

CARRYING CAPACITY INDICATORS IN RELATION TO A TOURIST DESTINATION: THE CASE OF THE ISLAND OF PAROS, GREECE

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ABSTRACT

Many researchers have studied the challenges concerning the carrying capacity of tourist destinations. Carrying capacity has been defined as the ability of an ecological system to sustain the development of human activities without negatively impacting the ecosystem services inherent within the system. It is a common belief that the carrying capacity approach has proved to be both significant and functionally supportive of tourist destination sustainable management. Considering the challenge of sustainable growth, it is important to emphasize that tourism causes various negative impacts that may risk long-term growth and that overlooking the interdependence between the concept of carrying capacity and sustainability of tourism growth will, most likely, exacerbate the many problems that arise in areas of unique socio-cultural and ecological value. Previous research has developed specialised measurement instruments and indicators, as well as a comprehensible methodological guide for their use, in order to estimate the carrying capacity and limits of a tourist destination. Many Greek islands and coastal areas have been studied in an attempt to identify the factors influencing a tourist product and its ecological, social and economic sub-systems, including infrastructure, environmental characteristics and tourism entrepreneurship. The above were applied to Paros, a Greek island in the central Aegean Sea, which hosts as many as 500,000 tourists per year, in an attempt to further involve local societies and stakeholders in addressing and understanding the impacts on existing non-renewable resources, the transport infrastructure and primary production. This endeavour aims to design a comprehensive, diverse and socially integrated sustainable tourism strategy policy for the island of Paros.

Keywords: carrying capacity in tourism, coastal zones and tourism, tourism development.

1 INTRODUCTION

It is the purpose of this paper to apply the principles of carrying capacity assessment to Paros Island in order to address tourism development and business opportunities. In this study we have used carrying capacity indexes in order to formulate a sustainable tourism development plan for the island. The research and data collection were financed by the municipality of Paros island Greece [1].

Paros is one of the most popular tourist destinations in the Cyclades region and in Greece as a whole, alongside Mykonos and Santorini, with a high traffic index during the summer months. Tourism development initiated as early as the 1960s and peaked in the early 1990s. Today, Paros holds a significant market share, in terms of tourism activities and tourism investments in hotels, additional companies, services and know-how. Paros attracts about 800,000 tourists a year [2]. Its tourist product is characterized by high quality services offered to all income levels, except that of mass foreign tourism, served by charter flights, since its airport does not have many short-haul international flights, even though the island is connected to Athens and Thessaloniki with more than 10 flights a day in summer. It has two small towns, Parikia and Naoussa, as well as several picturesque villages. Almost all the coastline can be characterized as areas of high quality bathing areas, which can be reached through an adequate road network stretching through both lowland and mountainous areas.



As previously stated, indicators derived from a carrying capacity assessment pinpoint areas where the links between the economy, environment and society need to be further studied in order to fulfil the requirements posed by sustainable tourist development. These indicators allow local communities and government bodies to highlight problematic regions and support efforts to resolve such conflicts, since these sustainability tools offer much more management options than traditional indicators of economic, social, and environmental progress. While much discussion and effort has been invested in the development of sustainability indicators, it seems that none of the existing methodologies clearly describe management structures and options that address sustainability issues, as well as carrying capacity does. The carrying capacity methodology has proven to go beyond drawing attention to the existence and origin of conflict and problem zones, by also indicating ways in which these complex issues can be overcome in a sustainable way.

2 TOURISM IN PAROS ISLAND

According to transport statistics since the operation of the new airport in July 2016, the number of passengers has increased dramatically. In 2013 the passenger arrivals at the old airport were 14,954, whereas the numbers increased to 37,872 in 2016 and 86,840 in 2017.

Arrivals in Paroikia port totalled 631,000 in 2013, whereas in 2018 visitors increased to 710,000, an increase of 45%.

Hotels first appeared in Paros in 1973 and by 2007 hotel rooms numbered 1,000 beds. Three years later, in 2010, these increased to 6,893 beds, an increase of almost 700%. In 2019 hotel beds reached a record number of 7,148 [3]. Apart from hotels, the room to let business offered 14,847 beds capacity, and “air b and b” houses were estimated to have contributed as many as 7,000 beds in 2019. Although these figures indicate that as early as the 1960s the island developed as a summer tourist destination and one of the most famous holiday resorts in the Cyclades islands, this increase was highly seasonal and was not accompanied by a planned tourist policy.

