

# TOURISM INFRASTRUCTURE, HEALTH AND ENVIRONMENT FOR THE ISLAND OF CRETE

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## ABSTRACT

The concept of carrying capacity in tourism is rooted in the notion of sustainable development. Alternative tourism is a new trend for the structure of the tourism product. Health tourism is related to high-quality services to tourist patients. In this study, we have used environmental and tourism indexes to estimate the impact of tourism to address the structure of the tourism business. We examine the potential opportunities for health tourism as we analyze the port management and development of the island. Crete is the largest island in Greece and concentrates more than 5 million tourists per year. It covers an area of 8,303 km<sup>2</sup> and has 170 km of beaches. There are approximately 630,000 inhabitants in Crete. Tourism supply in Crete includes more than 270,000 beds. The Cretan environment, both natural and manmade, can sustain a polymorphic tourism product for the island. The physical and human environment includes an extended coastline with many sandy beaches, picturesque cities, and traditional villages, unique mountains, wetlands, and lakes.

*Keywords: carrying capacity in tourism, coastal zones, and tourism, alternative tourism, health tourism, port management.*

## 1 INTRODUCTION

The population in Crete is mainly concentrated in the six large towns on the island, the capitals of the old Prefectures, cities of Chania, Rethimno, Heraklion, Agios Nikolaos, and three towns Neapoly, Sitia located in the east coast of the island and Ierapetra in the south coast, the only Greek town in the Libyan Sea (Table 1). The remainder of its inhabitants is principally engaged in rural economies, farming, and livestock raising. After the 1990s traditional lodgings are operated in mountainous villages and tourists have the opportunity to join the traditional living of Crete. Nearly all Cretans, but above all those who live in the market towns and the villages, maintain time-honored customs and manners. Crete is one of the most popular tourist destination in Greece, more than four million international tourist per year visit it. Tourism and agriculture are the two biggest economic sectors in the island (Tables 2 and 3). Tourism facilities in Crete includes more than 270,000 beds which cover the demand.

The objective of this paper is to evaluate the impact of tourism and other business activities on the environment of Crete and to estimate the quality of medical services as alternative tourism offered by the island's infrastructure to highlight the importance of developing long-term sustainable policies. The natural environment plays a major role in determining destination attractiveness [1] in many island destinations. In this study environmental, tourism, and social indices are used to address aspects of this complex interaction between tourism, environment, this leading to highlighting the existing challenges and options, pertinent to the formulation of a specific sustainable tourism development proposal for the island. The contemporary case studies for tourism are focused on the elaboration of the principles of sustainable tourism development, which are to



Table 1: Population of Crete is increasing from 1981.

Prefecture	Heraklion	Lasithi	Rethimno	Chania	Crete total
1981	243,622	70,053	62,634	125,856	502,165
2001	292,489	76,319	81,936	150,387	601,131
2011	338,052	75,995	97,059	171,822	682,928

Table 2: Arrivals in Cretan airports.

Arrivals in Cretan airports						
	Chania International Airport		Heraklion International Airport		Sitia Airport	Total for Crete
	Arrivals domestic	Arrivals abroad	Arrivals domestic	Arrivals abroad	Arrivals Greece	Arrivals abroad
1978	153,330		281,469	231,180		665,979
1980	152,482	5,387	266,170	386,952		810,991
1985	253,494	31,589	465,721	734,288	1,884	1,486,976
1990	155,157	173,770	298,012	926,820	1,992	1,555,751
1995	110,777	334,118	223,649	1,559,204	1,459	2,229,207
2000	254,231	450,258	494,317	20,078,233	799	21,277,838
2005	193,179	555,647	448,461	2,003,643	9,032	3,210,003
2006	212,376	660,904	493,760	2,159,452	11,109	3,537,601
2007	248,906	683,669	537,718	2,162,769	17,666	3,650,728
2008	254,659	671,477	547,484	2,154,010	20,000	3,647,635
2009	280,717	608,693	553,679	1,952,074	18,916	3,414,079
2010	227,956	593,228	504,633	1,930,155	19,136	3,275,108
2011	217,817	656,791	447,279	2,161,577	19,029	3,502,493
2012	193,565	717,249	405,104	2,113,501	16,617	3,446,036
2013	185,888	849,271	409,981	2,472,775	15,644	3,933,559
2014	285,611	935,615	407,162	2,595,702	14,767	4,238,857
2015	411,793	939,794	473,771	2,542,914	12,404	4,380,676
2016	436,793	1,039,616	503,021	2,859,931	9,578	4,848,939
2017	414,851	1,105,054	534,647	3,120,510	9,808	5,184,870
2018	311,058	1,141,589	640,169	3,330,492	11,476	5,434,784

