part in Gerence Bay by Teke Cape over the previously most valuable and biggest agricultural area of the peninsula named Karareis Ovasi is a patch of “destruction monument” coastline. New roads and the availability of electricity and water as the major needs for humans had and still have a great affect on the preferences of people wanting to possess a house, thus enhancing the overall invasion of humans on these coastlines as in the whole of the

Mediterranean. Human invasion by concrete structures at Kücükbahce Village and Gerence Bay gives us the alert sign on the possibility of losing natural and cultural values of delicate formations of these very valuable Mediterranean coastlines. Overall, 3500 secondary houses completed by 1990's reached up to 8000 by year 2000. Considering the ongoing construction activities this number is foreseen to reach 10.000 in a short time (Anonymous, 2000a).

The gross population of Karaburun is 10.553 and it consists of a city population of 2775 and a village population of 7758 (Figure 3). The Karaburun Peninsula, which covers 436 km square, has 13 villages and two municipalities named Karaburun and Mordogan. The increase in population after 1985 is not a natural one but rather an external and temporary one created by secondary house owners (seasonal) and retired people who like to live their rest of their life in villages like Karaburun, Kaynarpinar, Yeniliman, Mordogan, Balikliova.

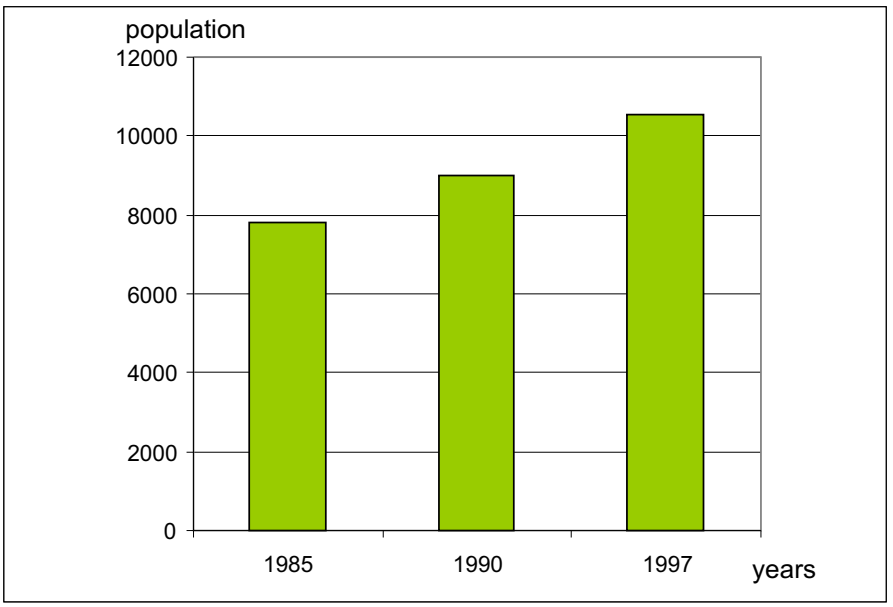

Figure 3. Population Changes in Karaburun by Years (Anonymous, 1986, 1991, 1999)

The average age in population is over 50 among the local people. The town is called “town of old people” due to migration of the young generation to nearby cities and especially to Izmir, which is the third most crowded in Turkey after or before 18 years old.

As regards the values of population in the last century, the peninsula had and still has a very stable population, despite some fluctuations due to very particular occasions (e.g., migration of foreign inhabitants after the Independence War, or migrations due to earthquakes). In year 2000, population of “local” people was 7.358, in summer time population of “local people, secondary house dwellers and tourists" is approximately 45.000.

4. FLORA AND FAUNA

Referring to previous studies on Akdag and the nearby region at Karaburun Peninsula and current ongoing researches on the coastline zone there are 384 species from 255 genius and 70 families of typical Mediterranean vegetation is observed in the Karaburun Peninsula. Natural forests in the form of small patches mainly of dominant tree species *Pinus brutia* (Red pine) up to altitudes of 800m exist around Yaylaköy, Yenicepinar, Yukariovacik and Gerence locations. Maqui and phrygana formations spread over nearly the whole of the peninsula following the forest diminution by human hand. It is possible to observe a wide variety of maqui species of which the most common are *Arbutus unedo* (Strawberry Tree), *Quercus coccifera* (Kermes Oak), *Pistacia lentiscus* (MasticTree), *Pistacia terebinthus* (Turpentin Tree), *Arbutus andrachne* (Rowboat Tree) and *Spartium junceum*. The most common phrygana species are observed as *Sarcopoterium spinosum* (Thorny Burnet), *Cistus sp.* (RockRoses), *Erica arborea*, *Erica verticillata*. (Bekat, Secmen, 1981).

The Karaburun Peninsula is a biologically rich natural reserve area with terrestrial and marine mammals and 204 land and/or marine bird species. Among these species some of which identified to be in the category of "endangered species" world or Mediterranean wide so declared to be protected within international regulations are listed in Table 1 (Eken, 1997).

Table 1. Mainly Terrestrial and Marine Species of the Karaburun Peninsula (Eken, 1997) (R=Resident, B=Breeding, SM=Summer migrant).