3 CARRYING CAPACITY INDICATORS FOR PAROS ISLAND

Carrying capacity is defined as the maximum number of people that may visit a tourist destination at the same time, without causing destruction to the physical, economic, socio-cultural environment, as well as causing an unacceptable decrease in the quality of visitors' satisfaction [4]. When estimating carrying capacity it is important to analyse the whole business as the environmental infrastructure of the region [5], [6]. Today, controlling tourism growth has become a central policy issue for the tourism trade [7] and it is noteworthy that carrying capacity assessment has become an important tool for facilitating planning and developing policy issues for the tourism industry [8]. Previous studies for other destinations [9]–[11] highlighted the following indices describing the Paros case [12].

The categories of the carrying capacity indices in Paros case study were: Energy and Natural Resources, Production, Environmental Infrastructure, Natural Environment and Land Use, Tourism, Coastal Zone, Transport, Health Services, Public Security and Culture. Data were collected from the municipality of Paros, the Hellenic Civil Aviation Authority, the Hellenic Police, the Hellenic Coast Guard, the Public Electricity Board, the Ministry of Health Services, the Hellenic Public Insurance Fund (EFKA), the Archaeological Museum of Paros, the Hellenic Emergency Aid Centre, the Greek National Tourism Organisation, the Regional Government of the Aegean Sea, the Hellenic Fire Service and the Paros Hotel Union.



3.1 Energy and natural resources

Paros electricity demands are serviced by the mainland through an underwater cable. Electricity consumption amounts to 50 MW, and energy from renewable energy sources stands at 3 MW. Electricity consumption in tourism season is 40 MW. Regarding the undergrounding of electricity networks a large percentage of the networks are above ground and the island is unable to accept other above ground networks. The water supply on the island of Paros is marginally sufficient in terms of quantity, while the supply network is old and in need of repair, by the municipality, creating several problems as to the quality, especially for drinking. This problem is further increased due to the fact that during the high season, the population of Paros quadruples. Water consumption is about 347,510 tons per year.

3.2 Production

Production in Paros is oriented towards the tertiary sector, processing is prosperous and primary production is low. Primary production has 337 employees (mainly in livestock, since the island accommodates a cattle population is 11,500), secondary production 1,375 and 3,663 employees in tertiary production.

In Paros, there are 2008 companies have sole owners, while others amount to 929. In fact, most businessmen are permanent residents of the island.

3.3 Environmental infrastructure

The waste management infrastructure is modern and well maintained, while waste recycling amounts to about 1,100 tons per year. Garbage production amounts to about 10,000 tons per year. Urban wastewater amounted to 713,000 cubic meters in 2018, while about 42% (7,040 to a total of 16,905) of all households and business are connected via a central sewage collection network. The island has no hazardous waste and any atmospheric exhaust emissions are mainly found around the port and on the road network, including the ring road of Parikia. Unfortunately no data exist concerning greenhouse gas production and the quality of air on the island, which is expected not to be impacted seriously.

3.4 Natural environment and land use

There is only one protected a 1,401 acre area. All over the island there is interesting bird fauna and sea mammals are found.

3.5 Tourism

Tourism in Paros is the main economic activity. In Paros there are 24 tourists per acre of protected areas and 2,919 tourists per permanent resident. Tourist development is concentrated on the coastal zone but extends all over the island, which is connected via an extended road network connecting several major cities and villages. The distances between tourist destinations are relatively small making it easy to visit several places in a short time. For example the distance between Parikia and Naoussa (two main cities) is only 10.6 km. Tourist density amounts to 204 tourists per square kilometre and the estimation of maximum seasonal population was 55,000 for the month of July 2019. Based on a calculation using data of urban waste production for the same month, the population was estimated at 65,000 people.