Source: Hellenic Civil Aviation Authority.

provide the balance between further development of tourism, international trade, economic interests on the one hand and environmental protection, protection of social and cultural values on the other [2].

In the late 1980s, globally, the concepts of sustainable development received much attention and governments adopted the principles of sustainable development [3].

## 2 TOURISM

The tourism development of the island started in the early 1960s in the Northern Part of the island. By 1971, hotels and rooms to rent reached about 20,000 beds, whereas by 2000 the number is estimated at nearly 120,000 beds.

Table 3: Arrivals in Crete airports.

International	Chania			Heraklion		
	2017	2018	2019	2017	2018	2019
January	771	5,919	1,738	4,225	4	1,738
February	1,118	10,513	6,587	3,951	524	6,587
March	3,794	30,130	10,228	13,823	18,674	10,228
April	160,356	160,744	185,666	114,370	126,429	185,666
May	374,022	433,402	402,172	257,459	305,457	402,172
June	512,666	548,220	543,179	358,690	397,248	543,179
July	637,982	655,826	646,822	451,333	464,252	646,822
August	627,883	649,196	651,055	411,159	427,519	651,055
September	512,853	550,345	536,058	373,931	386,533	536,058
October	304,883	302,194	299,013	218,646	224,184	299,013
November	11,049	18,853	16,178	3,418	6,944	16,178
December	4,249	6,455	3,471	80	4,504	3,471
	3,151,626	3,371,797	3,302,167	2,211,085	2,362,272	3,302,167

In the case of Crete, the number of homes to rent has doubled since the crisis – of the 2,423 homes registered on the platform in 2014 reached 5,100 in 2015 and has since increased at the same rate (10,298 in 2016, 16,911 in 2016 and 20,788 in 2018).

## 3 CARRYING CAPACITY IN TOURISM

Sustainable development and its quantification procedure with specialized measurement instrument consist a vital element for the environmental condition of the Greek destinations; as the tourist product is a blend of ecological, social and economic sub-systems [4]. For that reason, an adapted amount of sustainable indicators is selected and a comprehensible methodological guide for their use is created, aiming to the reliable measurement of selected parameters [5] that are considered to be important for our region. We believe that using this approach, the local societies and the stakeholders involved as well, can understand the size of the impact on the existing and mainly not renewable resources, to proceed with strategic planning and terms of sustainability for their future developmental course.

Indicators of sustainability point to areas where the links between the economy, environment, and society are weak. They allow you to realize where the problematic areas are and then to suggest the solution policy for each indicator [6]–[8]. The proposed model is based on 16 variables which take values from 0 to 100, proposed by Losano-Oyola et al. [9] Hadjibiros et al. [10], and Blancas et al. [11]. The sixteen variables measures different issues of sustainability.

The main objective of the first group of variables is the rating of environmental characteristics and infrastructure of the area. This group includes 12 out of 16 variables



(Table 4) and the score for each one is obtained by using questionnaires and qualitative indicators of each area. The second group consists of four variables (Table 4). The score is derived using quantitative data and quantitative indicators. It should be noted that for quantitative indicators 13–15 high scores correspond to a large burden on the environment and therefore the variable should have low scores in the model.

Table 4: Environmental and infrastructure variables.

