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SUSTAINABLE DEVELOPMENT AND LAND USE CHANGES IN KARABURUN PENINSULA

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ABSTRACT

Karaburun Peninsula, which is in the Aegean Region of Turkey, is handled in this study because it is one of the undisturbed natural sites. The peninsula is on the border of Izmir Province. Izmir is a very fast expanding city in the region, so all its districts are facing the threat of industry and tourism and consequently increase in population. Many other districts in the region such as: Foca, Cesme, Menderes, and Kusadasý have been lost so far (i.e. expanding industrial and touristic dwelling investments have invaded the natural sites in these districts). The current population of Karaburun town is about 15.000 so it doesn't seem to have been invaded by urban development yet.

The peninsula was once one of the biggest grape production centres in the region and despite destruction of vineyards there are still some remaining. Luckily the hard geological conditions of the area haven't let tourism invade the area that quickly. Therefore the study, before it is too late, aims at determining land use distribution and the trends of development for the last four decades as concerns population, agriculture, tourist dwellings, graze land, forest and fauna (sea mammals (monachus monachus) and terrestrial birds) and predicting future developments and finally making suggestions on how to divert the trend to a positive way.

1. INTRODUCTION

In this study, Karaburun Peninsula which is one of the undisturbed pieces of lands in the Aegean Region have been chosen to be analysed for land use which covers agricultural lands, graze lands, forests and others such as core settlements, second houses, tourist investments, roads etc.

The peninsula is located in the west end of the Aegean Region (Fig. 1). It covers an area of 426 km² and has a population of 10.332 (Anonymous, 1999). 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 also valleys and series of hills among which the highest one is Akdag (1218 m). The peninsula has typical Mediterranean climate. Besides having the Mediterranean's rich flora and fauna the area is also a breeding area for endangered birds and sea mammals internationally protected.

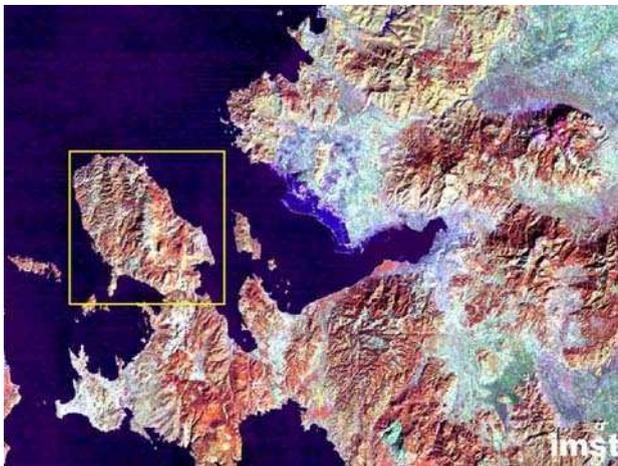


Fig. 1. The Landsat Image and Research Area.

The aim of the study is to analyse the trend in all aspects of investigations for the past 20 to 40 years and to be able to make predictions for the future in order to suggest appropriate precautions to take for the area.

2. MATERIAL AND METHOD

Apart from the photographs taken during the field work, satellite images of the protect area, 1:25 000 scale topographic maps, 1;25 000 environmental land use plans were used as visual materials. The reference of Bekat and Secmen (1982), Eken (1997), Erdem et al. (2001), Yilmaz (2001) and statistical documents and reports of Prime Ministry State Institute of Statistics (SIS), Ministry of Agriculture, Karaburun Municipality were used. Geomedia Professional 3.0 was used for inputting, querying, and displaying the spatial and tabular data in the laboratory of Centre for Environmental Studies.

The study is mainly based on the method "Trend Analysis" in which all data for each aspect of the investigations were gathered and classified into years (Khakee, 2002). Tables and graphics were prepared showing the trends of dynamics up to the present. Later in the study, all factors effective on the matters concerned are identified and their range of impact is determined. Doing this, one can make suggestions for precautions and available new investments without any hazard to the area. Additional filed surveys and lab works were carried out intensively.

3. LAND USE (YEARS 1990-1999)

Demographic development of the area is shown at first place as it is considered the most important process for land use developments (Table 1, Figure 2,3).

Table 1. Population Developments in Years 1960-1997 (Anonymous, 1961, 1969, 1973, 1977, 1981, 1986, 1991, 1999).