Tourism infrastructure includes 7,148 hotels, 14,847 rooms to let and 7,000 houses (airbnb). The total number of overnight stays is estimated at 278,140 for foreigners (2019) and 80,923 for visitors (2019), while the average stay in days is one week. The total active population of the island is 5,375 and the number of employees in the tertiary sector (mainly tourism) is 3,663.

The amount of the active population employed in accommodation services are 994 people which represents 44% of the total population (tertiary sector employees). The percentage of the active population employed in tourism represents 60.23% of the total population of the island. The analysis of total tourist arrivals in Paros and available accommodation lead to the conclusion that there are at least more 10,000 non licensed beds, probably without license, beds that are on the market, but are not declared and registered to Greek Government. Tourism activity is mainly concentrated along the coastal zone, with the number of beaches being 36, many of which are located on the west coast. Tourism infrastructure is located in Naooussa and Parikia. Conference halls in hotels are four with a capacity of 100 persons in each. A theatre room is available at a technical high school.

Alternative tourism companies in Paros are 20, privately owned boats for day cruises, ecological excursions, sea sports, boat renting, sea skiing, scuba diving, fishing tourism, excursions with cars, excursions with horse carriages, horse riding and bike excursions. There is public transport for residents and tourists with 15 intercity buses and one city bus and six tourist buses. It is calculated that there are 215 tourists per kilometre of coastline. Finally there were 17 cruise ships arrivals in 2018 with 2,476 visitors. In Paros there are five camping sites, 500 restaurants and 800 coffee shops. A variety of vehicles can be rented in Paros during the tourist season amounting to about 2,700 cars and 500 motorbikes.

The local tourism development policy is based on the General Urban Plan of Paros. The local tourist demand is mainly from Scandinavia, Britain, France and Germany.

3.6 Tourism destination marketing

The tourist promotion is organized by the municipality of Paros with the assistance of partners. Participation of Paros in tourism exhibitions is an important marketing activity, by providing information and promoting Paros as a tourist destination in forums such as BIT, BOOT, Ferrien Messe, Greek Tourism Expo, ITB, Philoxenia, Salon Mondial du Tourisme, Top Resa, WTM. It is believed that tourist promotion of Paros is well organized and has positive results.

3.7 Coastal zone and ports

The coastal zones are always sensitive and impacted by environmental pressures mainly human based. In total the beaches extend for about 22.5 km and the coastline is 175 km. There are five beaches with a Blue Flag accreditation out of a total of 36. The majority of the coast is inhabited and built. Settlements along the coast include: Parikia, Naooussa, Voutakos, Pounta, Alikí, Gyfas, Dryose, Tserdakia, Logaras, Piso Livadi. The only port that of Parikia, has eight berthing areas, while only four are in use by the Port Authority. In 2018, the port of Paros received 613,847 passengers, 54,227 more than in 2017, while the arrival of privately owned vehicles amounted to was 58,088 in 2018, compared to 51,067 in 2017. There are plans to build a new port on the island in the near future, to accommodate arrivals of commercial non-passenger ships, which amount to about 300 per year. Marine pollution cases are limited in Paros, with only three in last decade.

3.8 Health services and public security

Paros has one health centre and 48 doctors. Regional crimes and incidents are mainly concentrated in the Naooussa region, which accounts for about 70% of the island total. About 52% of accidents occur in the regional and urban roads of Parikia. Forest fire incidents are rare.

3.9 Culture

Paros has museums, archaeological sites, and Byzantine monuments of special interest. Archaeological excavations are being carried out in Paros in six locations.

4 CONCLUSIONS AND PROPOSALS

Taking into account the categories of the carrying capacity (CC) indices in Paros as described above, several conclusions and proposal are reached on issues such as energy and natural Resource management, primary and tertiary production, environmental infrastructure, protection of the natural environment and land use, and coastal zone planning. Other issues highlighted from the above CC analysis were also studied and specific proposals reached on issues pertinent to both sea and land transport, health services, culture and heritage and finally public security. The findings are summarized below covering the relevant areas of interest as far as tourist policy and development are concerned.

4.1 Infrastructure and development

The biggest problem facing Paros is wastewater and water management. In order for the place to develop, the island needs to be covered by sewage treatment plants. Water reserves must become further self-sufficient, and the water supply networks modernized and extended. The municipality is gradually working towards resolving the problem. Water reserves are sufficient and there is an action plan to improve the network. In Paros there are further sewage networks which serve settlements that do not have biological treatment.