		Crete		Greece	
		Mean	St Dev	Mean	St Dev
v1	Urban waste management	37.18	42.37	27.94	38.94
v2	Legality of buildings	58.45	47.32	54.64	46.61
v3	Protection against noise nuisance	81.69	23.36	84.94	22.23
v4	Garbage management	62.39	34.74	57.05	34.93
v5	Protection against pesticides usage	53.38	47.72	64.64	45.38
v6	Over pumping of sea waters	86.2	30.44	77.49	37.95
v7	Sufficient quantity of water resources	81.83	35.19	66.77	44.15
v8	Sufficient quality of drinking water	87.32	31.3	75.15	50.45
v9	Exposure to forest fires	68.87	40.69	71.83	40.77
v10	Land clearing	83.8	35.03	80.68	36.9
v11	Conservation of the landscape	69.86	37.74	71.79	33.41
v12	Adequacy of green areas	57.18	48.64	66.51	45.76
v13	Beds per kilometer of beach	1166	1824	763	134.7
v14	Beds per square kilometer	33.7	95.1	55.6	121.11
v15	Beds per inhabitant	0.3604	0.7788	6.1	83.83
v16	Blue flags per kilometer of beach	0.518	1.153	0.036	0.7328

For reversal and mapping the value of each indicator onto a 100-grade scale, descriptive analysis was used, extreme values were excluded and minimum tolerable limits for the environmental burden were defined based on environmental literature.

This model can help us to evaluate the policy of the stakeholders and to express infrastructure solutions for each parameter. In the Prokopiou Tselentis model [12], indicators for waste management, pressure on the coastline, illegal building, shore, and marine pollution, and use of freshwater resources have been used to address the sustainability profile of tourist development in the Greek Islands.

Environmental indicators for Crete are presented in Table 4 according to the results for the urban waste management Crete is covered 37.18%. There is protection to the environment against illegal buildings 58.45% (v2), and protection against the noise 81.69 (v3). Garbage management 62.39 (v4) is covered from Sanitary Burial as recycling is also taking place.

Protection against pesticides using 53.38 (v5) is implemented. There are no incidents from over pumping in sea waters 86.2 (v6). The quantity of water resources is adequate 81.83 (v7) as also the quality of drinking water 87.32 (v8). There are no fire incidents 68.87 (v9) Incidents of forest clearance 83.8 (v10) happened in tourist areas. The landscape is conserved 69.86 (v11) as green areas are enough 57.18 (v12). The values of the standard deviation in relation to the mean value show the inequality that occurs between the four regions but also within these regions.

The results indicate that regarding the beds per square kilometres the Crete concentrate more than 1,166 tourists' beds per kilometre of the beach as in the Greek stands this indicator highlights serious coastal pressures. Crete does not have serious pressures as has only 3.7 beds per square kilometre less than the 55.6 of Greek islands. Crete has only 0.36 beds per inhabitant. Regarding the blue flags, the program is developed on the island as is 0.518 blue flags per kilometer of beach in contrast to 0.036 in the rest of the Greek islands.

#### 4 INTERNATIONAL RETIREMENT MIGRATION

Large-scale international retirement migration (IRM) to southern Europe is of relatively recent origin. According to Williams et al. [13] there are four main reasons for the overall growth of IRM, the increases in longevity, the decline in the legal age of retirement, an increase in the life flow of earnings and accumulation of wealth so that increasing numbers of individuals have sufficient resources to consider a range of retirement strategies, including international migration and finally the changing patterns of lifetime mobility have provided more knowledge of and experience of living in foreign destinations.

O'Reilly [14] proposed a five-fold typology based on the amount of time spent therein:

- Expatriates: moved permanently; identified as living in the area; may own property; express intention of never returning.
- Residents: resident in terms of home, orientation, and legal status, but spend 2–5 months a year in the country of origin where they either own second homes or visit friends and family.
- Seasonal visitors: live in the country of origin, but return to the destination for 2–6 months each year, in one or more trips; orientated to the home country.
- Returners: usually own second homes; visit irregularly depending on commitments.
- Tourists: identified as being in the area specifically for a holiday; some may own apartments, but most rent space for a short duration.

A variety of factors attract tourists to become permanent residences. Among them:

- Climate;
- An associative and outdoor lifestyle;
- Local hospitality, food, culture;
- Quality and cost of local healthcare;
- Tourism infrastructure, like restaurants, ports, airports, etc.;
- Costs of living and accommodation (at least historically);
- Safety – political stability – taxes;
- Language.