YEARS	KARABURUN	IZMIR
1960	7.041	548.327
1965	7.294	621.553
1970	7.132	753.041
1975	6.941	905.059
1980	8.146	1.059.183
1985	8.802	1.800.797
1990	9.020	2.134.816
1997	10.332	2.544.363

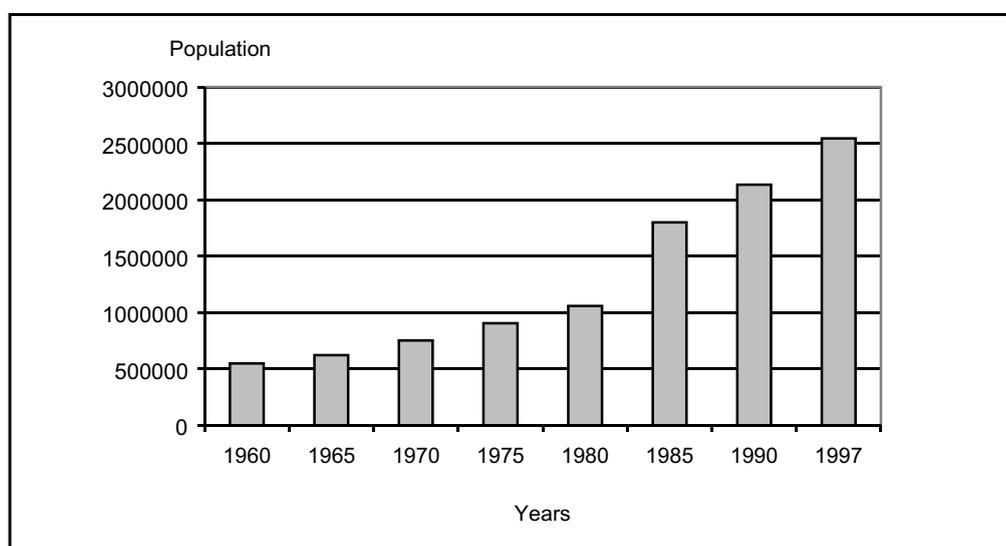


Fig.2. Increase in Population of Izmir during 1960-1997.

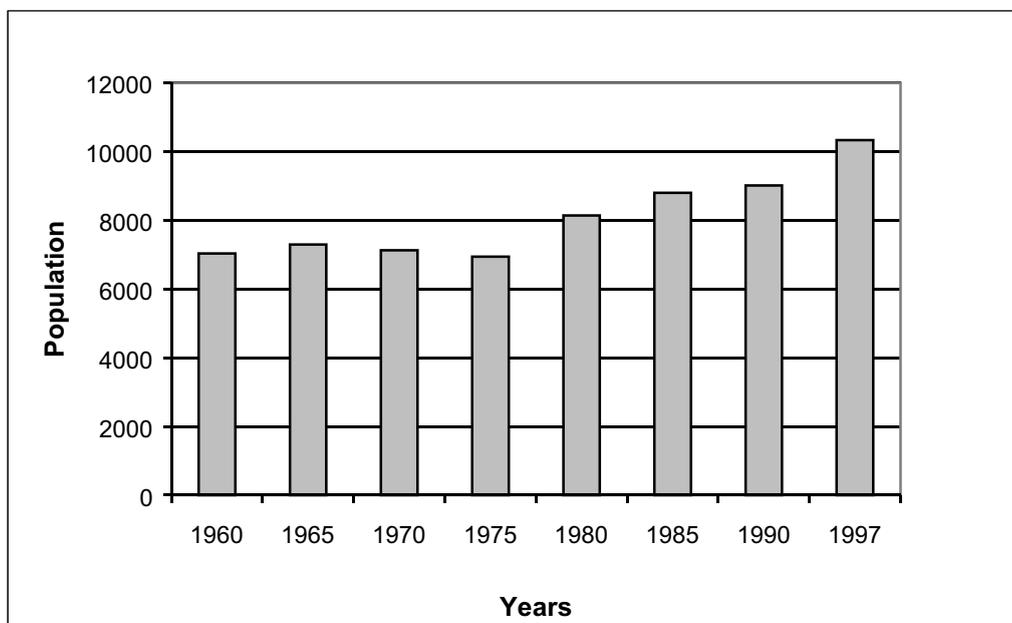


Fig. 3. Increase in Population of Karaburun during 1960-1997.