The city and village waste water networks are slowly being developed in order to interconnect with new urban waste treatment plants. Regarding garbage management, the existing landfills are almost full, but the municipality cannot take action, since this infrastructure is the responsibility of the Regional government, leading to long delays. According to Greek legislation, each hotel unit is obliged to operate its own waste treatment facility.

4.2 Tourism and habitats plus natural environment

The connection of the tourism product-service with the environment is a strong relationship. The phenomenon of Tourism stimulates the spirit of visitors to issues of maintaining the balance of the environment. The habitat of Aliko-Agkaria is the first place that is proposed for sustainable development in order to improve the lifestyle of the inhabitants as well as to upgrade the area that will be visited by tourists. The European standard of summer vacations presupposes that tourists enjoy the natural environment and the special landscape.

4.3 Wind farm electricity power units

Installing wind turbine parks in tourist destinations is an activity that needs special attention. Visitors buy holidays that contain primarily images, landscape, urban and natural. The



European standard of summer vacations presupposes that the tourist enjoys the natural environment and the special landscape. There are two main parameters of environmental nuisance in a place from the installation of wind turbines:

- (i) The location of the installation; and
- (ii) The high voltage connections of the wind turbines with the corresponding high voltage network through overhead pylons.

The image of a destination can be distorted not only by the propellers but also by the wire network. Even today the Greek islands do not have a completely clean landscape as the networks are mostly above ground. Paros with its rich history, its preserved landscape and the high level of its visitors cannot become an industrial park for the production of electricity. The cost of high voltage underground networks is high. Installing wind turbine parks in tourist destinations is an activity that needs special attention. Visitors buy holidays that contain primarily images, landscape, urban and natural.

4.4 Tourism and cycling

The use of bicycles is a very important component of the holidays as it has an ecological way of transportation that the visitor can spend his time in his vacation place. Cycling is a relaxing and ecological way of life with no environmental nuisance. Cycling is an idea to extend the tourist season. You do not need big investments except for bike lanes. Cycling concerns all ages and all the amounts that each visitor can allocate. Cycling is widespread in southwestern Europe. Paros is ideal for cycling. Areas such as the bay of Parikia, Agkaria and the wider area of Naooussa are suitable for alternative tourism.

4.5 Quarries and tourism

Traditionally, caves and quarries are attractions for tourists and act as destinations for hikers, climbers, underwater exploration, fish fauna monitoring and other alternative tourism activities are advertised at global alternative tourism fairs. The quarries in Marathi, from where the marble was mined in ancient times, are a permanent asset. Paros is the capital of ancient marble. Its association with the majority of the great masterpieces of ancient marble sculpture, is an advantage for the place.

4.6 Cultural and archaeological tourism

Greek tourism is based on ancient Greek history. Traditionally, tourism in Greece began with visits to archaeological sites on the mainland. Also, most of the masterpieces of Classical Antiquity were processed from Parian Marble. Paros and its rich historical reserve are the basis for the promotion of the place. The previous section mentions the archaeological sites. The Archaeological Museum needs continuous and intense promotion. The municipality has already made efforts, but the Museum also needs support from the tourist offices of Paros. The Museum of Paros is not included in organized guided tours of Paros. Religious and Byzantine tourism. Man is associated with religion. Millions of tourists visit places of religious interest every

4.7 Tourist awareness seminars

Tourist Consciousness is, the knowledge that we prove that we have through the professional and friendly service of the tourist who spends holidays in a place, predisposed to have a



positive recreation, The Tourist Consciousness must become an experience for all of us. The Tourist Consciousness, in practice, is based on the knowledge of the employees for behaviour and provision of services through professional and friendly service, on knowledge of the tourist infrastructure of the destination, History of Greece and the place, good behaviour, health and safety. Environmental knowledge is also necessary for Greek hospitality with Tourist Consciousness with: polite behaviour, maintaining a clean environment, showing respect to cultural heritage, respect for nature, as well as traffic and driving awareness. In addition, developing the culture of always showing a willing response to the requests of the visitors, maintenance and clean beaches, roads and residential areas in general, appropriate and decent working conditions, promotion of Greek gastronomy in accommodation and restaurants, respect to pets and wildlife, also are important issues that have to be studied and developed.