Tourism and migration have a two-way relation, as the retirement emigrants also carry their social networks, which means that they receive visits from friends and relatives every year, the “visiting friends and relatives” (VFR) tourism. Williams et al. [13] estimated that each immigrant brings about seven tourists to the area where he or she lives. On the other hand, repeated holiday visits can act as the stepping stone to seasonal or permanent emigration, often via the purchase of a holiday home. Crete offers everything that someone could want from retirement in Europe. There's marvelous food, rich culture, history, and sunny weather and, it's affordable. There is also high-quality healthcare at a decent price. The biggest challenge for the government is to make easiest the way to take a residence permit.



## 5 HEALTH TOURISM

Health tourism is a form of thematic tourism, which includes medical tourism, wellness tourism, therapeutic tourism, and spa tourism. The patient decides to travel to receive a specific medical service, motivated by factors such as the cost of the service, its quality, or even the opportunity to combine medical care with leisure.

Archaeological finds show that 5,000 years ago, in ancient Mesopotamia and ancient Greece, people traveled long distances looking for specialized treatments in temples and sanatoriums. The Asclepieia, the oldest Greek hospitals, attracted a large number of foreign patients, who stayed many days in them before returning to their homes and spent a lot of money.

International Medical Travel Tourism mentions that the medical tourism industry worldwide earns 500 million euros of profit per year. Canada, the United Kingdom, Israel, Singapore, and India have dominated the medical field for many years, but during last period countries like Turkey, Egypt, Tunisia, Morocco, countries close to Greece, have been claiming part of this golden market.

According to Table 5, in the four prefectures, there are nine hospitals on the island, with over 2,050 beds, with a bed index/100,000 inhabitants equal to 325, 45 units of intensive care, and an index of 7.12 per 100,000 inhabitants. There are, especially in the big urban centers, doctors of all specialties, while the whole island is covered by a wide network of primary care doctors.

Table 5: Health infrastructure.

Category	Prefecture				Total
	Chania	Rethymno	Heraklion	Lasithi	
Hospital	2	1	2	4	9
Beds					2,051
Intensive care unit					45
Private clinic	3	0	3	0	6
First level national health network	49	29	57	24	159
Private medical center	1	0	6	0	7
Private doctor office	307	109	695	114	1,225
Diagnostic health center	30	15	69	17	131
Hemodialysis and blood donation	3	1	3	1	8
Restore and rehabilitation	49	16	71	17	153
Mental health unit	30	8	15	8	61
Special care unit (for disabled patients)	7	2	5	3	17
Pharmacy	148	70	294	64	576
Dentist	145	56	313	61	575
Population	158,585	87,150	310,784	74,994	631,513

Special reference is made to dialysis units, There are two units of hemodialysis, and private clinics that offer IVF services. There are also three in vitro fertilization units (IVF) in Crete. Their websites are advertised in English, French, Italian, German, Russian, and Turkish. Hundreds of tourists are visiting these units for IVF.

## 6 WELLNESS TOURISM

The tourism industry is continually developing and expanding to meet the needs of changing consumer expectations. According to Tresidder [15] consuming tourism had a link with the associated benefits of health and wellbeing. Defined as “all travel associated with the pursuit of maintaining or enhancing one’s personal wellbeing” (Global Wellness Institute, 2020), wellness tourism has recorded remarkable growth in the recent years, making it as one of the fastest-growing market segments in the hospitality and tourism industry. The global wellness economy – which encompasses many industries that enable consumers to incorporate wellness into their lives – is estimated at \$4.5 trillion in 2017 (Global Wellness Institute, 2020). And wellness tourism is estimated to total \$650 billion. Spas and wellness centers are becoming important revenue sources for hotels, resorts, and destinations.

Wellness travelers spend more per trip than the average tourist, an international wellness tourist spends 53% more than the average international tourist and a domestic wellness tourist spends 178% more than the average domestic tourist. Trihas and Konstantarou [16] research about the spa-goers’ characteristics, their majority of them are females, aged 45–54 years, married, employed, bachelor’s degree holders, with an annual income between €30.001–€50.000 and can be described as experienced and regular spa-goers as approximately. An interesting finding of this study was that it seems that the word “spa” in the name of a resort influences tourists positively to choose the specific resort for their holidays.