Table 2. The List of Villages of Karaburun and Their Distribution of Population (YILMAZ, O, 2001).

	Village	Population
Karaburun Center	Center	2.813
	Amberseki	236
	Bozköy	168
	Hasseki	109
	Saip	213
	Sarpincik	259
	Tepeboz	257
Küçükbahçe Town	Center	608
	Parlak	165
	Salman	119
	Yaylaköy	130
Mordo an Town	Center	3.901
	E lenhoca	541
	Inecik	323
	Kösedere	490
Total		10.332

As the demographic comparison between Izmir and Karaburun shows the population in Karaburun has increased by only 50% compared to 500% in Izmir. The reason for this is the lack of industrial investment and the slowness of tourist developments in the area. In contrast to the slow movement of tourism into the area, the young population moved to industrial cities for jobs as if they were trying to balance the population. That is why one cannot see this exchange of population on first sight.

Table 3. Distribution of Land Use (ha) (Anonymous, 2000).

	Acreage (ha)	Agricultural Area (ha)	Forest Areas (ha)	Graze Lands (ha)	Other Areas (ha)
KARABURUN	43.600	3.820	27.351	200	12.229
IZMIR	1.197.300	379.442	513.705	120.939	183.214

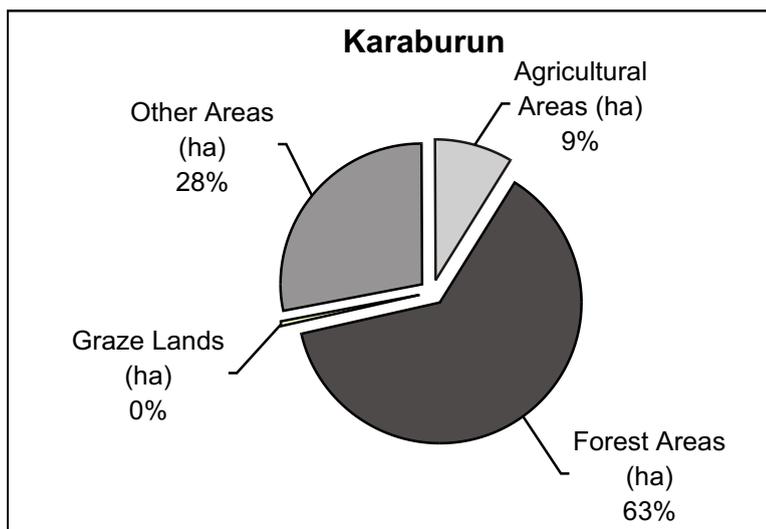


Fig.4. Distribution of Land Use in Karaburun.

3.1. Agriculture

When the table and the graphic are examined, it can be easily understood that the peninsula is very poor in agricultural and grazing lands but very rich in forests. Another factor for poor agricultural development is the low percentage of irrigated lands within the total agricultural land (Fig 5). Irrigation of 470 ha of land is provided by local farmers since there is no work done by the government at all.

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 Küçükbahçe 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 considered in two main characteristics, as inland and coastal (ERDEM *et al.*, 2001).

Given a coastline convenient for agricultural activities primarily and shores of sandy or pebble beaches in between capes that are attractive for local inhabitants and city people for summer season activities as a secondary reason, by 1970's there was an increase in the establishment and enlargement of locations along the coastlines. A moment of structural change along the coastline is observed as rapidly increasing secondary house construction grew in number. Change in agriculture was observed as plantation of vegetables (artichoke) and irrigated agriculture applications (citrus plantations) in areas where once production of olives and grapes were dominant. Locations like Denizgiren and Küçükbahçe began to be inhabited the whole year round for agricultural activities (Erdem *et al.*, 2001).