4.8 Tourism and photography

The art of photography is well respected and recognized. Everyone is photographing and being photographed. A large portion of the population is involved in artistic photography, participates in photographic groups or works individually. Many tourist destinations, especially big cities, organize photo festivals. Some of them have an international impact of global interest while some have a transnational character.

4.9 Wedding tourism

A recent trend in marriage practices, involves couples choosing to get married in a place different from that of permanent residence. This trip also includes the honeymoon. That is, combining a wedding with a vacation. In a research carried out in the municipality of Paros, no mass was observed at guest weddings and because this tourism is established, it is proposed in the present study, as a remarkable form of tourism. Paros is ideal for wedding tourism as the wedding experience will be multifaceted. Its tourist product is mild. It has traditional buildings, with panoramic views for weddings such as the hotels of Parikia. Its gastronomy is rich. Its beaches offer a unique landscape for photography. As an alternative to the location of civil weddings, they can also take place in its beautiful villages.

4.10 Gastronomy and tourism

Gastronomy is the delivery of dishes of a place, essentially the preparation of local dishes with traditional recipes of high quality. Delicious food is offered in various restaurants regardless of cost. The delicacies of each place are related to the local products. The local gastronomy protects from the alienation of the focus on the tourist destinations. Paros has a very good focus and rich tradition and dozens of recipes. Its restaurants offer high services and affordable prices.

4.11 Traditional music and island traditions

Music is a cultural heritage and connects indigenous peoples. Paros has a rich island music tradition. In the many festivals that take place in Paros, tourists become “mysteries” of the special island music culture of the island. The island music tradition has been maintained over time in Greece, because not only does it continue to evolve and incorporate creative contemporary musical elements, but at the same time it manages to express and comment on everyday life in a lively way.



4.12 Health services

With over 60,000 people on an island on a daily basis, it is necessary to have a well-staffed and equipped Hospital. So as to ensure the protection of the health and life of the inhabitants. In this case, the need for transportation to the General Hospital of Syros and Piraeus is reduced. Deliveries are expensive and time consuming and can be fatally fatal.

4.13 Port infrastructure

The berths of merchant ships in Paros are eight but the port authority gives permission for only four. For night mooring only one place is offered. The construction of a new port which has been launched is a common acceptance. The port of Paros presents problems with congestion in traffic waves since, despite the existence of several parabolic and safety places, there is no ease of decongestion of traffic when they have more than one or two ships. Then the situation becomes particularly difficult despite the efforts of the port corps. The presence of merchant ships in the port of Paros aggravates the situation given the frequent arrival of trucks and tankers supplying inert materials and liquid fuels of the island. As a result, Parikia is significantly burdened with a degree of dangerous traffic congestion, especially during the summer months. Therefore, the need for the construction of a new commercial port outside the urban fabric is considered urgent.

4.14 Cruise industry

The prospect of introducing a cruise industry in Paros is a challenge. It has many monuments and beautiful settlements, which make it a unique destination for this form of tourism. Priority is given to high-income private cruises. Carrying capacity can also be applied to the cruise, by studying ports and their services, consumption cost of cruise passengers, cruise ship mooring size and weather safety, vehicle service infrastructure, roads and parking that transport cruise tourists, sites of archaeological interest, cruise ship traffic annually, monthly and daily, the percentage for cruise passengers to permanent residents, total passenger arrivals both per day and per month, extent of cruise ship mooring docks, shops that serve cruise, catering and tourism, Environmental nuisance from cruise traffic, etc.

4.15 Traffic and vehicle safety

The ring road of Parikia has special characteristics of traffic congestion. Accidents are often observed, especially in the summer the traffic is difficult. It is suggested, the signalling or the constant presence of a traffic warden as a temporary measure. There is an urgent need to bypass the intersection, since the construction of a car. A very important problem is that of car parking in Parikia and Naoussa. Along with the necessary traffic study, new parking spaces must be found. A regional parking lot is a rational measure. But it is long-term and brings great costs.