Many new investments and marketing initiatives have been launched in recent years, from “the Year of Healthy Waters” promotion in Slovenia, to a Spain–Portugal partnership to jointly promote thermal establishments along their border, the multi-country partnership between Greece, Germany, Hungary, Portugal, France, and Bulgaria, named “Roman Thermal Spas of Europe”, to develop and promote thermal tourism packages involving spas and health resorts with a Roman origin. Greece has hot springs that are leading in the Greek tourism promotion, seeking investments to modernize and upgrade thermal offerings.

The challenge for Crete is to participate in these projects with the luxury hotel units in the east of the island and to become an international destination for wellness tourism.

## 7 PORTS OF CRETE

Crete are operating 78 ports currently distributed in the four districts (Fig. 1). According to official data, the 12 (46%) of the ports with berths are located to Chania district, 8 (31%) to Rethymno, 3 (11%) to Lathishi and 3, (11%) to Heraklio (Fig. 2). The most and the major of them, 53% or 68% of total, are located on the north coast of the Island viewing the South Aegean Sea, as it is more populated and related to continental Greece. Only 25 (32% of the total) port facilities are located on the south coast of the island viewing the Libyan Sea. (Fig. 3). Most of the Port facilities in Crete provide services to different users (Table 6). According to our data (Fig. 4) 14 ports (18%) provide services to passengers, 52 ports (67%) used and for fishing boats and 26 ports (33%) have yachts facilities. But the reality is little different, because only one marina exists in Lasithi (Ag. Nikolaos) providing quality services for 255 yachts. Berths for yachts also exist at the Port of Heraklion (200 berths) and the marina of Rethymno (170 berths).



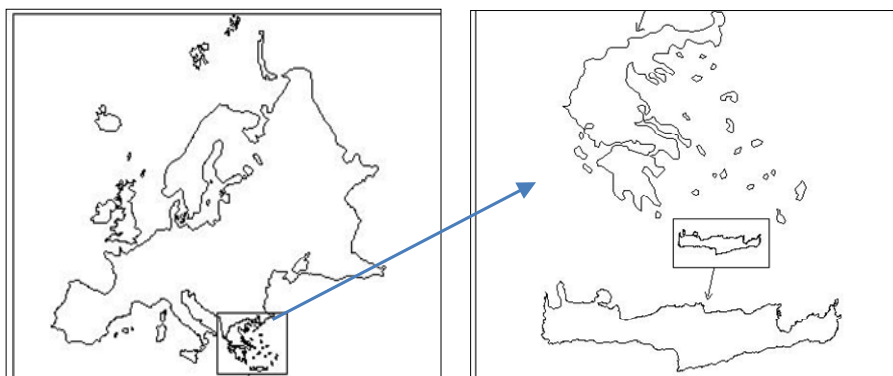


Figure 1: Europe, Greece and Crete.

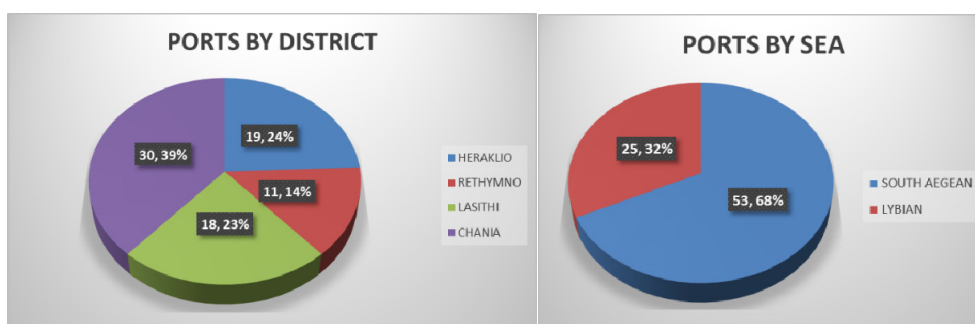


Figure 2: Distribution of Cretan Port by district (number of ports, percentage). (Source: Analysis by the authors.)

Figure 3: Distribution of Cretan Port by sea (number of ports, percentage).

Table 6: Passengers port lines.