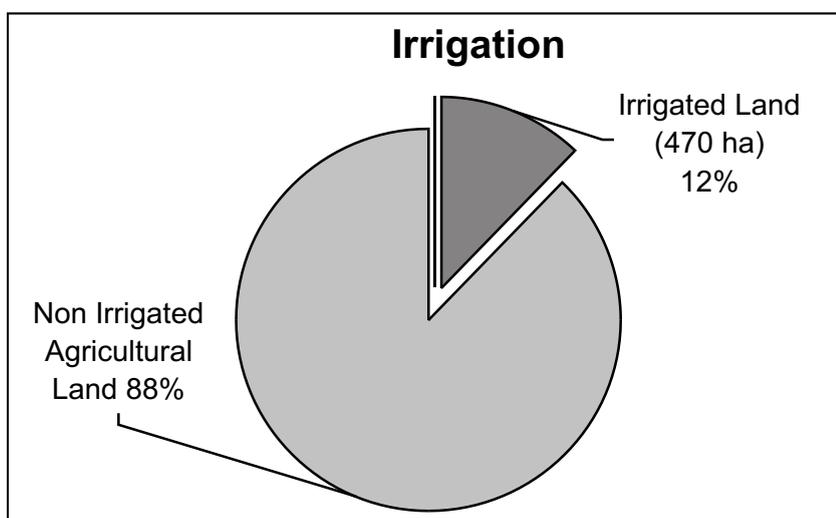


Fig. 5. The Proportion of Irrigated Lands in Total Agricultural Lands of Karaburun. (Yilmaz, 2001).

Table 4. The Coverage and Yields of Vegetable in the Region (Yilmaz, 2001).

PRODUCTS	PLANTATION (ha)	YIELD/TON
Pepper	6	120
Tomato	10	300
Artichoke	160	2.400
Cucumber	2	40
Watermelon	3	90
Muskmelon	3	90
Aubergine	7	210
Broad bean	1	20
Okra	1	5
Kidney bean	1	5
Bean	1	6
Squash	1	30
Spinach	1	12
Cauliflower	3	75
Celeriac	2	50
Cabbage	3	105
Onion	1	20
TOTAL	208	3.563

Table 5. The Coverage and Yields of Fruits in the Region (Yilmaz, 2001).

PRODUCTS	NUMBER OF TREES (ha)	YIELD/TON
Pear	1820	27
Quince	775	12
Apple	200	3
Plum	600	10
Apricot	830	15
Cherry	750	13
Peach	1540	17
Fig	610	12
Pomegranate	850	17
Almond	2750	12
Pistachio	200	0,8
Lemon	2800	70
Orange	1800	63
Tangerine	28000	840
Total	43625	1111,8

Table 6. Field Crops (grains) in Coverage Area and Yield (Yilmaz, 2001).

	PLANTATION (ha)	YIELD/TON
1999	391	705

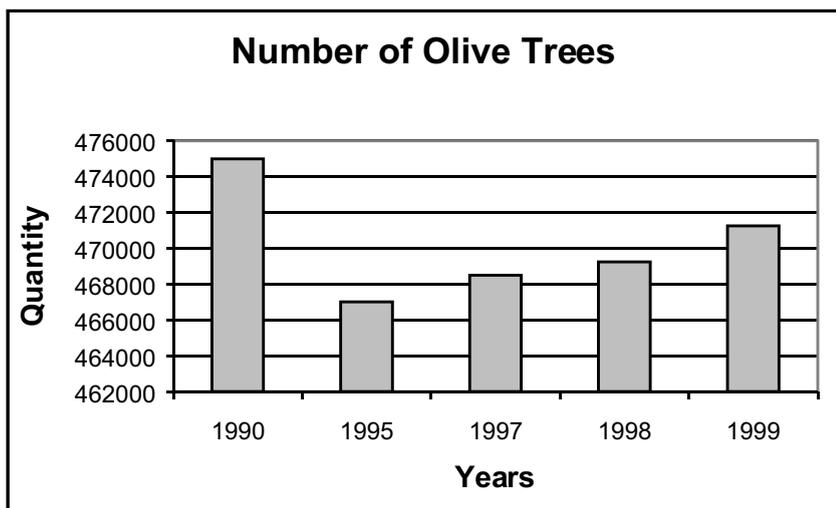


Fig. 6. The Change in the Number of Olive Trees during 1990-1999 (Yilmaz, 2001).