Marine Mammals	Mediterranean Monk Seal *(Monachus Monachus)*	R/B
	Eurasian Otter *(Lutra Lutra)*	R/B
Marine Birds	Audouin's Gull *(Larus audouinii)*	*R/B*
	Shag *(Phalacrocorax aristotelisdesmarestii)*	*R/B* (in Ildiri Bay)
	Yellow-legged Gull (*Larus cachinnans*)	R/B
Birds of Prey	Lesser Kestrel (*Falco naumanni)*	SM/B
	Golden Eagle *(Aquila chrysaetos)*	R/B
	Short-toed Eagle *(Circaetus gallicus)*	*S*M/B
	Peregrine Falcon *(Falco peregrinus)*	SM/B
	Lanner *(Falco biarmicus)*	R/B
	Eleonora's Falcon *(Falco eleonorae)*	SM
	Bonelli's Eagle *Hierraeetus fasciatus)*	*R (breeding not confirmed)*
Passerines	Rüppell's Warbler *(Sylvia rueppelli)*	SM/B
	Olive-tree Warbler *(Hippolais olivetorum)*	SM/B
	Cretzschmar's Bunting *(Emberiza caesia)*	*SM (breeding not confirmed)*

5. AGRICULTURAL ACTIVITIES

Despite fairly dynamic topography, agricultural activities have always had priority in the region. Production of olive and grape extends back to the 16th century in time with a wide Mediterranean reputation. Serving wine and olive oil to high-class consumers has been the major source of income for centuries.

Only 9 % of 3.705 hectares of total agricultural area are irrigated. Irrigated areas are mainly used for producing artichokes. Flower plantation is a recent activity, which is an alternative income source for the inhabitants owning rather small pieces of land for agriculture. Production of *Narcissus sp.* (Narcissus) has been adopted by the local people as a culture of land in agriculture during the last three decades. In Mordogan, Saip, Ambarseki, Hasseki, Tepeboz, Sarpincik sites, narcissus plantations are widespread. Olive oil processed in small-scale local olive oil factories is still a major income for the local people of the peninsula. 1.5 lt. of olive oil extracted from 4 kg. of olive indicates an efficient oil production rate.

Table 2. Agricultural Production Quantities by Year 2000 (Anonymous, 2000b).

PLANT	AREAS (ha)	YIELD
Olive	2576	2000 tons
Grape	170	150 tons
Artichoke	160	30.000 pieces/ha
Narcissus	75	400.000 pieces/ha

One of the major agricultural activities is cattle breeding. Milk and cheese production mainly from goat is another important local agricultural activity. Since 1990s with the support and guidance of governmental authorities local people have been encouraged to breed sheep rather than goats, as goats cause destruction on flora and fauna.

The Karaburun Peninsula presents original products of agriculture derived from the unique structure of nature and culture in harmony. Despite topographical disadvantages, areas in remote valleys are naturally isolated from cold north winds and storms. Coastal plains and slopes provide a very important potential for agriculture. Today this potential for agriculture is not used efficiently due to lack of human source. Immigrations after the Independence War, immigration of young local generations from village to

the city and remaining aged population are the main reasons for the situation. High-age average within the current population is the main reasons for this.

6. DISCUSSION

Scenarios on “Sustainable life in Mediterranean” are buildup and new ones are still under consideration. Despite these various scenarios on economy, population and dynamics, national development strategies, land management, and perception of environment, rapid change on the natural structure of the Mediterranean is continuous. Warnings for immediate and realistic conservation regulations and applications are also seen in the same scenarios.

Agricultural areas and fresh water sources are delicately limited in the Mediterranean Region. An amount of 46.000 km of coastline where cliffs, mountains and capes forced the inhabitants of Mediterranean was a very important geologic factor of the structural change. Considering the needs and ambitions of humans, methods driven to achieve the sought outputs and products have deteriorated coastlines rich of natural, cultural and historical values. The natural structure of the Mediterranean has been changed and /or reshaped, due to high-tech and concrete developments carried out by humans.

The soil and water of the Mediterranean are very sensitive to chemical and physical changes. Ability to renew and clean them selves is very slow and interactions of these natural sources in local or global change scale can be unpredictable.

To remind ourselves and all international Mediterranean partners the necessity to give conservation the chance of “making decision” and taking every problem in an interactive manner from the smallest scale up to largest, we need to secure the existence of natural and agricultural reserve areas. Likewise declaring the Karaburun Peninsula as a biosphere area in the very original Mediterranean natural values spectrum and also as an important agricultural area for the health and vital needs of today's and the coming generation, is a way to enhance international efforts for a sustainable life on earth.

Referring to results of current studies and previous national and international research studies, the Karaburun peninsula is found and accepted as an area having unique and very original natural structure in the Mediterranean. It can be declared as a biosphere.

Referring to outputs of ongoing research studies and recent national and international research study results on natural and agricultural potential of the area, the Karaburun Peninsula should be taken in consideration in proper management and conservation plans. The Karaburun Peninsula is a convenient area to apply current worldwide projections for sustainable life practices in the Mediterranean Basin.

There is a vital need for the local, national and international co-operation net to understand where we live, how conditions change and how to challenge these changes and apply the projected decisions. Being aware of natural and cultural heritage shared in the Mediterranean, a fair lot of stakeholders have taken part in this study. Similarly, believing in very valuable co-operation between local and national stakeholders, a number of institutions and individuals played a role in this study, too.

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