Service Port	Cruise	Daily cruise	Coastal shipping	Service	Ferries (South Chania)
				Port	
Heraklio	X		X	Ag. Roumeli	X
Chania (souda)	X		X	Gavdos	X
Ag. Nikolaos	X	X	X	Chora Sfakion	X
Rethymno	X	X	X	Loutro	X
Siteia	X		X	Sougia	X
Kissamos		X	X	Paliochora	X
Chersonissos		X			
Ierapetra		X			



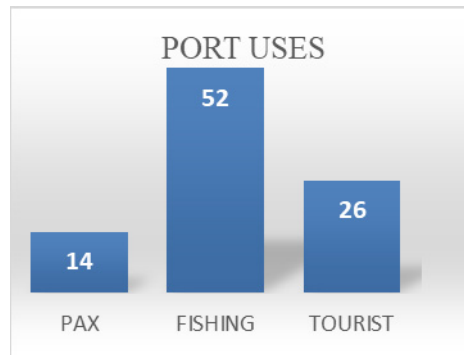


Figure 4: Port uses.

We have to mention that in South Chania area, the Ferry line connect villages with very difficult road access or even no access like Loutro, or the island of Gavdos.

There is also some private marinas related to hotels. All the other facilities are simply shelters for small boats of pleasure. Aerial views of (a) Ag. Galini Marina, (b) Paliochora Marina, and (c) the port of Chania city are presented in Fig. 5.



Figure 5: Aerial views. (a) Ag. Galini Marina; (b) Paliochora Marina; and (c) The port of Chania.

Cruise ships have visited six Cretan ports during recent years and one of them (Heraklion) is also Home Port. According to data provided by the Hellenic Ports Association, after some years of stagnation, a significant increase in calls and passengers arrivals is observed during 2019 (Fig. 6). Heraklion and Souda (Chania) are the most popular destinations. On the other hand, the number of coastal shipping passengers is stable

during recent years (Fig. 7). Also, Heraklion and Chania accept the most of passengers. The competition between ships and planes is present. For the line of ferries in South Chania, a significant decrease in passengers is observed after 2010.

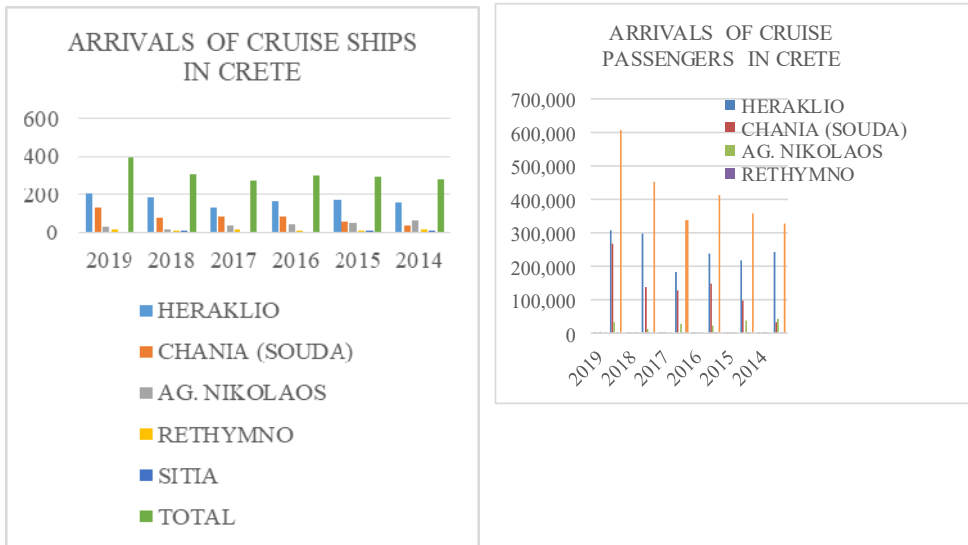


Figure 6: Arrivals of cruise ships and cruise passengers in Crete. (Source: Hellenic Ports Association ([www.elime.gr/krouaziera](http://www.elime.gr/krouaziera))).