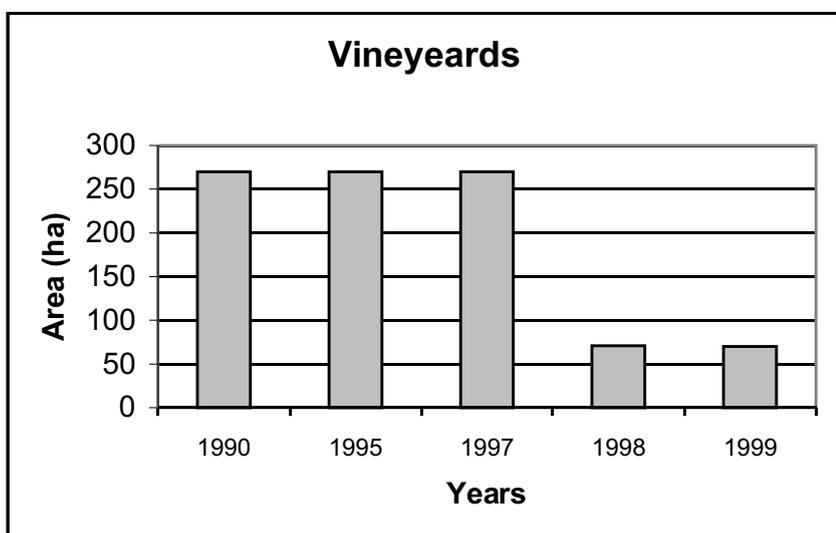


Fig. 7. The Change in the Number of Vineyards in Years 1990-1999 (Yilmaz, 2001).

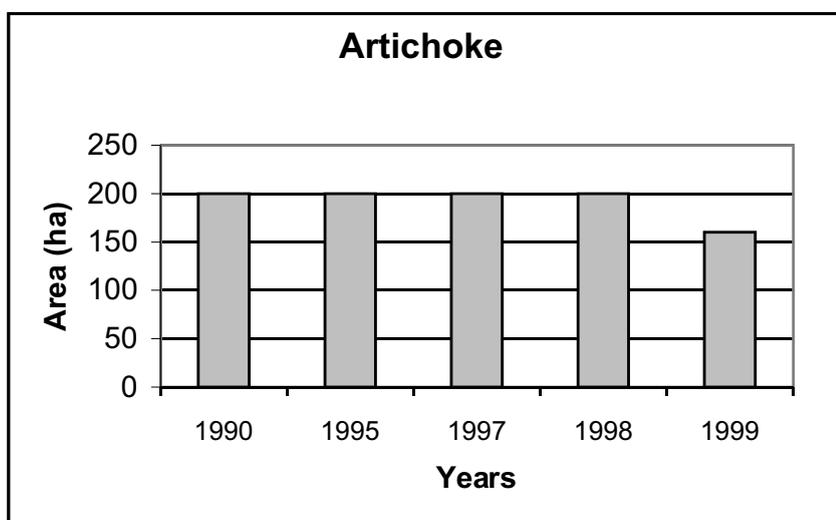


Fig. 8. The Change in the Number of Artichokes during 1990-1999 (Yilmaz, 2001).

3.2. Grazing Lands

Two hundred hectares of grazing land in total of 43.600 ha means there is no chance for domestic animal feeding.

3.3. Forests

Since the study aims at determining values of the area to be protected as well as the factors that threaten them, forests are considered important as a natural structure of the area. Due to the hard geographical formation of the area these forests are not easily accessed and this enables some endangered species to remain in the area.

3.4. Flora and Fauna

Referring to previous studies on Akdag and the regions near the Karaburun Peninsula and current ongoing researches on the coastal zone there are 384 species from 255 genus and 70 families. Typical Mediterranean vegetation is observed in Karaburun Peninsula. Natural forests in 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. Maqui and phrygana formations spread over nearly the whole peninsula following the forest diminution by human. 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* (Mastic Tree), *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.* (Rock Roses), *Erica arborea*, *Erica verticillata*. (BEKAT, L. and O. SEÇMEN, 1981).

The Karaburun Peninsula is a biologically rich natural reserve area with its terrestrial and marine mammals and 204 land and/or marine bird species. Among these species some have been identified in the category of "endangered species" world or Mediterranean wide so they were declared to be protected within international regulations and are listed in Table 7 (Eken, 1997).

Table 7. Some Major Terrestrial and Marine Species of Karaburun Peninsula (Eken, 1997).

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

R: Resident; B: Breeding; SM: Summer migrant.

3.5. Other areas

The core of Karaburun (old settlement) has remained very small since movement towards the coast started. The reason for this movement was the threat by earthquakes but later the need for providing services and facilities for the holiday makers accelerated this movement.

Second houses have been constructed on the narrow coastal line. The increase in the number of second houses is shown in years (Fig 9).