4.16 Support for tourism promotion and creation of an updated promotion video for culture and tourism in Paros

Modern destination videos combine not only the tourism product and the tourist experience but also emphasize the culture of each place. A new documentary is needed from a search



that was carried out. The parameters must be, highlighting the uniqueness of Paros. More specifically, the priorities must be: history and archaeology, ecology, tradition and music,

4.17 Gastronomy and restaurants

Gastronomy and restaurants as well as the production of products as well as wine production, The traditional settlements and the architectural character of the accommodation, Gastronomy restaurants, Natural beauties and the beaches as well as the coastal zones in general, culture – festivals – events and cultural events all year round, paths, flora and fauna, transportation, traffic to nearby islands: AntiParos, Delos, Naxos etc.

Commonly, a screening film about Paros will highlight the uniqueness of the place, bringing together the mosaic of all life and tourist products.

4.18 Integrated destination management

The parameters of tourist destination management are: The levels of action strategy, the level of destination by service sector, the purpose set by stakeholders involved in tourism.

4.19 Fishing tourism

Paros has the largest fishing fleet in the Cyclades. Many boats and fishermen are based in Paros. Fishing tourism is special for tourists as it combines sea cruising with fishing and gastronomy. It is another comparative opportunity for Paros.

4.20 Carrying out research on tourism in Paros

These surveys are done with questionnaires which are distributed to tourists. Many destinations have made similar efforts. The results of these surveys of visitors are prerequisites for the tourism policy of the municipalities, the tourist promotion, the measurement of the expenses of the visitors, the quality of the tourist product and the study of the origin of the tourist demand.

4.21 Sports tourism

Sports Tourism is related to sports organizations such as clubs, associations, federations, national and international, confederations at local, regional, national, continental and global levels.

4.22 Utilization of nearby areas

Despotiko Island is of special archaeological interest. The excavations reveal very important ancient monuments with a very characteristic temple of Apollo. Utilizing it as a place to visit the same day from Paros is an excellent opportunity. AntiParos is a small island adjacent to Paros, the entrance to the island is through Paros. Thousands of tourists visit it every year. Many visitors to Paros go for a swim or a drink in AntiParos. The co-operation of the two islands is an issue that needs to be addressed.

REFERENCES

- [1] Prokopiou, D., Research for sustainable tourism development for Paros Island. Municipality of Paros, Paros 2019. (In Greek.)
- [2] Paros airport and port statistics.



- [3] Greek National Tourism Organization.
- [4] World Tourism Org, http://www.biodiversity.ru/coastlearn/tourism-eng/con_capacity.
- [5] UNEP/MAP/PAP, 1997. <http://www.unepmap.org>.
- [6] http://ec.europa.eu/environment/iczmpdf/tcca_en.pdf.
- [7] Coccosis, H. & Mexa, A., *Challenge of Tourism Carrying Capacity Assessment*, Ashgate, 2004.
- [8] Garrigós-Simón, F., Narangajavana, Y. & Palacios-Marqués, D., Carrying capacity in the tourism industry: A case study of Hengistbury Head tourism management, 2003.
- [9] Navarro Jurado, E., et al. Carrying capacity assessment for tourist destinations. methodology for the creation of synthetic indicators applied in a coastal area. *Tourism Management*, **33**, 2012.
- [10] Blancas, F.J., Gonzalez, M., Lozano-Oyola, M. & Perez, F., The assessment of sustainable tourism: Application to Spanish coastal destinations. *Journal Ecological Indicators*, **10**, 2010.
- [11] Prokopiou, D.G., Tselentis, B.S., Mavridoglou, G. & Lagos, D., Prototype model of carrying capacity in tourism: The implementations for the island of Rhodes. *European Scientific Journal*, 2014.
- [12] Kyriakou, K., Hatiris, G.-A., Kapsimalis, V., Sourianos, E. & Vandarakis, D., The application of GIS in tourism carrying capacity assessment for the island of Rhodes, Greece. *15th International Conference on Environmental Science and Technology*, Rhodes, Greece, 31 Aug.–2 Sep., 2017.