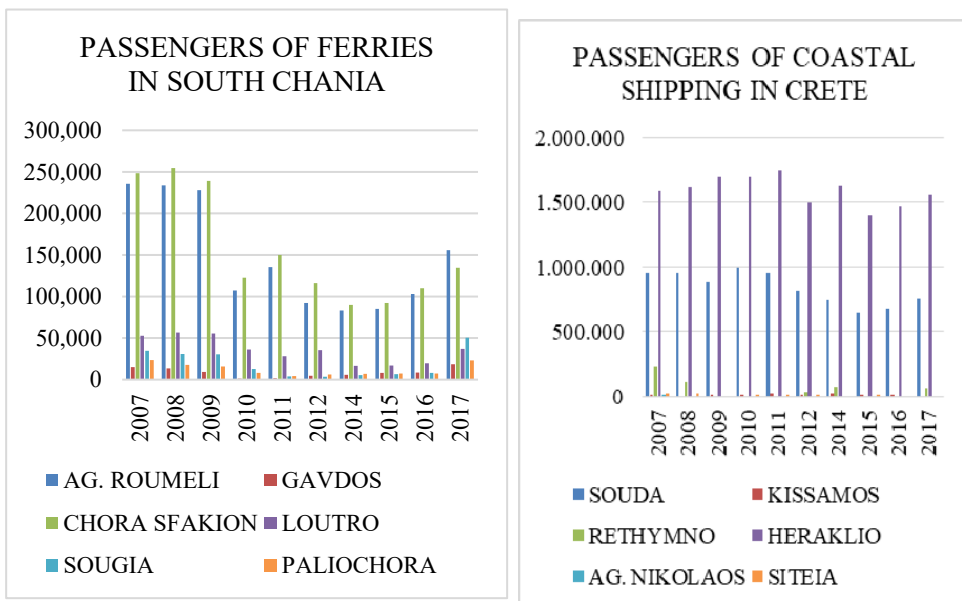


Figure 7: Passengers of coastal shipping and ferries in South Chania. (Source: Hellenic Statistical Authority ([www.statistics.gr/el/statistics/-/publication/SMA06/-](http://www.statistics.gr/el/statistics/-/publication/SMA06/-))).

A network of marinas and shelters in the north and the south coasts of Crete will make Crete a new destination for these users. In Crete, there are big opportunities to improve the touristic product via the development of the ports.

## 8 CONCLUSIONS: PROPOSALS

Tourism via seaports can be divided into Cruise, Daily Cruise, Coastal Shipping-Ferries, and Yachting. For the Cruise industry, Crete is a perfect destination with a strong brand name. An improvement of the existing infrastructures and provided services will awake the real potential in that sector.

Daily Cruise in Crete is not enough developed and can be improved. No special needs in port infrastructures are needed. Ferries in the South Chania can also be related to this kind of tourism.

Coastal shipping is always under the pressure of the airplanes' competition, but always is a vivid need for the connection of the island with continental Greece and other islands. To ameliorate yachting a generous improvement of the tourist port infrastructure is needed. New marinas will be constructed, especially in Heraklion, providing high-level services in this sector.

Crete, one of the most popular tourist destinations, has all the supplies to develop and value this valuable branch of medical tourism, taking advantage of its high standard hotel units and upgrading existing hospitals, doctors, and health centers.

Completion of urban waste treatment plants and networks, protection against pesticide usage, and adequacy of green areas must be in progress, as there is still a lack of efficiency. The current health crisis of the COVID-19 pandemic expansion, has had the tourism market as a major victim. The return to normalcy after the lockdowns will significantly change the way people think and their priorities. New opportunities arise for destinations that meet the new requirements of tourists, which concern the health services of tourist destinations as well as the possibility of non-cohesion of tourists.

Crete is the fifth largest island in the Mediterranean, important tourist infrastructures have a sunny Mediterranean climate and a long summer. Also, there is a significant number of hospitals, clinics, and a wide network of private doctors.

Taking into account the above, Crete has the opportunity to increase the tourist season, proposing to people who have the opportunity, such as retirees, to transfer their vacation in September or October to reduce the congestion in the area.

Many Europeans, under the fear of a new lockdown, will decide to travel and pass the following autumn and winter out of the cities, to a place where they can walk, exercise, and feel better. Crete can be this place so a campaign to attract people for long-term vacations or immigration after retirement.

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