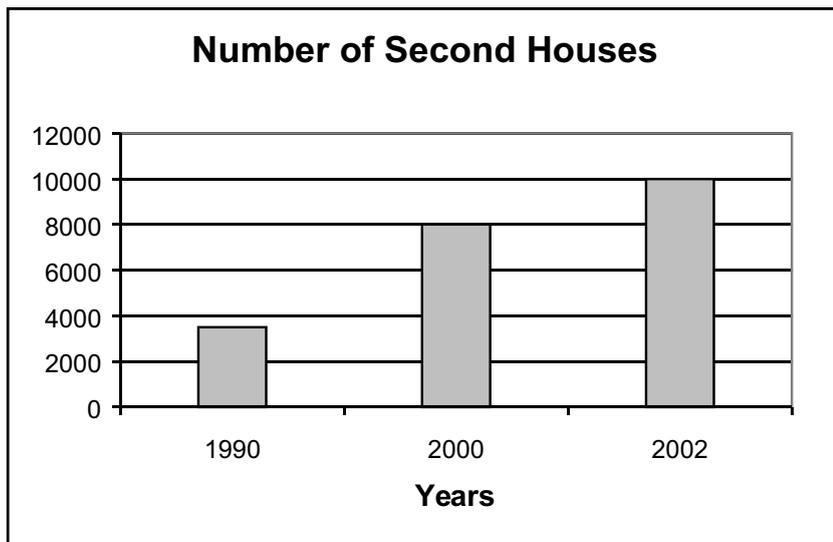


Fig. 9. Changes in Number of Houses in Years 1990-2002 (Sivrikaya, 2002).

The total length of highways and roads is 110 km. Although roads do not cover large areas in the region they threat on the fauna in particular aspects (insects, bees, reproductivity of plants and movements of local wild animals).

4. PREDICTIONS OF TRENDS IN NUMBER OF HOUSES

As the graphic (Fig. 10) shows the increase in the number of houses is 129% for the first 10 years starting from 1990 and 25% for the next two years. Therefore we can divide the next 18 years dwelling development into two year periods so the total number of houses in Karaburun is expected (predicted) to be 74.505 in 2020.

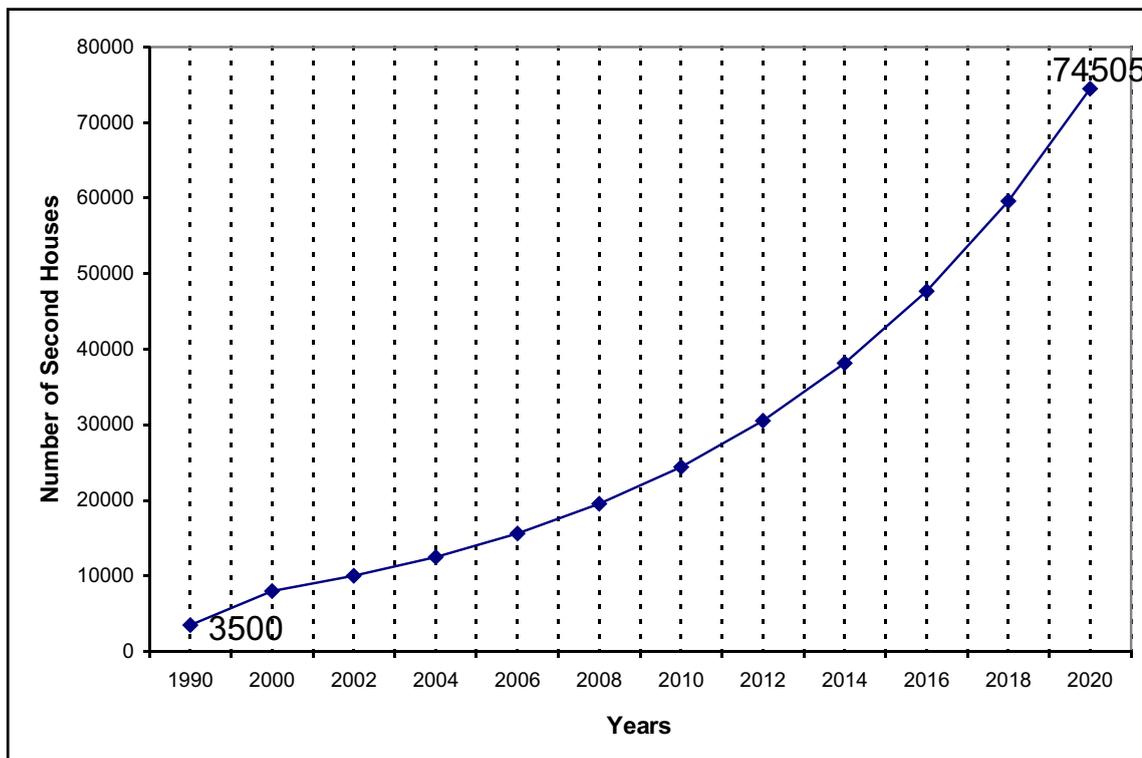


Fig. 10. Number of Second Houses in Years and Predictions for the Year 2020.

This number may not seem realistic to those who live in planned environments but on the coastal zone of Turkey there are examples of this drastic change in particular regions as Kusadasi, Antalya, Marmaris, Bodrum. In these regions the situation is completely irreversible.

There are also examples of drastic changes in local produce such as vineyards (Fig. 11).

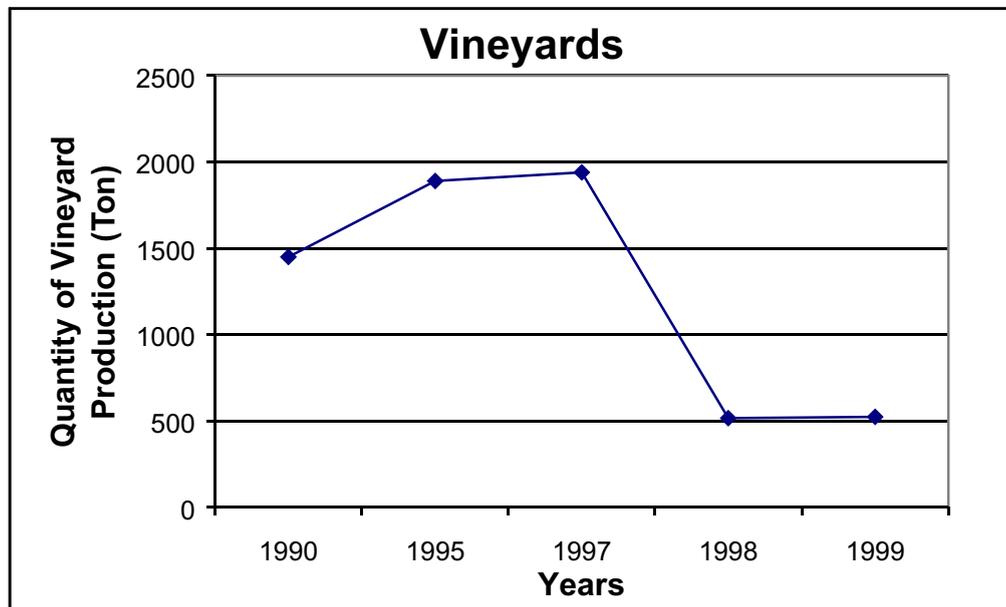


Fig. 11. Changes in the amount of grape productions (YILMAZ, O., 2001).

This case is shown just to demonstrate what could happen if predictions and precautions are not taken. As one can see in the figure there is no chance to suggest any correction for the future. The reasons for the drastic decrease in grape production are second houses and mandarin plantations (*Citrus reticulata var. Satsuma*). These have a great demand in international markets.

Apart from the above mentioned drastic changes, there are other negative effects of second housing in the region. Fauna, flora and sea ecology as well are negatively affected. An alarming example for this is on the life cycle of the endangered sea mammal Mediterranean Monk Seal (*Monachus monachus*) that has chosen the area as a breeding shelter for thousands of years. Survival of some terrestrial birds is also affected.

5. CONCLUSION

The data we have gathered and analysed has shown trends on a number of aspects (population, second house, agricultural land and productions). The point we have reached could be assessed as the starting point of some negative developments for the natural balance of this once undisturbed piece of land. Apart from being aware of the situation, we as researchers feel obliged to inform administrators, policymakers, and local authorities as well as the public. Therefore in conclusion we suggest:

Natural, archaeological and historical sites which were declared so earlier should be strictly kept.

Permissions for dwellings should be minimal as possible.

Endemic produces should be encouraged.

Waste management policies should be revised.

Public awareness should be raised in villages and small towns.

Endangered species especially the Mediterranean Monk Seal (*Monachus monachus*) should be made known to holidaymakers in order to prevent any harm to the species.

In addition to these suggestions all the principles of sustainable development for natural and urban sites should be followed.

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